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Environmental Factors That Predict Adolescent Smoking Behavior: The Influence of Parent, Peer, and Sibling Smoking

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Abstract

ENVIRONMENTAL FACTORS THAT PREDICT ADOLESCENT SMOKING BEHAVIOR: THE INFLUENCE OF PARENT, PEER, AND SIBLING SMOKING

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The majority of adult smoking begins during adolescence, and in order for prevention programs to be optimally effective it is critical to understand the influences of smoking initiation during this developmental period. However, little research has focused on how environmental factors, such as parent and peer smoking, influence smoking initiation exclusively within a rural population. The current study surveyed students from 23 middle schools in rural Virginia and New York State at the end of the sixth grade and then one-year later at the end of the seventh grade. Logistic regressions were used to predict changes in levels of adolescent smoking from factors such as parent smoking, peer smoking, sibling smoking, self-efficacy to refuse cigarettes, and whether the adolescent resided in a tobacco-growing area.

Results from this study indicated that having a best friend who smokes was more important for trying smoking, whereas the number of friends who smoke was more important for experimental and higher levels of smoking. Two variables, having a mother who smokes and an adolescent's self-efficacy to refuse cigarettes, were found to be a consistent influence across all stages of smoking behavior. Ethnicity had a slightly different impact on smoking behavior than demonstrated in previous research. African Americans were actually at a higher risk for trying smoking than Caucasians, and there were no differences for ethnicity among those who moved to experimental or higher levels of smoking. In addition, living in a tobacco-growing county was significantly related to adolescents trying smoking, but was not related to adolescents at this age moving to experimental or higher levels of smoking. The findings from this study suggest that there are unique aspects to the smoking behavior of rural adolescents, and suggestions for prevention are made.

CHAPTER I

INTRODUCTION

Adolescence is a time when individuals begin taking more purposeful steps toward individuating from their parents and shaping their own identities. As part of this process, adolescents look toward others in their environment as possible models of adult behavior (Bandura, 1986). While some behaviors can be "tried out" without long-term consequences, a behavior such as smoking is physiologically reinforcing (Levin, 1992) and can have a more substantial impact on one's health. Smoking is usually initiated during adolescence but often continues into adulthood (Chassin, Presson, Rose, and Sherman, 1996), with serious health consequences for long-term smokers such as an increased risk for cancer (Peto et al., 2000) and coronary heart disease (Lakier, 1992). It is because of the negative health consequences that more research is needed to understand why adolescents smoke if we are to reduce this health compromising behavior. One critical area that needs to be studied is the impact of environmental factors, including smoking by peers, parents, and siblings.

Smoking among family members in the environment may provide the adolescent with models for such behavior, may convey parental attitudes about the acceptability of smoking, or may make cigarettes more easily obtainable. Evidence suggests that

adolescents have an increased risk for initiating smoking when they have parents who smoke (Chassin, Presson, Sherman, Corty, & Olshavsky, 1984; Jackson, Bee-Gates, & Henriksen, 1994). However, parental smoking may influence adolescents differently, depending on such factors as the adolescent's stage in the smoking initiation process and the gender of the adolescent (Hu, Flay, Hedeker, Siddiqui, & Day, 1994; Robinson et al., 1997). Parents who smoke may be a stronger predictor of adolescents who are experimenting with cigarettes, and may not be as influential for adolescents progressing from experimental to more regular smoking. Sibling smoking is another potential source of influence on smoking initiation in adolescence (Chassin et al., 1984), although it has received less research attention.

Having peers who smoke is a potential source of influence that increases an adolescent's risk for smoking, and one that may be more persistent across stages of smoking onset (Chassin, Presson, Rose, Sherman, & McGrew 1986; Distefan, Gilpin, Choi, & Pierce, 1998). Having a best friend who smokes has been found to be particularly important (Headen, Bauman, Deane, & Koch, 1991). However, there is some question about the degree that peers who smoke influence other adolescents to smoke, and how much of that association may actually be due to adolescents selecting friends who are similar to themselves with regard to smoking behavior (Bauman & Ennett, 1996). Longitudinal studies that predict the onset of smoking behavior have suggested that the association between peer smoking and adolescent smoking may be more moderate than previously believed (Chassin et al., 1986; Urberg, Degirmencioglu, & Pilgrim, 1997; Engels, Knibbe, & Drop, 1999).

The purpose of the current research is to examine the extent that parental smoking, best friend smoking, peer smoking, and sibling smoking predict adolescent smoking at different stages of the smoking initiation process in a sample of rural adolescents. Research indicates that adolescents who live in rural areas have a higher prevalence for excessive cigarette use (Cronk and Sarvela, 1997). However, most of the studies that have examined the environmental influences of adolescent smoking initiation have used urban or suburban samples. An increased understanding of the environmental factors that influence adolescent smoking can enable prevention programs to be designed to counter these influences at the appropriate developmental time. Ultimately this can aid in the development of more effective prevention programs.

Overview

In Chapter II the literature is reviewed with regard to the negative consequences of adolescent tobacco use. Within Chapter II the theories that have relevance for adolescent smoking and the environmental factors that may influence the initiation of smoking in adolescence are also reviewed. Chapter II concludes with a statement of the problem in terms of an area of needed research, the purpose of the present study, and the hypotheses for the study. The method of the study is presented in Chapter III, including the sample, design, and proposed analyses. Chapter IV contains the statistical results of the proposed hypotheses. The final chapter, Chapter V, includes a discussion of the results, limitations of the study, and the implications for future research and practice.

CHAPTER II

REVIEW OF THE LITERATURE

The review of the literature is divided into three sections. The first section describes research on the consequences of adolescent tobacco use, including its affect on later smoking behaviors and the health of the individual. The second section presents a major theory and a secondary theory that can provide an understanding of the possible reasons for adolescent smoking. These theories can guide researchers who wish to investigate the influences of adolescent tobacco use. In the third section, the environmental influences of adolescent smoking are discussed, including parent, peer, and sibling influences.

The Negative Consequences of Adolescent Tobacco Use

Smoking Begins During Adolescence

Many of the adolescents who begin smoking early in adolescence go on to become established regular smokers. A study by Gilpin, Choi, Berry, and Pierce (1999) used a national data source to estimate the number of adolescents who smoke for the first time and then become established smokers. The authors used 1989 and 1993 data from The Teenage Attitudes and Practices Surveys (TAPS), designed to be representative of the United States population. The survey was primarily conducted in interviews over the

telephone and included questions about whether the individual had ever smoked and whether the individual had smoked at least 100 cigarettes in his or her life. A total of 7,960 adolescents were interviewed in both 1989 and 1993, and an additional 4,992 adolescents were interviewed in 1993. Results indicated that the age when the adolescents first began smoking cigarettes had a bimodal distribution, with smoking initiation occurring the most for adolescents, ages 12 and 14. Approximately 30% of adolescents smoking for the first time were 11 to 12 years of age, and approximately 80% of the adolescents smoking for the first time were 11 to 15 years of age.

Not only do adolescents begin smoking relatively early, but smoking behavior begun during adolescence often persists into adulthood. A study by Chassin, Presson, Rose, and Sherman (1996) first surveyed 4,035 individuals on their smoking status when they were in the eleventh or twelfth grade. The same individuals completed a first follow-up survey as young adults four to seven years later, and a second follow-up survey as adults 10 to 13 years after the initial survey. The survey at each time point included a question about the individual's smoking status, which was later dichotomized as weekly or more frequent smoking versus nonsmoking. The results indicated that among those who were adolescent smokers, 59.3% continued to be adult smokers, compared with 9.6% adult smokers who had reported not smoking during adolescence. These findings, along with similar results from other studies (Vartiainen & Puska, 1996), indicate that adult smoking generally begins during adolescence, and that those individuals who remain non-smokers through adolescence are less likely to initiate smoking during adulthood.

The study by Chassin et al. (1996) makes it clear that not all adolescent smokers continue smoking, but over half continue smoking into adulthood. A study by Choi, Pierce, Gilpin, Farkas, & Berry (1997) sought to determine how many experimental smokers in 1989 went on to become established smokers (reached a lifetime level of at least 100 cigarettes) in 1993. In this sample, a total of 9,135 adolescents between the ages of 12 and 18 were interviewed by telephone in 1989. A total of 7,960 of those adolescents were again interviewed in 1993. Individuals were considered experimenters if they reported smoking at least a few puffs of a cigarette but fewer than 100 cigarettes in their lifetime. Of the 2,684 adolescents who were experimenters in 1989, approximately 31% progressed to established smoking by 1993. This study is consistent with other studies that indicate that at least one-third of experimental smokers in adolescence progress to become established smokers (Hirschman, Leventhal, & Glynn, 1984).

Earlier Smokers Are Less Likely To Quit

In addition to a strong relationship between adolescent smoking and later smoking behavior, there is evidence suggesting that the younger an individual starts smoking, the more difficult it will be for that person to stop smoking during adulthood. A study by Breslau and Peterson (1996) selected a random sample of 1200 individuals between 21 and 30 years of age who were members of a Health Maintenance Organization. Individuals were interviewed regarding whether or not they smoked, whether they had previously smoked (with smoking cessation being defined as last smoking at least one year prior to the interview), and the age when they first started smoking. The results

indicated that the likelihood of having quit smoking was greater in smokers who had begun cigarette smoking after the age of 13 than in those who had begun earlier. Compared with those who began smoking prior to age 13, smokers who began at ages 14 to 16 were 1.6 times more likely to quit smoking, and those who began at age 17 years or later were twice as likely to quit.

A population study from a northeastern city in the United States similarly found that quitting in adulthood is more difficult when initiation takes place earlier in adolescence. In a study by Khuder, Dayal, and Mutgi (1999), 1,710 males were surveyed regarding whether they ever smoked, the age at which regular smoking started (smoked cigarettes everyday), whether they currently smoke, and their attempts to quit smoking. Results indicated that those who started smoking before age 16 were twice as likely to continue smoking as those who started after age 19. These findings again suggest that the decision an individual makes to smoke during early adolescence can persist into adulthood and make it less likely that the person will quit smoking as an adult.

Nicotine Addiction and Health Consequences of Smoking

One of the reasons that individuals have a difficult time quitting is because the nicotine contained in cigarettes is addictive. Nicotine is reinforcing, likely involving the indirect activation of midbrain dopamine neurons (Levin, 1992). As an individual progresses to more regular smoking, the reinforcement diminishes and the person smokes primarily to relieve or avoid withdrawal symptoms (Julien, 1995). Such symptoms include irritability, anxiety, difficulty concentrating, increased appetite, and insomnia (Hughes, Gust, Skoog, Keenan, & Fenwick, 1991). Eissenberg and Balster (2000)

suggest that adolescents who become regular tobacco users may be less sensitive to nicotine's dysphoric effects than those who remain non-users, or they may minimize the negative effects if in the presence of more experienced users. Whatever the reason for an adolescent beginning to smoke, the addictive nature of nicotine may make the seemingly harmless adolescent activity difficult to stop, with serious health risks resulting from continued use.

The medical literature has documented many adverse health effects associated with smoking. For example, individuals who smoke are at two to four times the risk of coronary heart disease than individuals who do not smoke (Lakier, 1992). Individuals who smoke also increase their risk for developing cancer, especially lung cancer. Importantly, a person who is able to stop smoking before middle age may avoid more than 90% of the risk for lung cancer attributable to smoking (Peto et al., 2000). The manner in which smoking is often initiated, and the health risks associated with smoking, make many in the public health community believe that cigarette smoking is the chief preventable cause of premature disease and death in the United States (Elders, Perry, Eriksen, & Giovino, 1994).

Summary

There are several good reasons why communities and health care professionals should take note of adolescent smoking. First, most adult smoking begins during adolescence. Smoking initiation usually occurs before high school graduation and frequently during early adolescence. School transitions such as going from elementary school to middle school (approximately age 12) or from middle school to high school

(approximately age 14) seem to be prevalent times for smoking initiation. Even if an adolescent experiments with smoking, the addictive nature of nicotine and other influential factors result in at least one-third of those adolescents who experiment with smoking becoming regular cigarette users.

Second, there is evidence that suggests that the earlier in adolescence an individual begins to smoke, the more difficult it will be for him or her to stop smoking as an adult. Even if an adult may want to stop smoking, choices made as an early adolescent and a resulting dependency on nicotine may make it difficult to change the smoking behavior. Finally, the choice to smoke as an adolescent may have serious health consequences as an adult, including the increased risk for cancer and heart disease (Lakier, 1992; Peto et al., 2000). Adolescents want to make decisions that will shape their identities. However, if these decisions involve smoking, there may be serious health consequences involved.

Theories of Smoking Initiation

Two theories will be discussed that have relevance for adolescent smoking. The first is Social Cognitive Theory (Bandura, 1986), a theory that focuses on the interaction between the individual and the environment. A theory that identifies the stages of smoking onset provides an additional framework for understanding the development of smoking behavior in adolescence (Leventhal & Cleary, 1980; Flay, 1993).

Social Cognitive Theory

Social cognitive theory (Bandura, 1986) suggests that the environments in which an individual exists has an influence on that person's behavior. Others in the

adolescent's social environment, such as family members, friends, and peers can influence the adolescent's behavior. One of the ways that the adolescent's behavior can be influenced is through the observational learning of behaviors being modeled by others in the environment. For example, parents who smoke may be modeling the smoking behavior for their children, and thus make it possible for the child to observe and later reproduce the behavior when given the opportunity. However, models in the environment are not a sole source of influence because social cognitive theory suggests that the individual's behavior also depends on cognitive and emotional factors.

A cognitive factor that a person brings to a situation includes his or her expectations for the outcome of performing that behavior. After observing other models in the environment, the individual expects positive or negative results from performing the behavior himself or herself. For example, an adolescent may learn to expect, from advertising, peers, or important adults, that smoking can be a fun or exciting experience (Baranowski, Perry, & Parcel, 1997). In addition, the adolescent who observes his or her friends smoking may expect that smoking will result in being accepted by friends or at least avoid being ostracized by them. In this situation an emotional component is also present because the adolescent is engaging in smoking behavior to feel accepted and valued by important friends.

The value that the individual places in the outcome of the behavior provides the incentive (Bandura, 1986) or outcome expectancy (Baranowski et al., 1997) that may provide motivation to perform the behavior. For example, an adolescent who believes that smoking will make her appear more grown-up, and who highly values appearing like

an adult, may have more incentive to try smoking cigarettes. Another personal factor is an individual's confidence or self-efficacy (Bandura, 1986) to perform a particular behavior. For example, an adolescent may have a large amount of confidence that he can resist offers from friends to smoke cigarettes. This confidence in his refusal skills can then moderate the influence that peers in his environment who smoke may have on him. Thus, social cognitive theory posits that there is a continuous interaction, or reciprocal determinism, between the individual and the environment whereby both the person and the environment influence each other.

Stages of Smoking Initiation

Leventhal & Cleary (1980) and Flay (1993) have posited that adolescents progress through a series of stages prior to actually engaging in smoking behavior. The first stage is the preparatory stage, whereby attitudes, beliefs, and outcome expectations are formed. For example, the adolescent may observe smoking being modeled by parents and begin to form an expectation that he or she will appear more adult-like, or perhaps get help coping with a stressful situation by smoking cigarettes. The second stage, or the trying stage, includes the first few times that the adolescent smokes. During the third stage, the experimentation stage, the adolescent may smoke repeatedly but the behavior is irregular and is often exhibited in response to a particular situation such as a party (Perry & Staufacker, 1996).

Regular use is the fourth stage of smoking onset, and includes an adolescent smoking regularly (at least once a week) and across a variety of situations. The final stage of smoking onset, addiction, includes tolerance of nicotine and withdrawal

symptoms if the adolescent tries to quit. This framework for the stages of smoking onset is important because the factors that influence the use of cigarettes may be different for adolescents in different stages. Research in areas of other adolescent drug use suggests that one needs to take into account the phase of an adolescent's behavior in addition to the type of behavior, because different factors may be more or less influential depending on the phase (Kandel and Andrews, 1987). For example, observed modeling of smoking behavior by parents may be more important during the preparatory stage, when attitudes and expectations are initially being formed, than in the experimentation stage, when other environmental factors such as peer smoking may become more influential for increasing the smoking behavior.

Despite the apparent importance of examining the different phases of smoking behavior, a review of the literature by Conrad, Flay, and Hill (1992) observed that very few researchers have attempted to determine the different antecedents for the different stages of adolescent smoking. A later review (Mayhew, Flay, & Mott, 2000) indicates that a further impediment to smoking stage research is the lack of a valid and reliable measure of smoking stages. However, examining influences at different stages of smoking may be important to more clearly interpret studies that have conflicting results. Moreover, if there is some consistency in the factors that are most influential at particular stages it might facilitate intervention efforts.

Operationalizing Theory In Research

Due to an individual's environment being so influential in shaping behavior, it is important to identify and measure the relative influence of different environmental

variables. One set of influences are parents, siblings, other family members, and peers. However, these sources of influence represent only some of the potential sources. There are many other environmental sources of influence, such as messages in the media (Botvin, Botvin, Michela, Baker, & Filazzola, 1991) and the availability or ease of obtaining cigarettes (Robinson, Klesges, Zbikowski, & Glaser, 1997). It is also important, however, not to overlook the personal factors that the individual brings to a situation. Several personal factors, such as the person's self-efficacy to remain tobacco-free and the person's tendency to engage in risk-taking behaviors (Robinson, Klesges, Zbikowski, & Glaser, 1997), can interact with the environment to determine whether an adolescent initiates smoking. Similarly, the attitudes, values, and expectations that the adolescent has toward smoking is both shaped by the environment and can motivate a response to the environment. In sum, social cognitive theory provides a solid guide for examining how environmental influences and personal values and experiences can interact to affect adolescent smoking behavior.

The Role of Environmental Influences on Adolescent Smoking

The following section will review research that has examined the environmental influences of parents, siblings, friends, and peers on adolescent smoking behavior. Such environmental influences are particularly salient to adolescents because, as they journey toward establishing their own identity, they look toward significant others in their environment who are modeling social behaviors. In addition to these direct and proximal environmental factors, the influence of more distal environmental factors, such as gender, ethnicity, and rural living area will be considered in this section. These variables are

considered distal because they are believed to act indirectly to affect tobacco use (Perry & Staufacker, 1996). However, distal variables such as gender and ethnicity may be especially important because their interactions with other variables can elucidate the conditions when proximal environmental factors are most influential.

Parental Influence on Smoking

Several studies have examined the effects of parents on the smoking behavior of their adolescent child. Most studies have examined whether the parents themselves smoke in an effort to identify the possible influence of parent modeling. A study by Chassin, Presson, Sherman, Corty, and Olshavsky (1984) illustrates the influence of parental smoking on different stages of adolescent smoking. In the study, 4,221 students in grades six through eleven were surveyed at two time points one year apart. The sample was predominantly Caucasian (96%) and from suburban (57%) or urban (26%) areas. The study used only participants who were nonsmokers or triers (smoked a cigarette or a few puffs) at the first time point. For participants who were nonsmokers at the first time point and had progressed to beginning to smoke one year later, results indicated that having more parents who smoked cigarettes was a significant predictor. Parent smoking was less important, however, for the adolescents who transitioned from experimental smoking to regular smoking.

A study by Hu, Flay, Hedeker, Siddiqui, and Day (1995) further illustrates differences in the influence of parental smoking for different stages of adolescent smoking. Investigators surveyed 6,695 seventh grade students from two urban areas in Southern California. The same students were again surveyed during eighth and ninth

grades. Participants' were categorized according to prior smoking status at Time Point 1 as nonsmokers, initiators, and higher-level smokers. Current smoking was assessed and categorized as nonsmokers, ex-smokers (smoked previously, but did not smoke in the past 12 months), experimenters (smoked once a month or less), and regular smokers (smoked a few times a month or more). Parental smoking was also assessed, with a hypothesis that parental smoking would have an influence on adolescents increasing their smoking behavior. Results indicated that parental influence was greater for those who never smoked and those who were initiators compared to higher level smokers. In addition, parental smoking was stronger for females than for males, and significant for all ethnic groups except for African Americans.

A study by Griesler and Kandel (1998) also found that the association between parental and adolescent smoking differs by ethnicity. The study examined the smoking behavior of 1,795 children and their mothers in 1992, with the children in the survey averaging 12.4 years of age. Items included whether the children had ever smoked or had smoked within the past three months. Results indicated that Caucasian adolescents were three times as likely to be current smokers (smoked within the past three months) if their mother currently smoked. However, among African American and Hispanic adolescents, there was not an association between maternal and child smoking.

A study by Robinson et al. (1997) also examined parental influence by stage of adolescent smoking. Investigators surveyed 6,967 seventh grade students in an urban school system in the middle southern United States. One survey item asked participants whether most of their family members smoked. By focusing on family members as

opposed to just parents, the researchers were able to incorporate grandparents and siblings. Participants' use of cigarettes was assessed and later categorized as nonsmokers, experimental smokers (smoked a few cigarettes), regular smokers (at least one cigarette per week), and those who had smoked regularly in the past but had quit.

Results indicated no significant main effect for family smoking when comparing nonsmokers to experimental smokers. However, there was an interaction with gender such that Caucasian girls whose families smoked were over three times more likely to try cigarettes than girls from nonsmoking families. The influence of familial smoking was also significant, although less pronounced, for African American girls and African American boys. Interestingly, when a comparison was made between experimental smokers and regular smokers (at least one cigarette per week), family smoking and its interactions with gender and race were not significant. One difficulty with this study is that it combines parent smoking and sibling smoking, thus making the results somewhat more difficult to interpret.

The study by Robinson et al. (1997) suggests that the influences within the family, including parenting influences, are complex. A study by Melby, Conger, Conger, and Lorenz (1993) used a sample of 204 seventh grade Caucasian boys who were primarily from lower middle class and middle class families from a midwestern state in an area heavily dependent on agriculture. The study used both self-report questionnaires and interviews in the family's home. Parental child-rearing behaviors were assessed and categorized on levels of harsh/inconsistent parenting (parenting practices that disrupt effective adolescent socialization and conventional attachment to parents) and

nurturant/involved parenting (practices that facilitate effective adolescent socialization and conventional attachment to parents). Parent tobacco use and the seventh grader's tobacco use was also assessed. Peer tobacco use was assessed by asking the adolescents the number of close friends who had used tobacco.

Results indicated that harsh/inconsistent parenting behavior was associated with adolescent tobacco use, and nurturant/involved parenting was negatively associated with adolescent tobacco use. Interestingly, the current use of tobacco by parents was not directly related to adolescent tobacco use, although the all male sample makes this finding consistent with other findings that parental influence is stronger for female adolescents (Chassin et al., 1986; Hu et al., 1995). However, the use of tobacco by mothers was indirectly related to adolescent tobacco use through the types of peers with whom the adolescent chose to associate. Thus having a mother who smoked increased the likelihood that the adolescent would have friends who smoke. Nevertheless, the cross-sectional nature of these data limits interpretations of the direction of causality among the variables.

Two other studies suggest that parents smoking in itself, however, is an influential and valuable predictor of adolescent smoking. A study by Jackson, Bee-Gates, and Henriksen (1994) surveyed 937 students in the third grade through the eighth grade in Northern California. Participants were asked about their parents' smoking status. Parents were categorized as former smokers, current smokers, or nonsmokers. Participants were also asked to complete a measure of their parents' parenting behavior to determine the level of authoritative parenting or nonauthoritative parenting.

Authoritative parenting, which is characterized by both setting clear standards of behavior and responding to the child's needs and rights, was expected to influence child smoking through its effect on child competencies and the maintenance of parental authority. The participants were also asked their level of smoking, categorized as intenders (reporting they were likely to smoke when they were older), initiators (reporting having at least one or two puffs), and experimenters (reporting smoking "2-4 cigarettes" to "more than one pack").

Results indicated that authoritative parenting was inversely related to child smoking intention and behavior. Thus, the more authoritative parenting that was reported, the less likely it was for the child to intend on smoking or to actually smoke. When a logistic regression was used on these variables, there continued to be a positive association between parent smoking and child smoking, and a negative association between authoritative parenting and child smoking. This indicates that both parent smoking status and authoritative parenting made unique contributions, suggesting that both parenting traits and parent modeling of smoking can be influential factors on the smoking of children. The cross-sectional nature of this data again limits the interpretation of these findings. A second limitation is that the study includes a broad developmental age range, from children in elementary school grades to adolescents, each of whom are at different stages of smoking and for whom parents may have differential influence. These factors may make the findings less clear for the specific age group of adolescence.

A study by Chassin, Presson, Todd, Rose, & Sherman (1998) examined smoking behaviors among three generations of women from the midwestern part of the United States. For this study, a total of 214 participants in the sixth through the twelfth grades completed questionnaires at annual intervals from 1980 to 1983. The adolescents who were surveyed between 1980 and 1983 reported whether or not each parent smoked and completed measures of parental strictness. They also reported their own smoking behavior which was later dichotomized as nonsmoking (abstinence or less than monthly smoking) and regular smoking (monthly or more). In 1995, these adolescents, now all parents themselves, were surveyed. Their smoking status was assessed as currently smoking or not currently smoking, and they completed measures that assessed consistent discipline and provision of support to her child. The adolescents' children were assessed for smoking, dichotomized as those who never smoked and those who had at least tried a cigarette. Peer smoking was also assessed for the adolescents when surveyed between 1980 and 1983, and their children when surveyed in 1995.

Results indicated that parent smoking was significantly directly related to offspring smoking, and this relation was demonstrated in two generations of participants. Parental smoking also had a significant indirect effect on adolescent smoking in both generations, mediated through affiliations with smoking peers. In addition, parental smoking remained a significant predictor of adolescent smoking above and beyond the parenting behavior, again suggesting that there may be influences of parental smoking modeling. However, children whose mothers smoked viewed their mothers as less likely to punish their smoking, suggesting that parents' smoking is more complex than just

modeling behavior, and that it may help to establish the beliefs and attitudes among children as well. Although this was a longitudinal design, the analyses for the youngest generation and their parents was actually cross-sectional, limiting the interpretations that can be made.

Several of the above studies suggest that parental influence is complex, with both parental smoking behavior and other parenting practices likely to influence adolescent smoking behavior. Robinson et al. (1997) also demonstrated how parent influences may be intertwined with other environmental influences, such as with sibling smoking behavior. A study by Pierce, Choi, Gilpin, Farkas, and Merritt (1996) examined how the combination of several environmental factors can be influential. In the study, researchers surveyed adolescents between the ages of 12 and 18 at two time points four years apart. The study focused on 4,500 adolescents who, at the first time point in 1989, reported never having experimented with smoking.

The participants' smoking behavior was assessed, along with the smoking behavior of each older member of the household, the immediate family members not living at home, and the participants' four best male and four best female friends. A single, four-level variable was created that consisted of minimal exposure to smoking (i.e., no exposure from family or best friends), exposure through family members only, exposure through best friends only, and exposure through both family and friends. When predicting the adolescents who progressed from nonsmokers to experimenters, the results indicated that 39% of those exposed only to smokers within their family had experimented, and 47% exposed to best friend smoking only had experimented.

Approximately 50% of those exposed to smoking by both their family and their best friends had experimented. The variables were also used to predict which adolescents progressed from nonsmokers to established smokers (smoked at least 100 cigarettes) by the second time point. A similar pattern emerged, with those exposed to smokers in both their family and their best friend network having the highest rate of established smoking at follow-up (13.8%) compared to those exposed to family only (8.7%) or best friends only (9.3%). The findings suggest that, while parental smoking behaviors are influential, it is important to examine other sources of environmental influence.

Summary of parental influences on smoking. Several studies suggest that parental smoking may be especially influential for adolescents who are moving from the preparatory or trying stage of smoking to the experimentation stage of smoking (Chassin et al., 1984; Hu et al., 1995; Robinson et al., 1997). However, the same studies indicate that parent smoking behavior may be less influential for adolescents who are already experimenting with smoking and who are progressing to a higher level of smoking such as regular use. When parent smoking behavior does have an influence on adolescent smoking, this influence appears to be stronger for females than males (Hu et al., 1995; Robinson et al., 1997), and stronger for Caucasians than African Americans (Hu et al., 1995; Griesler & Kandel, 1998). Importantly, the influence of parents on the smoking behavior of their children is complex, and includes specific parenting behaviors (Melby et al., 1993; Jackson et al., 1994), as well as through their influence on the types of friends (smoking or nonsmoking) with whom their children associate (Melby et al., 1993). Although studies that take parenting behaviors into account suggest that parental

smoking remains a significant predictor of adolescent smoking (Jackson et al., 1994; Chassin et al., 1998), it is important to examine parental smoking within the context of other environmental influences, such as peer smoking (Pierce et al., 1996).

Peer Influences

As an individual progresses into adolescence, peers are increasingly looked toward as models of ideas, verbal expressions, dress, and behavior. It is theorized that adolescents who smoke are modeling such behavior to their peers, and therefore influencing other adolescents to smoke. Several studies have investigated the effects of peer smoking on the smoking behavior of adolescents. In the study by Melby et al. (1993) that examined a sample of 204 seventh grade Caucasian boys from lower middle class and middle class families, peer tobacco use was measured by asking adolescents for the number of close friends who used tobacco. The results of a structural equation model indicated that the effects of associating with tobacco-using peers was directly related to adolescent tobacco use.

Peer influence has also been examined across the different stages of adolescent smoking onset. In the study by Chassin et al. (1986) 2,128 sixth through eleventh grade students who reported either never smoking or had only tried smoking were surveyed in 1982 and again one year later. Peer smoking was measured by asking participants the number of their five closest friends who smoke cigarettes. For those who had reported never smoking at the first time point, those with more smoking peers were significantly more likely to begin to smoke by the second time point. For those who had been triers at

the first time point, those with more smoking friends were more likely to become regular smokers one year later.

In the study by Robinson et al. (1997) in which 6,967 seventh grade students in an urban school system were surveyed, peer cigarette use was assessed by asking participants how many of their five best friends smoke at least once a week. When comparing nonsmokers to experimental smokers (smoked a few cigarettes), adolescents were 34% more likely to try smoking when their friends smoked. When comparing experimental smokers to regular smokers (one cigarette per week), adolescents were more than twice as likely to be regular smokers compared to experimental smokers when their friends smoked. In addition, although Caucasian adolescents and African American adolescents were both more likely to smoke regularly when their friends smoked, the effect of peer smoking on Caucasian adolescents was stronger.

The study by Hu et al. (1995) that surveyed 6,695 seventh grade students from two urban areas in Southern California also examined the effects of peer influence on adolescent smoking. Participants were asked how many of their 10 closest friends have tried a cigarette, with responses ranging from 1 (none) to 6 (8-10 friends). Participants' were categorized according to prior smoking status as nonsmokers, initiators, and higher-level smokers. Results indicated that friends' smoking had a greater influence on adolescents' current smoking for prior nonsmokers than for prior initiators. In essence, the effect of friends' smoking decreased with escalating levels of prior smoking. In addition, friends' smoking was stronger for females than for males. However, because the study used some adolescents who had already been smoking, it is important to

consider that adolescents' may have previously selected friends with similar smoking behaviors as themselves.

A study by Urberg, Degirmencioglu, & Pilgrim (1997) attempted to control for the effects of friendship selection. In the study, 1,028 students in the sixth, eighth, and tenth grades from a large midwestern city were surveyed in the fall and then the spring of the same school year. Adolescent cigarette use was measured and dichotomized as "no use in the recent past" and "some use in the recent past." In order to control for selection of friends while predicting the onset of smoking behavior, only those adolescents who had never smoked were included in the analysis. Adolescents were asked to name their best friend and other good friends in school, and names were later matched to establish the friendship groups. Results indicated that the initiation of smoking was influenced by the adolescent's close friend, and not by the friendship group. Only if the closest friend had initiated smoking was the adolescent likely to initiate smoking himself.

In a study by Headen, Bauman, Deane, and Koch (1991), adolescents ages 12 to 14 from a sample of 10 Standard Metropolitan Statistical Areas in the southeastern United States completed self-administered questionnaires in the presence of a trained interviewer in both 1985 and 1987. Adolescents were considered smokers if they smoked "at least a few times in the past year," and were considered nonsmokers if they had not smoked within the past year. Only those adolescents who had reported that they did not smoke in 1985 (n=1,277) were included in the analyses in order to assess the variables that were associated with the adolescents progressing to smoker status. The results indicated that, among Caucasian adolescents, the odds of smoking were 2.44 times

greater if a best friend smoked. However, among African Americans, the odds of smoking did not increase if a best friend smoked.

A study by Distefan, Gilpin, Choi, and Pierce (1998) surveyed adolescents between the ages of 12 and 18 in 1989, and again in 1993 when the participants were between the ages of 15 and 22. Participants were asked the number of their four best male and four best female friends who smoked. They were also asked how their best friends would feel about them smoking one or more packs of cigarettes a day (approve, disapprove, or would not care). Among the adolescents who had progressed from being a nonsmoker at baseline to an experimenter (fewer than 100 cigarettes) four years later, the rates of progression were significantly higher for both male and female adolescents who had at least one male best friend who smoked at baseline. The attitudes of the best friends (how they would feel toward the teen smoking) were not significant. Among the adolescents who had progressed from being an experimenter at baseline to an established smoker (more than 100 cigarettes) four years later, the rates of progression were significantly higher for those adolescents having a male or female best friend who smoked.

A study by Stacy, Sussman, Dent, Burton, and Flay (1992) was unique because it examined potential moderators of the influence of peer smoking. The study surveyed 1,245 high school students in grades 9 through 12 in southern California. The participants' smoking tendency was determined by the sum of three items that assessed how often the participant currently smokes, the number of times the participant tried smoking in her life, and the number of times the participant intends to smoke in the next

year. Friends' social influence was comprised of the sum of three items, including the number of the participants' five closest friends who tried cigarettes, the number who smoke at least one cigarette per week, and the number who would approve if the participant smoked cigarettes. Self-efficacy was assessed with two, six-item measures that assessed the degree to which the student felt he could resist social pressures to use tobacco, and the degree to which he could exchange ideas and interact with other students without having to use tobacco. Self-esteem, latchkey status (amount of adult supervision after school), and perceived stress was also assessed. The results indicated that self-efficacy toward resisting social influence was the only significant moderator of the predictive effect of friends' social influence on smoking. Friends' social influence was a better predictor of smoking tendency among participants who were lower in self-efficacy than those higher in self-efficacy.

Methodological considerations for assessing peer influence. Several of the studies reviewed above (Stacy et al., 1992; Melby et al., 1993; Robinson et al., 1996) use cross-sectional data to determine the level of association between peers who smoke and an adolescent's smoking behavior. One limitation of such studies is that, while there may be a strong association between peer and adolescent smoking, the direction of causality cannot be determined. The association may be attributed to peers influencing their friends to smoke, or perhaps adolescents who are already smoking choosing friends who are similar to themselves with regard to smoking. Bauman and Ennett (1996) suggest that the failure to control for an adolescent's selection of friends may overestimate the contribution of the influence of peers on smoking behavior. Others suggest that the

overestimation of peer influences results in a concomitant underestimation of parental influences (Kandel, 1996). One way to better control for friendship selection is to utilize longitudinal data that uses peer smoking variables to predict smoking before smoking begins.

Several studies reviewed above (Headen et al., 1991; Urberg et al., 1997; Distefan et al., 1998) used longitudinal data to better control for friendship selection and still found peers to be influential. However, the problem of friendship selection remains an important consideration when attempting to determine the relative amount of influence peers have on adolescent smoking. To further illustrate, at least two studies examined their data sets using both longitudinal and cross-sectional methods. Chassin et al. (1986), first using cross sectional data in sixth through eleventh grade students, found that as the age of the adolescent increased, the magnitude of peer influence also increased. When longitudinal data was used with the same sample, there was not an interaction of age with peer influence, although the peer influence on smoking remained significant.

Similarly, a study by Engels, Knibbe, and Drop (1999) surveyed 1,454 adolescents in the Netherlands at three time points, each three years apart. Participants reported their level of smoking, the smoking status of their same-sex best friend, and the number of their peers who smoked, ranging from 1 (no one) to 5 (all peer members smoke). When cross-sectional data was examined, smoking by the best friend and the number of smokers in the peer group were positively associated with current smoking at each time point. However, when time point 1 and time point 2 data for nonsmokers was used to predict smoking at time point 3, smoking by the best friend and the number of

peer group members who smoked were not significant predictors. The results suggest that controlling for friendship selection should be an important consideration when investigating the strength of the effects of peers on adolescent smoking.

Summary of peer influence on adolescent smoking. Adolescent smoking is associated with having peers who smoke. In addition, having peers who smoke is a consistent predictor of adolescent smoking across the stages of onset, such as from nonsmokers to experimenters, and experimenters to regular smokers (Chassin et al., 1986; Robinson et al., 1996; Distefan et al., 1998). However, the results of one study did indicate that the effects of friends' smoking decreased with escalating levels of prior smoking (Hu et al., 1995). The results from a few studies indicated that, although participants of all ethnic backgrounds were more likely to smoke when friends smoked, the influence of peer smoking was stronger for Caucasian adolescents (Headen et al., 1991; Robinson et al., 1997). The results of one study also indicated that the association of peer smoking with adolescent smoking was stronger for females than males (Hu et al., 1995), but gender did not appear to interact with peer smoking in other studies.

The results of several studies indicated that having a best friend who smokes is associated with adolescent smoking (Headen et al, 1991; Distefan et al., 1998), perhaps more so than the overall peer group (Urberg et al., 1997). The results of one study also indicated that self-efficacy is a moderator of the association between peer and adolescent smoking (Stacy et al., 1992). Social cognitive theory suggests that cognitive and emotional factors of the individual can interact with the environment, and therefore it is surprising that more studies do not explicitly examine individual factors that moderate

influences of the environment. Finally, it is important to consider the possibility that friendship selection accounts for some of the association between peer smoking and adolescent smoking. Although it is likely that peer smoking is associated with adolescent smoking, this association may be more moderate (Chassin et al., 1986; Urberg et al., 1997; Engels et al., 1999) than what is indicated through cross-sectional studies, and may yield an underestimation of parental or other influences (Kandel, 1996).

Sibling Influence

Social cognitive theory suggests that siblings who smoke are modeling the behavior to adolescents in their family. Siblings may be perceived in a manner similar to a peer, and therefore have some influence on adolescent behavior. In the study by Melby et al. (1993) that examined a sample of 204 seventh grade Caucasian boys from a midwestern state, sibling tobacco use was measured. Results from a structural equation model indicated that the effects of sibling tobacco use were both directly and indirectly, through peer associations, related to adolescent tobacco use. However, the study utilized cross-sectional data that limits interpretation of the direction of causality.

A study by Engels et al. (1999) surveyed 1,454 adolescents in the Netherlands at three time points, each three years apart. Adolescent smoking and the smoking behavior of participants' eldest brother and eldest sister were assessed. When cross-sectional data was examined, the association between sibling smoking and adolescent smoking was not significant. However, when time point 1 and time point 2 data for nonsmokers was used to predict smoking at time point 3, adolescents who had a sister who smoked were more likely to become smokers themselves. Having a brother who smoked was not significant.

A study in Finland by Vartiainen and Puska (1996) surveyed the smoking behavior of 848 adolescents at the age of 15, along with their perceptions of their sibling smoking behavior. Cross-sectional results indicated that a sister's smoking was significantly associated with participants' smoking. However, a brother's smoking was significantly associated with participants' smoking only among girls. A total of 75% of the sample was later surveyed at the age of 28, and sibling smoking behavior when participants were adolescents was used to predict adult smoking. Results indicated that a brother's smoking when the participants were adolescents was significantly associated with adulthood smoking for women but not for men.

In the study by Chassin et al. (1984) that initially surveyed students in the sixth through eleventh grade and then at a one-year follow-up, having an older sibling who smoked was a significant predictor of those adolescents who progressed from being nonsmokers to experimental smokers. This finding was particularly strong for middle school female nonsmokers, but was not as strong for males or high school nonsmokers. However, sibling smoking was not a significant predictor of those adolescents who progressed from experimental smoking to regular smoking. As suggested by Chassin et al. (1984) having family members who smoke may provide available cigarettes and opportunities for initial experimentation, but subsequent smoking decisions may be based on different factors.

Summary of sibling influence on adolescent smoking. The influence of siblings on adolescent smoking behavior has received less research attention than the influences of parents and peers. In addition, few studies consider the influence of parents, siblings,

and peers simultaneously (Melby et al., 1993). From the studies that have examined sibling influence, it appears that siblings who smoke are associated with adolescent smoking. However, the effects of sibling and adolescent gender are unclear. When sibling smoking is used to predict adolescent smoking, it appears to have a stronger association with female smokers (Chassin et al., 1984; Vartiainen & Puska, 1996). However, the results of one study suggest that smoking by a sister is related to adolescent smoking (Engels et al., 1999) while the results of another study suggest that smoking by a brother is more important (Vartiainen and Puska 1996). Like parental smoking, sibling smoking may be a more important predictor for adolescents who progress from nonsmoking to experimental smoking than from experimental smoking to regular smoking (Chassin et al., 1984), but more studies that examine the effects of sibling smoking are needed.

The Rural Environment as a Risk Factor for Adolescent Smoking

The studies reviewed above regarding parent, peer, and sibling influences have almost all used participants from urban or suburban areas. However, adolescents from rural areas are believed to be at the same amount of risk for smoking initiation, if not more. A study by Harrell, Bangdiwala, Deng, Webb, & Bradley (1998) compared smoking initiation of rural and urban adolescents in North Carolina in which half of the participants were from a rural area. The participants were surveyed at five time points over a six-year period, beginning when the participants were in the third and fourth grades and extending into their early high school years. Results indicated that children in rural areas were significantly more likely to initiate smoking than urban children at all

time points except the first one. In addition, rural residence was a significant predictor of experimental smoking at the final two time points, when the adolescents were in late middle school and early high school. However, the sample was from a tobacco growing state, which may limit the ability of the results to be generalized to other areas of the country.

A study by Cronk and Sarvela (1997) used a national, probability-based sample to compare smoking between urban and rural adolescents. The study used a sample of 127,098 high school seniors, 51,182 who were from rural areas. According to the design of the study, participants were surveyed one time, during their senior year in high school, with surveys occurring from 1976 through 1992. Results indicated that rural adolescents tended to have similar or higher use prevalence than urban adolescents throughout the entire time period. By 1992 rural males and females had higher rates of smoking than urban adolescents. Rural adolescents also showed more stable and substantially higher prevalence for excessive cigarette use, with rural males having the highest rates for smoking more than one pack of cigarettes per day. Clearly rural adolescents are not exempt from the risks of smoking, but they are generally an understudied population with regard to the predictors of smoking initiation.

Living in a rural area may impact adolescent smoking rates for different reasons. For example, there may be a different cultural expectation about the age at which adolescents can make their own decisions. Rural areas may also have fewer school and extracurricular programs that promote non-smoking due to lack of funds or other resources. Rural areas also commonly have a lower socio-economic status (SES) than

many urban areas. Lower SES youth are generally at greater risk to begin smoking, perhaps due to fewer opportunities for healthy development and parental supervision (Perry & Staufacker, 1996). Thus there are many factors encompassed within a rural culture that may influence adolescent smoking.

An additional influence may occur in rural areas where there is significant tobacco farming. A study by Noland et al. (1996) surveyed 3,851 seventh grade students from tobacco-producing counties in Kentucky. Participants were surveyed about their tobacco use, the tobacco use of their parents and friends, and the extent to which they and their family are involved in growing tobacco. Participants were classified as either being from a non-tobacco raising home, a tobacco raising home where the participant was not personally involved in raising tobacco, or a tobacco raising home where the participant was personally involved in raising tobacco.

Results indicated that the seventh graders who were personally involved in raising tobacco were at higher risk for smoking than those who were not personally involved in raising tobacco, but smoking rates for both groups were higher than smoking rates for participants from non-tobacco raising households. In addition, seventh graders at the highest risk for smoking were those who were personally involved in raising tobacco and who had at least one parent who smoked. The results suggest that both parent smoking and the extent the household is involved in raising tobacco are significant risk factors for adolescent smoking. Therefore it is important to consider tobacco-growing as a possible influence within rural areas.

Statement of the Problem

The majority of adult smoking begins during adolescence, and among those who begin smoking at that time, at least one-third become adult smokers (Chassin et al., 1996; Choi et al., 1997). The nicotine contained in tobacco reinforces smoking behavior (Levin, 1992), and the earlier in adolescence smoking is initiated the less likely the person will be to quit (Breslau and Peterson, 1996; Khuder et al., 1999). Unfortunately, the decision that many adolescents make to experiment with smoking can lead to an increased risk of severe health problems such as lung cancer (Peto et al., 2000) and coronary heart disease (Lakier, 1992). The strong evidence that adolescence is the critical time to prevent the initiation of smoking behavior makes it important to understand the factors that influence smoking initiation. With an increased understanding of such factors, more effective interventions can be planned.

Social cognitive theory (Bandura, 1986) has provided a framework for investigating several environmental variables that may be influential for adolescent smoking initiation. In particular, the modeling of smoking behavior by parents and peers in the adolescent's environment have been studied. However, the relative influence of peers and parents at different stages of smoking onset remains unclear, and relatively little research has been done with regard to the influence of siblings on the different stages of smoking. In addition, possible moderators of these environmental influences, such as self-efficacy, have not been extensively examined. Finally, findings have been inconsistent with regard to how many of these variables affect broad sociodemographic

characteristics such as gender and ethnicity, and very little research has focused on adolescents living in rural areas.

Purpose of the Present Study

The present study will examine how well several environmental factors predict changes in the stage of smoking from sixth grade to seventh grade in a rural sample of adolescents. Parents who smoke, a best friend who smokes, peers who smoke, and siblings who smoke will be used to predict whether adolescents are nonsmokers, experimenters, or regular smokers. These environmental factors will also be used to predict changes in the preparatory stage as well, measured by the adolescent's intention to smoke. The adolescent's self-efficacy to refuse cigarettes will be examined to determine whether this personal factor moderates an environmental factor such as peers who smoke. In addition, how these environmental factors may predict adolescent smoking differently for boys and girls, and Caucasians and African Americans, will be examined.

Hypotheses

Hypothesis 1

The first analysis will examine the sample of sixth graders who never tried smoking to determine the independent variables that significantly predict participants who tried smoking by the seventh grade. The specific hypotheses for the first analysis are as follows:

Hypothesis 1a: Having parents who smoke, a best friend who smokes, peers who smoke, siblings who smoke, and more overall people in the home who smoke will

significantly predict participants who progress from having never tried cigarettes in the sixth grade to having tried cigarettes in the seventh grade.

Hypothesis 1b: Having lower self-efficacy to refuse cigarettes in the sixth grade will significantly predict trying smoking in the seventh grade. In addition, there will be an interaction between peer smoking and self-efficacy to refuse cigarettes, such that peer smoking will be a stronger predictor of trying smoking for those with lower self-efficacy to refuse cigarettes.

Hypothesis 1c: Gender and ethnicity will interact with several of the independent variables. Specifically, mother smoking and father smoking will be a stronger predictor of trying smoking for females than for males. It is also hypothesized that peer smoking will be a stronger predictor of trying smoking for Caucasians than for African Americans or other ethnic groups.

Hypothesis 2

The second analysis will examine the sample of nonsmokers in the sixth grade (did not smoke in the past month) to determine the independent variables that significantly predict participants who reported smoking at higher levels (smoked within the past month) by the seventh grade. The specific hypotheses for the second analysis are as follows:

Hypothesis 2a: Having parents who smoke, a best friend who smokes, peers who smoke, siblings who smoke, and more overall people in the home who smoke will significantly predict participants who progress from nonsmokers in the sixth grade to higher levels of smoking in the seventh grade.

Hypothesis 2b: Having lower self-efficacy to refuse cigarettes in the sixth grade will significantly predict higher levels of smoking in the seventh grade. In addition, there will be an interaction between peer smoking and self-efficacy to refuse cigarettes, such that peer smoking will be a stronger predictor of higher levels of smoking for those with lower self-efficacy to refuse cigarettes.

Hypothesis 2c: Gender and ethnicity will interact with several of the independent variables. Specifically, mother smoking and father smoking will be a stronger predictor of higher levels of smoking for females than for males. It is also hypothesized that peer smoking will be a stronger predictor of higher levels of smoking for Caucasians than for African Americans or other ethnic groups.

Hypothesis 3

The third analysis will examine the sample of nonsmokers in the sixth grade (did not smoke in the past month) to determine the independent variables that significantly predict the participants who are considered experimenters (smoked only 1 or 2 cigarettes in the past month) by the seventh grade. The specific hypotheses for the third analysis are as follows:

Hypothesis 3a: Having parents who smoke, a best friend who smokes, peers who smoke, siblings who smoke, and more overall people in the home who smoke will significantly predict participants who progress from nonsmokers in the sixth grade to experimenters in the seventh grade.

Hypothesis 3b: Having lower self-efficacy to refuse cigarettes in the sixth grade will significantly predict experimenters in the seventh grade. In addition, there will be an

interaction between peer smoking and self-efficacy to refuse cigarettes, such that peer smoking will be a stronger predictor of experimental smoking for those with lower self-efficacy to refuse cigarettes.

Hypothesis 3c: Gender and ethnicity will interact with several of the independent variables. Specifically, mother smoking and father smoking will be a stronger predictor of experimental smoking for females than for males. It is also hypothesized that peer smoking will be a stronger predictor of experimental smoking for Caucasians than for African Americans or other ethnic groups.

Hypothesis 4

The fourth analysis will examine the sample of experimental smokers in the sixth grade (smoked 1 or 2 cigarettes in the past month) to determine which independent variables significantly predict participants who progressed to higher levels of smoking in the seventh grade (3 or more cigarettes in the past month).

Hypothesis 4a: Having parents who smoke, a best friend who smokes, peers who smoke, siblings who smoke, and more overall people in the home who smoke will significantly predict participants who progress from experimenters in the sixth grade to higher levels of smoking in the seventh grade.

Hypothesis 4b: Having lower self-efficacy to refuse cigarettes in the sixth grade will significantly predict progressing from experimenting in the sixth grade to higher levels of smoking in the seventh grade. In addition, there will be an interaction between peer smoking and self-efficacy to refuse cigarettes, such that peer smoking will be a

stronger predictor of higher levels of smoking for those with lower self-efficacy to refuse cigarettes.

Hypothesis 4c: Gender and ethnicity will interact with several of the independent variables. Specifically, mother smoking and father smoking will be a stronger predictor of progressing from experimental to higher levels of smoking for females than for males. It is also hypothesized that peer smoking will be a stronger predictor of this progression for Caucasians than for African Americans or other ethnic groups.

Hypothesis 5

The fifth analysis will examine seventh grade nonsmokers to determine which independent variables are significantly associated with participants who intend to smoke in the next six months.

Hypothesis 5a: It is hypothesized that, among nonsmokers in the seventh grade, having parents who smoke, a best friend who smokes, peers who smoke, siblings who smoke, and more overall people in the home who smoke will be significantly related to those who intend to smoke in the next six months.

Hypothesis 5b: Having lower self-efficacy to refuse cigarettes will be significantly related to those who intend to smoke in the next six months. In addition, there will be an interaction between peer smoking and self-efficacy to refuse cigarettes, such that peer smoking will have a stronger relationship with smoking intention for those with lower self-efficacy to refuse cigarettes.

CHAPTER III

METHOD

The present study will examine the extent that environmental variables are able to predict various stages of smoking initiation among a sample of rural middle school students. This chapter contains a brief description of the sample, design, and proposed analyses.

Overview of Intervention

Goals for Health (GFH) is a 5-year National Cancer Institute funded randomized school-based project designed to positively impact the health behaviors of middle school students living in rural areas of Virginia and New York. Three major health behaviors associated with reducing the risk for cancer (decreasing dietary fat, increasing fiber, and being tobacco-free) are the major health focuses of the program. The program is taught to adolescents in two successive school years, first in the sixth grade, with the second part of the program taught during the seventh grade.

Goals for Health 6th Grade Program. The sixth grade program consists of 12, one-hour workshops taught to the students in their classrooms by high school students trained as peer leaders. The emphasis of the sixth grade program is on learning life skills that can help students accomplish what they desire for their future, including their career and their health. The health component of the sixth grade program focuses on nutrition,

with tobacco-related activities interwoven into the program. Specific tobacco-related activities in the sixth grade program include the relationship between tobacco use and health, a discussion of a video created by GFH that focuses on tobacco use, and activities related to smoking and the benefits of being tobacco-free.

Goals for Health 7th Grade Program. The seventh grade program builds upon the foundation of life skills and health information developed in the sixth grade but is aimed more directly at preventing tobacco use. The program consists of 10, one-hour workshops taught to the students in their classrooms by their school's trained health instructor. The content of the program includes developing health goals, thinking about the effects of tobacco, developing skills to resist peer and media influences to smoke, building skills to cope with stress, and learning self-monitoring skills to stop tobacco use or other behaviors students may want to stop.

Design and Participants

Twenty-three middle schools in rural Virginia and New York State were randomly assigned to either an intervention condition (12 schools) or a wait-list control condition (11 schools). Half of the schools in each condition (6 intervention schools and 6 control schools) began participation in the project in 1998 and the other half (6 intervention schools and 5 control schools) began participation in 1999. One cohort of students was surveyed beginning in the sixth grade, regardless of the year the school began participation in the project. All students at a particular school were surveyed on the same day, although an attempt was made to obtain surveys from students who were absent on the day surveys were administered. All survey booklets were pre-coded with

assigned student identification numbers. In accordance with school policy and approval of the Internal Review Board, passive consent procedures were used for participation in all surveys.

Sixth grade participants, under the supervision of trained staff from the Life Skills Center at Virginia Commonwealth University, completed self-report surveys in their classrooms at three time points. The first survey was administered in January of their sixth grade year (Time Point 1). Participants from the intervention schools then received the sixth grade GFH program between February and April of the sixth grade school year. A second survey was administered to sixth grade students in both the intervention and control schools in May of their sixth grade year (Time Point 2). The following year as seventh graders, students in the intervention condition received the seventh grade GFH program during February and March. A third survey was then administered to students in the intervention and control conditions in March and April of their seventh grade year (Time Point 3).

Measures

The *Goals for Health* survey booklet for each of the three time points included measures pertinent to the behaviors, attitudes, and knowledge related to the content of the *Goals for Health* program. Measures that pertain to the present study are discussed below, and are also listed in Appendix A.

Peer smoking behavior. Two items assessed the smoking behavior of the participants' peers and best friend. These items were based on the questionnaire used for the Child and Adolescent Trial for Cardiovascular Health (CATCH) study (Luepker et

al., 1996). One item asked, "Does your best friend smoke?" The item had a yes/no response format and was coded as "0" for a "no" response and "1" for a "yes" response. A second item asked, "How many of your friends smoke?" This item had an open-ended response format and was entered into the data set as a continuous variable.

Parental smoking behavior. Two items, developed from the CATCH questionnaire (Luepker et al., 1996) assessed the smoking behavior of the participants' parents. Each of the items ("Does your mother or stepmother smoke?" and "Does your father or stepfather smoke?") had a yes/no response format. Each item was coded separately as "0" if the response was "no" (the mother/father did not smoke) and "1" if the response was "yes" (the mother/father smoked).

Sibling smoking behavior. One item, developed from the CATCH questionnaire (Luepker et al., 1996) assessed sibling smoking. The item ("Do you have a sister or brother who smokes?") had a yes/no response format. The item was coded as "0" if the response to the item was "no" and "1" if the response was "yes" to indicate that the sibling smokes.

Smoking in the home environment. In the study by Robinson et al. (1997), an item measuring the social influence of family smoking was constructed to allow for the possibility that children may live in nonnuclear family structures, such as with grandparents or other extended family members. In order to account for other smokers living in the home with the adolescent, and therefore being a potential source of environmental influence, one item in the current study asked, "How many people in your

home smoke?" The item consisted of an open-ended response format and was entered into the data set as a continuous variable.

Adolescent smoking behavior. Items that assessed participants' smoking behavior were developed from the Virginia Middle School Youth Risk Behavior Survey (1993). Whether or not the adolescent had ever tried smoking was assessed by the item, "Have you ever tried cigarette smoking, even one or two puffs?" The item consisted of a yes/no response format and was coded as "0" for "no" (never tried smoking) and "1" for "yes" (tried smoking).

Frequency of cigarette smoking was assessed by the item, "During the past month, on how many days did you smoke cigarettes?" Participants responded to the item by selecting from one of the following: "I do not smoke;" "I did not smoke a cigarette during the past 30 days;" "1 or 2 days;" "3 to 9 days;" "10 to 29 days;" and "all 30 days" (Appendix A). The frequency of smoking is generally used to distinguish between the stages of smoking initiation. In this study, the criteria for distinguishing between the stages of smoking is based on other studies that consider regular adolescent smoking as occurring more than a few times a month (Hu et al., 1995; Robinson et al., 1997).

Therefore an adolescent is considered a nonsmoker if he or she did not smoke within the past month, and is considered an experimental smoker if he or she smoked "1 or 2 days" in the past month. An adolescent is considered a regular smoker if he or she smoked "3 to 9 days, "10 to 29 days," or "all 30 days." When used as a dichotomous dependent variable, the comparatively lower level of smoking was coded as "0" and the higher level of smoking was coded as "1." For example, when comparing nonsmokers to

experimenters, nonsmokers were coded as "0" and experimenters were coded as "1." When comparing experimenters to regular smokers, experimenters were coded as "0" and regular smokers were coded as "1."

The number of cigarettes smoked per day was assessed by the item, "During the past month on the days you smoked cigarettes, how many cigarettes did you smoke each day?" Participants responded to the item by selecting from one of the following: "I do not smoke;" "I did not smoke during the past month;" "less than one cigarette each day;" 1 to 5 cigarettes each day;" 6 to 10 cigarettes each day;" "11 to 20 cigarettes each day;" and "more than 20 cigarettes each day" (Appendix A). Responses were coded from 1 ("I do not smoke" and "I did not smoke during the past month") to 6 ("more than 20 cigarettes each day") and were treated as categorical variables.

Self-efficacy for refusing cigarettes. Self-efficacy for being able to refuse cigarettes was assessed by the item, "I am sure I can refuse cigarettes if someone offered them to me." The item, developed for this study, was based on social cognitive theory (Bandura, 1986) and related studies on adolescent smoking (Botvin, Dusenbury, et al., 1989). The response options ranged from 1 (strongly disagree) to 5 (strongly agree) and was treated as a continuous variable.

Smoking intention. The participants' intention to smoke was assessed by the item, "Do you think that you may try smoking within the next 6 months?" The item consisted of a yes/no response format and was coded as "0" for "no" and "1" for "yes." The item was developed for this study and is similar to other measures of smoking intention and susceptibility (Distefan et al., 1998; Engels, Knibbe, & Drop, 1999).

Demographic Information. Survey items requested the participants' gender and ethnicity. Gender was coded as "0" for girls and "1" for boys. Ethnicity was determined by the item, "Please check the one that best describes you," followed by several ethnicity options. Due to the sample being largely Caucasian and African American, ethnicity was coded as either Caucasian, African American, or "other ethnic group." For the purposes of this study, Caucasians were coded as the comparison group.

County Tobacco-Growing Status. Fifteen of the middle schools in this study are located in Virginia, a state that is significantly involved in raising tobacco crops. It is reasonable to expect that adolescents who are raised in a tobacco-growing area may be influenced by such an environment. Overall, there were seven middle schools in this study located in a tobacco-growing county. In order to statistically control for this potential environmental influence, the variable was coded as "0" if the school was in a county that did not grow tobacco, and "1" if the school was in a tobacco-growing county.

State of Residence. Participants in this study resided in either Virginia or New York State. In order to account for potential regional environmental influences (beyond whether the school was located in a tobacco-growing county), each school was coded for whether or not it was located in Virginia. Schools in New York were coded as "0" and schools in Virginia were coded as "1."

Intervention/Control Group Status. Twelve of the schools in the study received the *Goals for Health* intervention in the sixth and seventh grade. Due to the potential influence of receiving this intervention, each school was coded for whether or not it

received the program intervention. Schools in the control condition were coded as "0" and schools in the intervention condition were coded as "1."

Hypotheses and Analyses

Hypothesis 1

The first analysis will examine the sample of sixth graders who never tried smoking to determine the independent variables that significantly predict participants who tried smoking by the seventh grade. The specific hypotheses for the first analysis are as follows:

Hypothesis 1a: Having parents who smoke, a best friend who smokes, peers who smoke, siblings who smoke, and more overall people in the home who smoke will significantly predict participants who progress from having never tried cigarettes in the sixth grade to having tried cigarettes in the seventh grade.

Hypothesis 1b: Having lower self-efficacy to refuse cigarettes in the sixth grade will significantly predict trying smoking in the seventh grade. In addition, there will be an interaction between peer smoking and self-efficacy to refuse cigarettes, such that peer smoking will be a stronger predictor of trying smoking for those with lower self-efficacy to refuse cigarettes.

Hypothesis 1c: Gender and ethnicity will interact with several of the independent variables. Specifically, mother smoking and father smoking will be a stronger predictor of trying smoking for females than for males. It is also hypothesized that peer smoking will be a stronger predictor of trying smoking for Caucasians than for African Americans or other ethnic groups.

Analysis: Using a logistic regression with a sample of sixth graders who never tried smoking, independent variables from the sixth grade (Time Point 2) will be used to predict differences between those who tried smoking and those who never tried smoking in the seventh grade (Time Point 3). Distal environmental factors including county tobacco-growing status, the state in which the participant lived, and intervention/control group status will be controlled for by entering them into the equation at step 1. Gender and ethnicity will be entered into the equation at step 2. Theory and research suggests the strong influence of peers on adolescent smoking; therefore best friend smoking status and the number of friends who smoked will be entered into the equation at step 3.

Familial variables will be entered at step 4, including mother smoking status, father smoking status, sibling smoking status, and the number of people in the home who smoke. Self-efficacy to refuse cigarettes will be entered at step 5. At step 6 the interaction between self-efficacy and the number of friends who smoke will be entered into the equation. At step 7 the interaction between gender and mother smoking status, and the interaction between gender and father smoking status will be entered. The interaction between ethnicity and best friend smoking status will be entered at the final step.

Hypothesis 2

The second analysis will examine the sample of nonsmokers in the sixth grade (did not smoke in the past month) to determine the independent variables that significantly predict participants who reported smoking at higher levels (smoked within

the past month) by the seventh grade. The specific hypotheses for the second analysis are as follows:

Hypothesis 2a: Having parents who smoke, a best friend who smokes, peers who smoke, siblings who smoke, and more overall people in the home who smoke will significantly predict participants who progress from nonsmokers in the sixth grade to higher levels of smoking in the seventh grade.

Hypothesis 2b: Having lower self-efficacy to refuse cigarettes in the sixth grade will significantly predict higher levels of smoking in the seventh grade. In addition, there will be an interaction between peer smoking and self-efficacy to refuse cigarettes, such that peer smoking will be a stronger predictor of higher levels of smoking for those with lower self-efficacy to refuse cigarettes.

Hypothesis 2c: Gender and ethnicity will interact with several of the independent variables. Specifically, mother smoking and father smoking will be a stronger predictor of higher levels of smoking for females than for males. It is also hypothesized that peer smoking will be a stronger predictor of higher levels of smoking for Caucasians than for African Americans or other ethnic groups.

Analysis: Using a logistic regression with the sample of nonsmokers in the sixth grade (Time Point 2), independent variables from the sixth grade (Time Point 2) will be used to predict differences between nonsmokers and higher levels of smoking in the seventh grade (Time Point 3). Distal environmental factors including county tobacco-growing status, the state in which the participant lived, and intervention/control group status will be controlled for by entering them into the equation at step 1. Gender and

ethnicity will be entered into the equation at step 2. Best friend smoking status and the number of friends who smoked will be entered into the equation at step 3.

Familial variables will be entered at step 4, including mother smoking status, father smoking status, sibling smoking status, and the number of people in the home who smoke. Self-efficacy to refuse cigarettes will be entered at step 5. At step 6 the interaction between self-efficacy and the number of friends who smoke will be entered into the equation. At step 7 the interaction between gender and mother smoking status, and the interaction between gender and father smoking status will be entered. The interaction between ethnicity and best friend smoking status will be entered at the final step.

Hypothesis 3

The third analysis will examine the sample of nonsmokers in the sixth grade (did not smoke in the past month) to determine the independent variables that significantly predict the participants who are considered experimenters (smoked only 1 or 2 cigarettes in the past month) by the seventh grade. The specific hypotheses for the third analysis are as follows:

Hypothesis 3a: Having parents who smoke, a best friend who smokes, peers who smoke, siblings who smoke, and more overall people in the home who smoke will significantly predict participants who progress from nonsmokers in the sixth grade to experimenters in the seventh grade.

Hypothesis 3b: Having lower self-efficacy to refuse cigarettes in the sixth grade will significantly predict experimenters in the seventh grade. In addition, there will be an

interaction between peer smoking and self-efficacy to refuse cigarettes, such that peer smoking will be a stronger predictor of experimental smoking for those with lower self-efficacy to refuse cigarettes.

Hypothesis 3c: Gender and ethnicity will interact with several of the independent variables. Specifically, mother smoking and father smoking will be a stronger predictor of experimental smoking for females than for males. It is also hypothesized that peer smoking will be a stronger predictor of experimental smoking for Caucasians than for African Americans or other ethnic groups.

Analysis: Using a logistic regression with the sample of nonsmokers in the sixth grade (Time Point 2), independent variables from the sixth grade (Time Point 2) will be used to predict differences between nonsmokers and experimenters in the seventh grade (Time Point 3). Distal environmental factors including county tobacco-growing status, the state in which the participant lived, and intervention/control group status will be controlled for by entering them into the equation at step 1. Gender and ethnicity will be entered into the equation at step 2. Best friend smoking status and the number of friends who smoked will be entered into the equation at step 3.

Familial variables will be entered at step 4, including mother smoking status, father smoking status, sibling smoking status, and the number of people in the home who smoke. Self-efficacy to refuse cigarettes will be entered at step 5. At step 6 the interaction between self-efficacy and the number of friends who smoke will be entered into the equation. At step 7 the interaction between gender and mother smoking status, and the interaction between gender and father smoking status will be entered. The

interaction between ethnicity and best friend smoking status will be entered at the final step.

Hypothesis 4

The fourth analysis will examine the sample of experimental smokers in the sixth grade (smoked 1 or 2 cigarettes in the past month) to determine which independent variables significantly predict participants who progressed to higher levels of smoking in the seventh grade (3 or more cigarettes in the past month).

Hypothesis 4a: Having parents who smoke, a best friend who smokes, peers who smoke, siblings who smoke, and more overall people in the home who smoke will significantly predict participants who progress from experimenters in the sixth grade to higher levels of smoking in the seventh grade.

Hypothesis 4b: Having lower self-efficacy to refuse cigarettes in the sixth grade will significantly predict progressing from experimenting in the sixth grade to higher levels of smoking in the seventh grade. In addition, there will be an interaction between peer smoking and self-efficacy to refuse cigarettes, such that peer smoking will be a stronger predictor of higher levels of smoking for those with lower self-efficacy to refuse cigarettes.

Hypothesis 4c: Gender and ethnicity will interact with several of the independent variables. Specifically, mother smoking and father smoking will be a stronger predictor of progressing from experimental to higher levels of smoking for females than for males. It is also hypothesized that peer smoking will be a stronger predictor of this progression for Caucasians than for African Americans or other ethnic groups.

Analysis: Using a logistic regression with the sample of experimenters in the sixth grade (Time Point 2), independent variables from the sixth grade (Time Point 2) will be used to predict differences between experimental smoking and higher levels of smoking in the seventh grade (Time Point 3). Distal environmental factors including county tobacco-growing status, the state in which the participant lived, and intervention/control group status will be controlled for by entering them into the equation at step 1. Gender and ethnicity will be entered into the equation at step 2. Best friend smoking status and the number of friends who smoked will be entered into the equation at step 3.

Familial variables will be entered at step 4, including mother smoking status, father smoking status, sibling smoking status, and the number of people in the home who smoke. Self-efficacy to refuse cigarettes will be entered at step 5. At step 6 the interaction between self-efficacy and the number of friends who smoke will be entered into the equation. At step 7 the interaction between gender and mother smoking status, and the interaction between gender and father smoking status will be entered. The interaction between ethnicity and best friend smoking status will be entered at the final step.

Hypothesis 5

The fifth analysis will examine seventh grade nonsmokers to determine which independent variables are significantly associated with participants who intend to smoke in the next six months.

Hypothesis 5a: It is hypothesized that, among nonsmokers in the seventh grade, having parents who smoke, a best friend who smokes, peers who smoke, siblings who smoke, and more overall people in the home who smoke will be significantly related to those who intend to smoke in the next six months.

Hypothesis 5b: Having lower self-efficacy to refuse cigarettes will be significantly related to those who intend to smoke in the next six months. In addition, there will be an interaction between peer smoking and self-efficacy to refuse cigarettes, such that peer smoking will have a stronger relationship with smoking intention for those with lower self-efficacy to refuse cigarettes.

Analysis: Using a logistic regression with the sample of nonsmokers in the seventh grade (Time Point 3), independent variables from that time point will be used to distinguish differences between those who intend to smoke in the next six months and those who do not intend to smoke. Distal environmental factors including county tobacco-growing status, the state in which the participant lived, and intervention/control group status will be controlled for by entering them into the equation at step 1. Gender and ethnicity will be entered into the equation at step 2. Best friend smoking status and the number of friends who smoked will be entered into the equation at step 3. Familial variables will be entered at step 4, including mother smoking status, father smoking status, sibling smoking status, and the number of people in the home who smoke. Self-

efficacy to refuse cigarettes will be entered at step 5. At step 6 the interaction between self-efficacy and the number of friends who smoke will be entered into the equation.

CHAPTER IV

RESULTS

Preliminary Analysis

A total of 2,272 sixth grade students were surveyed from the 23 schools in Virginia and New York. Cases were removed from the data set if participants responded to questions randomly or in an inconsistent manner. A total of 19 cases were removed for this reason. Furthermore, outliers were examined for the two open-ended items asking participants how many of their friends smoke and how many people in their home smoke. Six cases that contained extreme outliers on either one of the two items were removed from the data set.

Thus the final sample included 2,247 sixth grade students, approximately half of whom were boys. The ethnicity of the participants was largely Caucasian (53.2%) and African American (38.6%). Approximately 8.2% of the participants described themselves as Asian American, Hispanic or Latino, American Indian, or "other." Due to the very small percentage of students in any one of these other ethnic groups, these cases were combined into a third "other" ethnic group for data analytic purposes.

The participants were again surveyed one year later as seventh grade students. A total of 27 cases were removed from the data set in accordance to the same cleaning

procedures as described above (random or inconsistent responders, and extreme outliers). In addition, 451 participants who were surveyed as sixth graders were not available to be surveyed one year later as seventh graders. Unavailability was due to students who moved out of the school districts or who were not in school on the day surveys were administered. An effort was made to obtain surveys from students who may have been absent or suspended on the day surveys were administered. Although many surveys were obtained from such students, the process depended on schools administering and returning the surveys, a process that was often incomplete.

As a result of the cleaning procedures for seventh grade student data, but mostly due to attrition from sixth grade to seventh grade, there were a total of 1,794 participants in the seventh grade sample. The reader is referred to Table 1 for a comparison of demographic information for the sixth grade and seventh grade time points. The final sample of seventh grade students again included approximately equal gender representation. Ethnicity of the seventh grade sample was also similar to the sixth grade sample, with 55.7% Caucasian, 37% African American, and 7.3% describing themselves as other ethnic groups.

The reader is referred to Table 2 for a descriptive comparison of smoking behavior for the sample as sixth grade students and then one year later as seventh grade students. Approximately 28% of the students in sixth grade reported that they tried smoking, even one or two puffs. By the time the students were surveyed in the seventh grade, the percentage of students who reported that they tried smoking increased to approximately 45%. The frequency of days smoked in the past month increased slightly

from sixth grade to seventh grade. For example, the number of students who reported smoking one or two days in the past month increased from 3.7% in the sixth grade to 5.8% in the seventh grade. The amount of cigarettes smoked each day they smoked in the past month also increased from sixth grade to seventh grade, with 2.8% of sixth graders who reported smoking "1 to 5 cigarettes each day" increasing to 5.5% by the seventh grade.

The reader is referred to Table 3 for a descriptive comparison of individuals in the students' environment who smoke, as reported by participants in the sixth grade and one year later in the seventh grade. When assessed in sixth grade, 34.8% of the students reported that their mothers smoke and 41.2% reported that their fathers smoke. These percentages remained essentially the same when the students were assessed again in seventh grade. However, the students who reported a best friend smokes increased from 13.7% in the sixth grade to 23.9% in the seventh grade. Likewise, students who reported that a brother or sister smoked increased from 18.6% in the sixth grade to 24.6% in the seventh grade.

Analysis of Attrition

Students who had completed surveys in both the sixth grade and the seventh grade were compared to students who completed only the sixth grade survey (i.e. were not available for the seventh grade survey). Comparisons were made using measured variables from the study. The reader is referred to Table 4 for a summary of these analyses. Pearson χ^2 analyses were performed on all discrete or dichotomous variables to determine whether significant differences existed for attrition. There was not a

significant difference between groups for gender, χ^2 (1, N=2203) = 2.10, p>.05. However, significantly more African Americans and those of other ethnic backgrounds compared to Caucasians did not complete the second time point, χ^2 (2, N=2182) = 10.56, p<.01.

Students who reported in sixth grade that they had tried smoking were significantly less likely to have completed a survey in seventh grade, χ^2 (1, N=2194) = 9.99, p<.01. Similarly, sixth graders who reported smoking within the past month were significantly less likely to have completed a survey in seventh grade, χ^2 (4, N=2191) = 42.74, p<.001. There were also significant differences between nonsmokers, experimental smokers, and regular smokers, with regular smokers significantly less likely to have completed both time points, χ^2 (2, N=2191) = 30.72, p<.001. Sixth grade students who had a best friend who smokes, χ^2 (1, N=2173) = 13.44, p<.001; a mother who smokes, χ^2 (1, N=2166) = 19.29, p<.001; a father who smokes, χ^2 (1, N=2161) = 12.26, p<.001; and a brother or sister who smokes, χ^2 (1, N=21.64) = 9.25, p<.01, were also less likely to have completed both time points. With regard to the over-all number of friends who smoke, students who completed only the sixth grade time point reported having more friends who smoke (M=1.81, SD=3.79) than sixth graders who completed both time points (M=1.19, SD=2.90; t=3.59, p<.01). Similarly, students who completed only the sixth grade time point reported having more people in their home who smoke (M=1.16, SD=1.08) than sixth graders who completed both time points (M=.93, SD=1.22; t=3.75, p<.01).

Analysis of Sixth Graders Who Never Tried Smoking

One hypothesis in this study used a sub-sample of sixth graders who reported that they never tried smoking, even one or two puffs. It is therefore important to describe this sub-sample. Out of the entire 2,247 sixth graders surveyed, 1,592 (70.9%) reported that they never tried smoking, even one or two puffs. The reader is referred to Table 5 for a summary of demographics for sixth graders who never tried smoking. Of those who never tried smoking, 46.8% were boys and 53.2% were girls. A total of 55.8% of those who never tried smoking were Caucasian, 36.5% were African-American, and 7.7% were from other ethnic groups.

The reader is referred to Table 6 for a description of this sub-sample's smoking behavior when surveyed in the seventh grade. Among the "never triers" in the sixth grade, 28.5% tried smoking by the seventh grade. Although 93.7% reported that they did not smoke in the past 30 days, 3.4% reported that they smoked "1-2 days" in the past 30 days. Approximately 2.7% reported smoking between one and five cigarettes each day they smoked in the past month. The reader is referred to Table 7 for a description of individuals in the sixth-grade "never tried" environment who smoke. Similar to the over-all sample, the percentage of participants who reported that a best friend or a sibling smoked increased from sixth grade to seventh grade. The reader is referred to Table 8 for the intercorrelations among variables for the students who reported they had never tried smoking in the sixth grade.

Analysis of attrition for sixth graders who never tried smoking. Among sixth graders who never tried smoking, those who completed a survey in the seventh grade

were compared to those who completed only the sixth grade survey (i.e. were not available for the seventh grade survey). There was not a significant difference between groups for gender, χ^2 (1, 1570)=.535, p>.05. However, significantly more African Americans and those of other ethnic backgrounds compared to Caucasians did not complete the second time point, χ^2 (2, 1559)=7.99, p<.05. Sixth graders who reported that their mother smoked, father smoked, or sibling smoked were also less likely to complete both time points. However, there were no differences in attrition for whether or not a best friend smoked. The reader is referred to Table 9 for a summary of the percentage from each group that completed both time points. In addition, those who were surveyed at only one time point reported a higher number of people in the home who smoked (M=1.05, SD=1.01) than those who completed both time points (M=.76, SD=1.03; t=4.12, p<.01). However, there was not a difference in the number of friends who smoked between those who completed only the first time point (M=.57, SD=1.48) and those who completed both time points (M=.55, SD=1.83; t=0.13, p=.90).

Univariate Analyses. Among all sixth graders who reported that they never tried smoking, a comparison was made between those who remained non-triers in the seventh grade and those who reported that they tried smoking in the seventh grade. Pearson chi-square analyses were used to determine whether differences were significant among discrete or dichotomous variables. Among non-triers in the sixth grade, there was not a significant difference between the percentage of boys (30.2%) and girls (27%) who tried smoking by the seventh grade, χ^2 (1, N=1779) = 1.61, p>.05. However, within each ethnic group, a significantly higher percentage of African American students (34.1%)

tried smoking by the seventh grade than Caucasian students (25.3%), χ^2 (2, N=1268) = 10.50, $p<.01$. Significant differences were also found for the variables of state, tobacco county status, best friend smoking, mother smoking, father smoking, and sibling smoking. The reader is referred to Table 10 for a summary of these results.

T-tests were used to examine whether differences on continuous variables were significant. Among sixth graders who never tried smoking, the mean number of friends who smoked was higher for those who tried smoking by the seventh grade (M=.83, SD=2.16) than those who remained non-triers (M=.44, SD=1.67; t=3.35, $p<.01$). Similarly, the mean number of people in the home who smoked was higher for those who tried smoking by the seventh grade (M=1.04, SD=1.22) than those who remained non-triers (M=.66, SD=.92; t=5.95, $p<.01$).

Results of Hypotheses

Hypothesis 1. The first hypothesis examined the sample of sixth graders who never tried smoking to determine which independent variables would significantly predict the participants who tried smoking by the seventh grade. A logistic regression was conducted on the sample of sixth graders who reported that they never tried smoking, with the dependent variable being whether or not the student tried smoking by the seventh grade. Distal environmental factors including county tobacco-growing status, the state in which the participant lived, and intervention/control group status were controlled for by entering them into the equation at step 1. Gender and ethnicity were entered into the equation at step 2. Best friend smoking status and the number of friends who smoked were entered into the equation at step 3.

Familial variables were entered at step 4, including mother smoking status, father smoking status, sibling smoking status, and the number of people in the home who smoke. Self-efficacy to refuse cigarettes was entered at step 5. At step 6 the interaction between self-efficacy and the number of friends who smoke was entered into the equation. At step 7 the interaction between gender and mother smoking status, and the interaction between gender and father smoking status were entered. The interaction between ethnicity and best friend smoking status was entered at the final step.

A test of the full model with all predictors against a constant-only model was statistically reliable, χ^2 (18, N=1152) = 93.71, p<.001. This result from the logistic regression indicated that the predictors, as a set, reliably distinguished between participants who remained non-triers and those who tried smoking by the seventh grade. The reader is referred to Table 11 for a summary of the model after the final step, including the regression coefficients, Wald statistic with significance levels, partial correlations, odds ratios, and 95% confidence intervals for odds ratios for each of the predictors. The Wald statistic (which is an indicator of significance) and the odds ratio (in which the confidence interval should not encompass one) were used to determine the significance of each predictor.

Results indicated that among the predictors entered into the equation, several reliably predicted whether or not sixth graders would try smoking by the seventh grade. Tobacco-growing counties (Wald=20.13, p<.001, odds ratio = 1.97, CI 1.46-2.65), African American students compared to white students (Wald=3.95 p<.05, odds ratio = 1.38, CI 1.00-1.89), having a best friend who smokes (Wald=3.95, p<.05, odds ratio =

2.14, CI 1.01-4.53), having a mother who smokes (Wald=4.42, $p<.05$, odds ratio = 1.60, CI 1.03-2.48), and having less self-efficacy to refuse cigarettes (Wald=5.77, $p<.05$, odds ratio = 1.17, CI 1.03-1.33) significantly predicted whether a nonsmoker in the sixth grade tried smoking by the seventh grade. Participants classified as "other" for ethnic group were significantly less likely than Caucasians to try smoking by the seventh grade if they had a best friend who smoked (Wald=4.42, $p<.05$, odds ratio = 0.06, CI 0.004-0.82).

Results also indicated that several steps significantly contributed to the overall model. The reader is again referred to Table 11 which shows the degrees of freedom and chi square at each step. At step 1, the inclusion of distal variables (county's tobacco status, state, and intervention status) was a better predictor of trier status than the constant-only model, step χ^2 (3) = 35.59, $p<.001$. At step 3, peer smoking status (best friend smoking and number of peers who smoke) significantly improved the model, step χ^2 (2) = 12.18, $p<.001$. Familial variables at step 4 (mother smoking, father smoking, sibling smoking, and number in the home who smoke) significantly improved the model, step χ^2 (4) = 27.86, $p<.001$. Self-efficacy to refuse cigarettes at step 5 also significantly improved the model, step χ^2 (1) = 6.50, $p<.05$. At step 8, the interaction of ethnicity by best friend smoking status significantly improved the model, step χ^2 (2) = 6.02, $p<.05$.

Hypothesis 1a: Having parents who smoke, a best friend who smokes, peers who smoke, siblings who smoke, and more overall people in the home who smoke will significantly predict participants who progress from having never tried cigarettes in the sixth grade to having tried cigarettes in the seventh grade.

This hypothesis was partially supported. Mothers who smoke, but not fathers who smoke, significantly predicted whether a sixth grade student tried smoking by the seventh grade. Having a mother who smokes increased the odds by 1.6 that a sixth grader would try smoking by the seventh grade. Having a best friend who smokes, but not the over-all number of friends who smoke, also significantly predicted whether a sixth grader would try smoking by the seventh grade. Best friend smoking was the strongest predictor among all the variables, doubling a sixth grader's odds (OR=2.13) of trying smoking if his or her best friend smoked. Sibling smoking and having more people in the home who smoked did not significantly predict trying smoking by the seventh grade.

Hypothesis 1b: Having lower self-efficacy to refuse cigarettes in the sixth grade will significantly predict trying smoking in the seventh grade. In addition, there will be an interaction between peer smoking and self-efficacy to refuse cigarettes, such that peer smoking will be a stronger predictor of trying smoking for those with lower self-efficacy to refuse cigarettes.

Although having a low self-efficacy to refuse cigarettes significantly increased a sixth grader's odds of smoking by the seventh grade by 1.17, having peers who smoke was not a significantly stronger predictor for those with low self-efficacy.

Hypothesis 1c: Gender and ethnicity will interact with several of the independent variables. Specifically, mother smoking and father smoking will be a stronger predictor of trying smoking for females than for males. It is also hypothesized that peer smoking

will be a stronger predictor of trying smoking for Caucasians than for African Americans or other ethnic groups.

Having either a mother who smokes (Wald=0.33, p=.56, odds ratio = 0.83, CI 0.45-1.54) or a father who smokes (Wald=0.32, p=.57, odds ratio = 1.19, CI 0.66-2.15) was not a stronger predictor for females than for males. Peer smoking was not a stronger predictor of trying smoking for Caucasians than for African Americans (Wald=1.07, p>.05, odds ratio = .54, CI 0.17-1.73). However, participants classified as "other" for ethnic group were significantly less likely than Caucasians to try smoking by the seventh grade if they had a best friend who smoked (Wald=4.42, p<.05, odds ratio = 0.06, CI 0.004-0.82).

Hypothesis 2. The second hypothesis examined the sample of nonsmokers in the sixth grade (did not smoke in the past month) to determine which independent variables would significantly predict the participants who reported smoking at higher levels (smoked within the past month) by the seventh grade. A logistic regression was conducted on the sample of sixth grade nonsmokers, with the dependent variable being whether or not the student reported smoking within the past month in the seventh grade. Independent variables were entered in the same order as the first hypothesis in order to determine any differences in predictors between non-smokers and smokers within the past month. Distal environmental factors including county tobacco-growing status, the state in which the participant lived, and intervention/control group status were controlled for by entering them into the equation at step 1. Gender and ethnicity were entered into

the equation at step 2. Best friend smoking status and the number of friends who smoked were entered into the equation at step 3.

Familial variables were entered at step 4, including mother smoking status, father smoking status, sibling smoking status, and the number of people in the home who smoke. Self-efficacy to refuse cigarettes was entered at step 5. At step 6 the interaction between self-efficacy and the number of friends who smoke was entered into the equation. At step 7 the interaction between gender and mother smoking status, and the interaction between gender and father smoking status were entered. The interaction between ethnicity and best friend smoking status was entered at the final step.

A test of the full model with all predictors against a constant-only model was statistically reliable, χ^2 (18, N=1459) = 58.46, $p<.001$. This result from the logistic regression indicated that the predictors, as a set, reliably distinguished between participants who remained non-smokers and those who smoked within the past month in seventh grade. The reader is referred to Table 12 for a summary of the model after the final step, including the regression coefficients, Wald statistic with significance levels, partial correlations, odds ratios, and 95% confidence intervals for odds ratios for each of the predictors.

Results indicated that among the predictors entered into the equation, several reliably predicted whether or not sixth graders would smoke by the seventh grade. The number of friends who smoke (Wald=4.78, $p<.05$, odds ratio = 1.11, CI 1.01-1.21), having a mother who smokes (Wald=5.84, $p<.05$, odds ratio = 1.98, CI 1.14-3.46), and having less self-efficacy to refuse cigarettes (Wald=5.42, $p<.05$, odds ratio = 1.21, CI

1.03-1.41) significantly predicted whether a nonsmoker in the sixth grade smoked within the past month by the seventh grade.

Results also indicated that variables at several steps also contributed to the model. The reader is again referred to Table 12 which shows the degrees of freedom and chi square at each step. Among the steps that significantly improved the model, peer smoking status at step 3 (best friend smoking and number of peers who smoke) significantly improved the model, step χ^2 (2) = 25.92, p<.001. Familial variables at step 4 (mother smoking, father smoking, sibling smoking, and number in the home who smoke) significantly improved the model, step χ^2 (4) = 12.17, p<.05. Self-efficacy to refuse cigarettes at step 5 improved the model, χ^2 (1) = 6.26, p<.05. The other steps failed to improve the overall model.

Hypothesis 2a: Having parents who smoke, a best friend who smokes, peers who smoke, siblings who smoke, and more overall people in the home who smoke will significantly predict participants who progress from nonsmokers in the sixth grade to higher levels of smoking in the seventh grade.

This hypothesis was partially supported. Mothers who smoke, but not fathers who smoke, significantly predicted whether a sixth grade student smoked within the past month by the seventh grade. Having a mother who smokes was the strongest predictor among all variables, nearly doubling the odds that a sixth grader would smoke by the seventh grade (OR=1.98). Having a greater number of friends who smoke increased the odds of smoking by the seventh grade (OR=1.11). However, having a best friend who smokes in the sixth grade did not significantly predict smoking in the seventh grade.

Sibling smoking and the overall number of people in the home who smoked did not significantly predict smoking in the seventh grade.

Hypothesis 2b: Having lower self-efficacy to refuse cigarettes in the sixth grade will significantly predict higher levels of smoking in the seventh grade. In addition, there will be an interaction between peer smoking and self-efficacy to refuse cigarettes, such that peer smoking will be a stronger predictor of higher levels of smoking for those with lower self-efficacy to refuse cigarettes.

Although having a low self-efficacy to refuse cigarettes significantly increased a sixth grader's odds of smoking by the seventh grade by 1.21, having peers who smoke was not a significantly stronger predictor for those with low self-efficacy (Wald=0.003, p=.95, odds ratio = 1.00, CI 0.96-1.04) .

Hypothesis 2c: Gender and ethnicity will interact with several of the independent variables. Specifically, mother smoking and father smoking will be a stronger predictor of higher levels of smoking for females than for males. It is also hypothesized that peer smoking will be a stronger predictor of higher levels of smoking for Caucasians than for African Americans or other ethnic groups.

Having either a mother who smokes (Wald=0.89, p=.35, odds ratio = 0.69, CI 0.32-1.50) or a father who smokes (Wald=1.70, p=.19, odds ratio = 1.67, CI 0.77-3.60) was not a stronger predictor for females than for males. Peer smoking was not a stronger predictor of higher levels of smoking for Caucasians than for African Americans (Wald=.34, p>.05, odds ratio = 1.35, CI .49-3.70). Peer smoking was also not a stronger

predictor of higher levels of smoking for Caucasians than for the other ethnic groups (Wald=1.03, $p>.05$, odds ratio = .29, CI .03-3.13).

Hypothesis 3. The third hypothesis examined the sample of nonsmokers in the sixth grade (did not smoke in the past month) to determine which independent variables would significantly predict the participants who are considered experimenters (smoked only 1 or 2 cigarettes in the past month) by the seventh grade. A logistic regression was conducted on the sample of sixth grade nonsmokers, with the dependent variable comparing nonsmokers to experimenters in the seventh grade. Independent variables were again entered in the same order as the previous hypotheses. Distal environmental factors including county tobacco-growing status, the state in which the participant lived, and intervention/control group status were controlled for by entering them into the equation at step 1. Gender and ethnicity were entered into the equation at step 2. Best friend smoking status and the number of friends who smoked were entered into the equation at step 3.

Familial variables were entered at step 4, including mother smoking status, father smoking status, sibling smoking status, and the number of people in the home who smoke. Self-efficacy to refuse cigarettes was entered at step 5. At step 6 the interaction between self-efficacy and the number of friends who smoke was entered into the equation. At step 7 the interaction between gender and mother smoking status, and the interaction between gender and father smoking status were entered. The interaction between ethnicity and best friend smoking status was entered at the final step.

A test of the full model with all predictors against a constant-only model was statistically reliable, χ^2 (18, N=1394) = 52.42, p<.001. This result from the logistic regression indicated that the predictors, as a set, reliably distinguished between nonsmokers and experimenters in the seventh grade. The reader is referred to Table 13 for a summary of the model after the final step, including the regression coefficients, Wald statisitc with significance levels, partial correlations, odds ratios, and 95% confidence intervals for odds ratios for each of the predictors.

Results indicated that among the predictors entered into the equation, several reliably distinguished between nonsmokers and experimenters in the seventh grade. The number of friends who smoke (Wald=7.32, p<.05, odds ratio = 1.16, CI 1.04-1.30), having a mother who smokes (Wald=6.91, p<.05, odds ratio = 2.59, CI 1.27-5.28), and having less self-efficacy to refuse cigarettes (Wald=7.56, p<.05, odds ratio = 1.32, CI 1.08-1.60) significantly predicted whether a nonsmoker in the sixth grade was an experimenter in the seventh grade.

Results also indicated that a limited number of steps significantly improved the overall model. The reader is again referred to Table 13 which shows the degrees of freedom and chi square at each step. At step 1, the inclusion of distal variables (county's tobacco status, state, and intervention status) was a better predictor of experimenter status than the constant-only model, step χ^2 (3) = 13.32, p<.01. Peer smoking status at step 3 (best friend smoking and number of peers who smoke) significantly improved the model, step χ^2 (2) = 17.63, p<.001. At step 5, self-efficacy to refuse cigarettes improved the

model, χ^2 (1) = 6.43, p<.05. The other steps in the model did not significantly improve the overall model.

Hypothesis 3a: Having parents who smoke, a best friend who smokes, peers who smoke, siblings who smoke, and more overall people in the home who smoke will significantly predict participants who progress from nonsmokers in the sixth grade to experimenters in the seventh grade.

This hypothesis was partially supported. Mothers who smoke, but not fathers who smoke, significantly predicted whether a sixth grade student was an experimenter by the seventh grade. Having a mother who smokes was again the strongest predictor among all variables, doubling the odds that a sixth grader would be an experimenter by the seventh grade (OR=2.59). Having a greater number of friends who smoke increased the odds of smoking by the seventh grade (OR=1.16). However, having a best friend who smokes in the sixth grade did not significantly predict smoking in the seventh grade. Sibling smoking and the number of people in the home who smoked did not significantly predict smoking in the seventh grade.

Hypothesis 3b: Having lower self-efficacy to refuse cigarettes in the sixth grade will significantly predict experimenters in the seventh grade. In addition, there will be an interaction between peer smoking and self-efficacy to refuse cigarettes, such that peer smoking will be a stronger predictor of experimental smoking for those with lower self-efficacy to refuse cigarettes.

Although having a low self-efficacy to refuse cigarettes significantly increased a sixth grader's odds of smoking by the seventh grade by 1.31, having peers who smoke

was not a significantly stronger predictor for those with low self-efficacy (Wald=0.48, p=.49, odds ratio = 0.98, CI 0.94-1.03) .

Hypothesis 3c: Gender and ethnicity will interact with several of the independent variables. Specifically, mother smoking and father smoking will be a stronger predictor of experimental smoking for females than for males. It is also hypothesized that peer smoking will be a stronger predictor of experimental smoking for Caucasians than for African Americans or other ethnic groups.

Having either a mother who smokes (Wald=1.49, p=.22, odds ratio = 0.52, CI 0.19-1.48) or a father who smokes (Wald=1.94, p=.16, odds ratio = 2.07, CI 0.74-5.78) was not a stronger predictor for females than for males. In addition, peer smoking did not interact with ethnicity to better predict experimental smoking.

Hypothesis 4. The fourth hypothesis examined the sample of experimental smokers in the sixth grade (smoked 1-2 cigarettes in the past month) to determine which independent variables would significantly predict the participants who progressed to higher levels of smoking in the seventh grade (3 or more cigarettes). Due to the high rate of attrition among experimental smokers from Time Point 1 (sixth grade) to Time Point 2 (seventh grade), it was not possible to conduct the planned logistic regression for this hypothesis. Among the 60 experimental smokers at Time Point 1, only 19 remained at Time Point 2.

Hypothesis 5. The fifth hypothesis examined seventh grade nonsmokers to determine which independent variables were significantly related with participants who intend to smoke in the next six months. A logistic regression was conducted on the

sample of nonsmokers in the seventh grade (no smoking within the past month) with the dependent variable comparing whether or not the seventh grader intends to try smoking in the next six months. County tobacco-growing status, the state in which the participant lived, and intervention/control group status were controlled for by entering them into the equation at step 1. Gender and ethnicity were entered into the equation at step 2. Best friend smoking status and the number of friends who smoked were entered into the equation at step 3. Familial variables were entered at step 4, including mother smoking status, father smoking status, sibling smoking status, and the number of people in the home who smoke. Self-efficacy to refuse cigarettes was entered at step 5. At step 6 the interaction between self-efficacy and the number of friends who smoke was entered into the equation.

A test of the full model with all predictors against a constant-only model was statistically reliable, χ^2 (14, N=632) = 76.80, $p<.001$. This result from the logistic regression indicated that the predictors, as a set, reliably distinguished between those who intended to try smoking and those who did not intend to try smoking in the next six months. The reader is referred to Table 14 for a summary of the model after the final step, including the regression coefficients, significance levels, partial correlations, odds ratios, and 95% confidence intervals for odds ratios for each of the predictors.

Results indicated that among the predictors entered into the equation, two reliably distinguished between those who intended to smoke and those who did not intend to smoke in the next six months. Having a best friend who smokes (Wald=5.98, $p<.05$, odds ratio = 2.61, CI 1.21-5.62) and having low self-efficacy to refuse cigarettes

(Wald=23.70, $p<.001$, odds ratio = 2.07, CI 1.55-2.78) were significantly related to whether a nonsmoker in the seventh grade intended to smoke in the next six months. Results also indicated that step 3 (best friend smoking and number of peers who smoke) significantly improved the model, step χ^2 (2) = 29.42, $p<.001$. Self-efficacy to refuse cigarettes at step 5 also significantly improved the model, step χ^2 (1) = 42.58, $p<.001$. The other steps in the model did not improve the overall model.

Hypothesis 5a: It is hypothesized that, among nonsmokers in the seventh grade, having parents who smoke, a best friend who smokes, peers who smoke, siblings who smoke, and more overall people in the home who smoke will be significantly related to those who intend to smoke in the next six months.

Among these independent variables, only having a best friend who smokes (Wald=5.98, $p<.05$, odds ratio = 2.61, CI 1.21-5.62) was significantly related to whether a nonsmoker in the seventh grade intended to smoke in the next six months.

Hypothesis 5b: Having lower self-efficacy to refuse cigarettes will be significantly related to those who intend to smoke in the next six months. In addition, there will be an interaction between peer smoking and self-efficacy to refuse cigarettes, such that peer smoking will have a stronger relationship with smoking intention for those with lower self-efficacy to refuse cigarettes.

Having low self-efficacy to refuse cigarettes (Wald=23.70, $p<.001$, odds ratio = 2.07, CI 1.55-2.78) was significantly related to whether a nonsmoker in the seventh grade intended to smoke in the next six months. However, there was not a significant interaction between peer smoking and self-efficacy to refuse cigarettes.

CHAPTER V

DISCUSSION

The discussion is divided into five sections. The first section provides an overview of the smoking behavior for the sample of rural adolescents in this study, and an effort is made to place the description of their smoking behavior into a larger context. The second section discusses the specific hypotheses and how individual environmental variables impact adolescents' progression through different stages of smoking behavior. The third section reviews the limitations of the study. The fourth section includes a discussion of the implications of this study and future directions for research in adolescent smoking. The fifth section provides a final summary of the current study.

Sample of Rural Adolescent Smoking Behavior in Context

Previous research on adolescent smoking, as well as social-cognitive theory, suggests that environmental factors are important influences on the development of smoking behavior among adolescents. However, little research has focused on the process of smoking initiation exclusively within a rural adolescent population. This study examined the smoking behavior of rural adolescents at two time points, first in the sixth grade and then one-year later in the seventh grade. Environmental factors including parental smoking, peer smoking, and sibling smoking, as well as the personal factor of

self-efficacy, were used to predict changes in the level of adolescent smoking behavior. The levels examined included participants who never tried smoking, even one or two puffs; non-smokers (did not smoke in the past month); experimental smokers (smoked 1 or 2 times in the past month); higher level smokers (smoked between 1 day and all 30 days in the past month); and those nonsmokers who intended to smoke in the next six months.

From the overall sample of 2,247 sixth grade adolescents, 28.2% had tried a cigarette by the sixth grade, even one or two puffs. By the seventh grade, the percentage of adolescents who had tried smoking increased to 44.9%. This indicates a large number of students at least tried smoking at a young age. Comparing this figure with other studies can be difficult because the majority of studies do not report smoking rates specifically for seventh grade students. However, in two studies of urban seventh grade students, one study reported that 37.8% had already tried smoking (Robinson et al., 1997), and another study reported that 42.2% had tried smoking (Hu et al., 1995). Thus, in the current sample of rural adolescents, the percentage of seventh grade students who tried smoking is at least toward the higher range for this age group, if not higher.

Higher levels of smoking, beyond trying, are determined by whether the individual smoked within the past month. Overall, 7.3% of sixth graders in the current study smoked at least one day within the past month, with 3.6% considered regular smokers (smoked three or more days in the past month). By the seventh grade those who smoked at least one day in the past month increased to 12.6%, with 6.8% considered regular smokers. Hu et al. (1995) reported that 6.79% of seventh graders in their urban

sample were regular smokers (smoked a few times a month or more). This is consistent with the 6.8% of seventh graders who were regular smokers in the current study.

It is also useful to consider the incidence of new smokers from the sixth grade to the seventh grade. A total of 1,592 sixth grade students (70.9% of the sixth grade sample) reported that they never tried smoking, even one or two puffs. By the seventh grade, 28.5% of those students had tried smoking, even one or two puffs. Slightly over 6% of the students who had never tried smoking in the sixth grade had smoked within the past month by the seventh grade. Among those previous non-smokers who now smoked within the past month, 3.4% could be considered experimenters and 2.9% could now be considered regular smokers.

The numbers suggest that by the time these rural adolescents were completing seventh grade, almost half of them had tried smoking, with many having tried for the first time within the past year. If one is to consider the stages of smoking initiation, a large number of the seventh graders are in the second, or "trying," stage. Although not all will progress to more advanced stages of smoking, it clearly places a large number of adolescents at risk for furthering their use of tobacco. Indeed, as might be expected, greater numbers of adolescents in this sample moved into both experimenter and regular smoking stages as they got older.

It is important to note that a young adolescent labeled as a "regular smoker" may not be the same as what one would think of as a regular adult smoker in terms of quantity of cigarettes smoked. For example, of the sixth graders, 3.5% smoked less than one cigarette each time they smoked, 2.8% smoked between one and five cigarettes each

time, and slightly over 1% smoked more than 6 cigarettes. Of the seventh graders, 5.7% smoked less than one cigarette each time they smoked, 5.5% smoked between one and five cigarettes each time, and almost 2% smoked more than 6 cigarettes. However, again the trend is clearly an increase in the amount of smoking. Although to some the overall numbers may appear low, it is important to keep in mind that this is the beginning of what could become an addiction that, for many, lasts a lifetime.

The last point is important to keep in mind because previous research has demonstrated that those in the experimental stage progress to established smokers at relatively high rates. Thus the 3.4% of seventh graders who are experimenters have a high likelihood of becoming more regular smokers. The large percentage of "triers" also provides an opportunity for many to experiment and then move on to regular smoking. What makes this sample of seventh grade smokers particularly at risk is that younger smokers are also less likely to quit smoking than those who initiate smoking at a later age.

Although the above figures suggest an increase in various levels of smoking from sixth grade to seventh grade, these figures may actually underestimate the percentage of rural adolescents in this sample that were actually smoking. This is suggested by a comparison between the students who completed surveys at both time points and those who only completed the first time point. Approximately 76% of sixth graders who had tried cigarettes, even one or two puffs, completed both time points. This was significantly different from the approximately 82% of sixth graders who had never tried cigarettes and completed both time points. Similarly, 81% of sixth graders who had not

smoked in the past 30 days completed both time points. However, as the number of days smoked in the past 30 days among sixth graders increased, the likelihood that they completed a survey in the seventh grade decreased. This ranged from 75% for those sixth graders who smoked one to two days in the past month to only 29.4% for the sixth graders who smoked all 30 days.

This disparate loss of data is unfortunate but the significance may be meaningful. Problem behavior theory (Jessor & Jessor, 1977) posits that problem behaviors among adolescents, such as smoking, alcohol use, drug use, and delinquency, are related and part of a syndrome of behaviors. Research has demonstrated that adolescents who engage in one problem behavior are more likely to engage in other problem behaviors (Farrell, Danish, & Howard, 1992). In addition, deviant behaviors have been found to be particularly good predictors of smoking transitions for middle school students (Chassin, Presson, Sherman et al., 1984). In the current sample, sixth grade students who had higher levels of smoking were less likely to complete a survey in the seventh grade. It may be that sixth graders who engage in higher levels of smoking also engage in other problematic behaviors that lead to school suspensions or simply higher rates of absenteeism from school. These students are then less available to be surveyed, with one possible result being the underestimation of the actual percentage of students who are smoking.

Relationship Between Predictors and Adolescent Smoking

The hypotheses in this study sought to examine the influence of environmental factors on adolescent smoking, and determine whether different factors may be more or

less influential depending on the level of smoking. These levels included moving from never smoking into the trying stage (tried smoking, even one or two puffs); moving from the nonsmoker stage (did not smoke in the past month) to the experimenter stage (smoked one or two cigarettes in the past 30 days); moving from the nonsmoker stage (no smoking in the past 30 days) to higher levels of smoking (smoked between one day and all 30 days in the past month); and those who did not smoke in the past month but were intending to smoke in the next six months.

Previous research demonstrated that having peers who smoke is significantly related to smoking in adolescence. However, the extent to which peer smoking influences adolescent smoking has varied across studies. One of the strengths of the current study is that smoking initiation was examined through longitudinal rather than cross-sectional data, therefore better controlling for friendship selection. Second, the influence of peer smoking variables (best friend smoking and the number of friends who smoke) was examined across different levels of smoking. The results indicated that, consistent with other studies, peer smoking is significantly related to adolescent smoking.

However, the results also indicated that an important distinction needs to be made between the type of peer smoking (best friend smoking versus overall number of friends who smoke) and the stage of smoking. In this study, having a best friend who smokes made it twice as likely that the sixth grade "never trier" would try smoking by the seventh grade. However, the number of friends who smoke was not significantly related to trying smoking for the first time. The opposite was true for moving to either experimental smoking or overall higher levels of smoking. In those cases, having more friends who

smoke increased the odds of a nonsmoker becoming an experimenter by 16%, and increased the odds of overall higher levels of smoking by 11%. For both experimenters and higher level smokers, best friend smoking was not significantly related.

One additional result may help clarify the relationship between peer smoking and adolescent smoking in this study. For seventh grade nonsmokers, having a best friend who smoked increased the odds by 2.61 that they intended to smoke in the next six months; but again, for nonsmokers, the overall number of friends who smoked was not significantly related to smoking intention. It appears that having a best friend who smokes is an important influence on the early stages of smoking initiation, primarily the preparatory and the trying stages. Having a number of friends who smoke is more of an influence on moving an adolescent toward the experimenter or regular use stages. For many adolescents at this age, trying smoking (or the thought of trying smoking) may occur in the company of a best friend. Having a number of friends who smoke may mean there is more opportunity, or perhaps more social pressure, to smoke. Therefore having more friends who smoke may lead to more experimental or regular cigarette use.

Another hypothesis was that adolescent smoking would be related to having parents who smoke. The results indicated that the mother's smoking status, but not the father's smoking status, was related to various levels of adolescent smoking. Among the sixth graders who never tried smoking, having a mother who smoked increased the odds by 1.60 that he or she would try smoking by the seventh grade. Among nonsmokers in the sixth grade, having a mother who smoked increased the odds by 2.59 that adolescents would be experimenters in the seventh grade and increased the odds by 1.98 that

adolescents would engage in an overall higher level of smoking (experimenter or regular use). There may be several reasons for this relationship. One possibility is that mothers may be modeling smoking behavior for their children. They may be more influential models of smoking behavior than fathers because in rural environments, as is the case in many other environments, mothers may be in a primary caregiver role. As a result of being in such a role, adolescents may observe and adopt similar behaviors, including smoking.

A second possible reason that mother smoking is related to adolescent smoking is that adolescents may have more accessibility to cigarettes when a parent smokes. Having a parent who smokes means that cigarettes would likely be in the home and make it easier to obtain a few cigarettes, stealthily or otherwise. It would mean that, at least for trying smoking or engaging in experimentation, cigarettes or partial cigarettes would be more available. However, why in this study does having a mother who smokes, but not a father who smokes, significantly related to adolescent smoking? This may be related to a limitation of the study. That is, the composition of the households was not determined, and therefore it is not known how many fathers lived in the homes with their children or how much contact the adolescents had with their fathers. If a large percentage of adolescents in the study did not have fathers living with them, then adolescents would not have as much access to their fathers' cigarettes, nor might fathers be as influential as mothers for modeling smoking behavior.

Although the smoking status of mothers was related to adolescents trying, experimenting, and regularly using cigarettes, mother smoking was not related to

adolescents intending to use cigarettes in the next six months. Having a best friend who smoked and having a low self-efficacy to refuse cigarettes were the only significant predictors for smoking intention. It appears that having a best friend who smokes and not feeling confident that one can refuse cigarettes outweighs the influences of a smoking parent. A related hypothesis was that the effect of parental smoking might be different for boys and girls. Although previous research indicated that parents who smoke may be a stronger influence for females than for males, neither mother nor father smoking had any different effect for boys or girls.

There were two other familial variables that were not significantly related to adolescent smoking, yet worthy of mention. First, the overall number of people in the home who smoke was not a significant predictor of smoking. It could be the case that many homes included other relatives such as grandparents, aunts, and uncles, or non-related individuals such as friends of the parents. In this sample, the smoking status of the mother remained a more important factor than the number of people in the home who smoked.

Second, having siblings who smoke was not related to adolescent smoking. Again, this suggests that it is not just any family member who is influential for adolescent smoking, but there is something unique about mothers who smoke. Nevertheless, previous research has yielded some inconsistent findings for sibling smoking, and it may be important to examine how sibling smoking is measured. For example, previous research that demonstrated the influence of sibling smoking determined that brothers and sisters impact adolescent smoking differently. The questionnaire in this study asked

whether a "brother or sister" smoked, and therefore in future research it may be important to request separate smoking information for brothers and sisters.

As mentioned above, self-efficacy was significantly related to adolescents considering smoking, but it was also consistently related to all levels of smoking. Having less self-efficacy to refuse cigarettes increased the odds by 1.17 that an adolescent would try smoking. Low self-efficacy increased the odds by 1.32 that an adolescent would become an experimenter, and increased the odds by 1.21 that an adolescent would move to higher levels of smoking. Although this personal variable may have been less influential than environmental variables at times, its consistent relationship with all stages of adolescent smoking suggests its importance. In addition, this was only a single-item measure of self-efficacy, and it is possible that a more comprehensive measure of self-efficacy could detect an even greater influence. The limitation of the measure may have also prevented this study from detecting whether self-efficacy moderates the relationship between best friend smoking and adolescent smoking.

Several of the variables intended to be control variables are also worthy of discussion. First, sixth graders who never tried smoking but lived in a county in which tobacco was grown were nearly twice as likely to try smoking by the seventh grade. However, living in a tobacco-growing county was not significantly related to higher levels of smoking. In other words, adolescents from tobacco-growing counties were more likely to try cigarettes, but not necessarily more likely to begin experimenting, move to higher levels of smoking, or even intend to try smoking.

In this instance it may be that trying smoking is highly related to availability. Living in a county with tobacco farms or where tobacco production takes place likely allows accessibility to tobacco. Tobacco farming and production may also be seen as a livelihood for many in the community, and therefore perhaps it is more acceptable to try tobacco. Nevertheless, there may be some protective factors that prevent the adolescents from moving into higher tobacco usage at this age. Thus, while living in a tobacco-growing county may not have a strong relation to experimenting and regular smoking in sixth and seventh grade, it may become a stronger factor when the adolescent is older.

A second control variable, ethnicity, had a different relationship with smoking than expected. Previous research determined that Caucasian adolescents are more likely to initiate smoking than African American adolescents. For experimental and higher levels of smoking in this sample, ethnicity was surprisingly not related to adolescent smoking. In addition, African American adolescents were significantly more likely to try smoking than Caucasian adolescents. This occurred even after controlling for state and county tobacco-growing status, and may be an indication that the rural environment results in ethnicity having a different influence for adolescent smoking.

Previous research also indicated that having a best friend who smokes is a stronger influence for smoking among Caucasian adolescents. In this sample of rural adolescents, best friend smoking was not significantly more influential for Caucasians than for African Americans. Nonetheless, having a best friend who smoked was less related to trying smoking for other ethnic groups than for Caucasians. It is possible that the ethnic groups incorporated into the "other" category are from cultures that place more

emphasis on parental obedience (such as the Asian culture). This could work as a protective factor for preventing adolescents from those cultures from trying cigarettes.

Study Limitations

There are several limitations to this study that must be considered. First, all of the data gathered in the study relied on self-report surveys administered to sixth and seventh grade middle school students. There is an assumption that the respondents honestly and accurately reported their own smoking behavior as well as the smoking behavior of family members and friends, although this may not necessarily be the case. Misperceptions of the smoking behavior of others in their environment (such as the number of family or friends who smoke) or misrepresentation of their own smoking behavior (such as reporting that they smoke less than they actually do) could potentially impact the results of the study. However, perhaps some of this concern can be mitigated because obvious inconsistent responders were eliminated from the study, and there is evidence that children's self-reports of smoking are consistent over time (Henriksen & Jackson, 1999).

A second limitation is that there was a large amount of attrition from this school-based sample. As previously discussed, there were significant differences for smoking behavior between respondents who completed one time point compared to those who completed both time points. The attrition prevented an analysis of those who moved from experimental to regular smoking, and also likely created an underestimation of the overall number of smokers in the seventh grade. In addition, the statistical power to detect the strength of relationships between variables was reduced. Thus, for instance,

there may have been an even stronger relationship between peer smoking and adolescent smoking, or between parent smoking and adolescent smoking.

A third limitation involves the age of the sample, and hence the degree that the results can be generalized. The study essentially gives a "snapshot" of the relationship between several environmental variables and adolescent smoking during one year of adolescence (sixth to seventh grade). Although the environmental variables discussed in this study may influence changes in the stages of smoking for sixth and seventh graders, these variables may be more (or less) influential for older adolescents. For example, the smoking status of mothers may be less influential for older adolescents because the influence of friends may become more important or cigarettes may be more easily obtained outside the home. However, although the ability to generalize the results to other ages may be limited, these results are important because they address what is, for many rural adolescents, the very beginning of smoking initiation and experimentation.

Implications and Future Directions

Findings from this study have implications for the design of prevention programs and for areas of future research. First, peers have always been an important component of tobacco prevention. However, for prevention programs aimed at young adolescents who may have not yet tried cigarettes, perhaps an emphasis should be placed on developing and practicing skills to cope with a best friend who smokes. Refusing cigarettes from any friend may be difficult, but from a best friend it may be especially difficult. The significant relationship between low self-efficacy to refuse cigarettes at all

stages of smoking indicate that skills that build self-efficacy should also continue to be an important focus for prevention programs.

Second, the results of this study add further support for the important relationship between mother smoking and adolescent smoking. Prevention programs designed to help adolescents deal with smokers in their environment should place particular focus on dealing with a mother who smokes. Maternal smoking has meaning for a young adolescent developing his or her identity, and it is important to assist the adolescent to explore the impact of this modeling. However, future research should also clarify which parents are living in the home, how much contact an adolescent has with a parent who does not live in the home, and the involvement in parenting for mothers and fathers. This will help clarify whether fathers are also influential if significantly involved in the adolescent's life.

Several control variables produced unexpected findings in this rural sample that warrant further study. One result from this study indicated that living in a county that grows tobacco is related to an adolescent trying tobacco but not necessarily engaging in higher levels of tobacco use. A future research question is whether the tobacco-growing status of a county has a different impact for different ages of students. If a high school sample were used, for example, the tobacco-growing status of the county might have a different influence, perhaps more significantly related to higher levels of tobacco use. In addition, the greater balance between African American and Caucasian smokers in this rural sample should be explored in future research. There may be more of a shared culture in rural settings, therefore reducing differences in smoking initiation at this age.

Summary

There has been little previous research that has focused specifically on adolescent smoking in rural settings. Results from this longitudinal study suggest that, consistent with other research, peer smoking is significantly related to adolescents trying smoking, moving to experimental smoking, and moving to overall higher levels of smoking. However, there are subtle distinctions to be made among peer smoking. Having a best friend who smokes appears to be more important for trying smoking, whereas the number of friends who smoke is more important for experimental and higher levels of smoking. Mother's who smoke were found to be a consistent influence across all stages of smoking behavior at this age, making it twice as likely that an adolescent would move to experimental or higher levels of smoking. This finding should serve as a reminder that the influence of parents on adolescent smoking should not be underestimated, and future research should more closely examine the nature of parental relationships to determine whether fathers may also be influences on smoking behavior.

An adolescent's self-efficacy to refuse cigarettes was consistently related to all stages of smoking, and was particularly related to adolescents intending to smoke. While this finding is consistent with other studies, the more distal environmental variable of ethnicity had a slightly different impact on smoking behavior than demonstrated in previous research. African Americans were actually at a higher risk for trying smoking than Caucasians, and there were no differences for ethnicity among those who moved to experimental or higher levels of smoking. In addition, living in a tobacco-growing county was significantly related to adolescents trying smoking, but was not related to

adolescents at this age moving to experimental or higher levels of smoking. The findings from this study suggest that there are unique aspects to the smoking behavior of rural adolescents. Future research should continue to focus on adolescents living in rural areas, as differential findings could shed further light on the processes involved in smoking initiation for all adolescents.

List of References

References

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice Hall, Inc.

Baranowski, T., Perry, C.L., & Parcel, G.S. (1997). How individuals, environments, and health behavior interact: social cognitive theory. In K. Glanz, F.M. Lewis, & B.K. Rimer (Eds.), *Health behavior and health education: Theory, research, and practice* (2nd ed.) (pp. 153-178). San Francisco, CA: Jossey-Bass Publishers.

Bauman, K.E., & Ennett, S. (1996). On the importance of peer influence for adolescent drug use: Commonly neglected considerations. *Addiction, 91,* 185-198.

Botvin, E.M., Botvin, G.J., Michela, J.L., Baker, E. & Filazzola, A.D. (1991). Adolescent smoking behavior and the recognition of cigarette advertisements. *Journal of Applied Social Psychology, 21,* 919-932.

Botvin, G.J., Dusenbury, L., Baker, E., James-Ortiz, S., & Kerner, J. (1989). A skills training approach to smoking prevention among hispanic youth. *Journal of Behavior Medicine, 12,* 295-297.

Breslau, N., & Peterson, E.L. (1996). Smoking cessation in young adults: Age at initiation of cigarette smoking and other suspected influences. *American Journal of Public Health, 86,* 214-220.

Chassin, L., Presson, C., Sherman, S.J., Corty, E., & Olshavsky, R.W. (1984). Predicting the onset of cigarette smoking in adolescents: A longitudinal study. *Journal of Applied Social Psychology, 14,* 224-243.

Chassin, L., Presson, C.C., Montello, D., Sherman, S.J., & McGrew, J. (1986). Changes in peer and parent influence during adolescence: Longitudinal versus cross-sectional perspectives on smoking initiation. *Developmental Psychology, 22,* 327-334.

Chassin, L., Presson, C.C., Rose, J.S., & Sherman, S.J. (1996). The natural history of cigarette smoking from adolescence to adulthood: Demographic predictors of continuity and change. *Health Psychology, 15,* 478-484.

Chassin, L., Presson, C.C., Todd, M., Rose, J.S., & Sherman, S.J. (1998). Maternal socialization of adolescent smoking: The intergenerational transmission of parenting and smoking. *Developmental Psychology, 34,* 1189-1201.

Choi, W.S., Pierce, J.P., Gilpin, E.A., Farkas, A.J., & Berry, C.C. (1997). Which adolescent experimenters progress to established smoking in the united states. *American Journal of Preventive Medicine, 13,* 385-391.

Conrad, K.M., Flay, B.R., & Hill, D. (1992). Why children start smoking cigarettes: Predictors of onset. *British Journal of Addiction, 87,* 1711-1724.

Cronk, C.E., & Sarvela, P.D. (1997). Alcohol, tobacco, and other drug use among rural/small town and urban youth: A secondary analysis of the monitoring the future data set. *American Journal of Public Health, 87,* 760-764.

Distefan, J.M., Gilpin, E.A., Choi, W.S., & Pierce, J.P. (1998). Parental influences predict adolescent smoking in the united states, 1989-1993. *Journal of Adolescent Health, 22,* 466-474.

Eissenberg, T., & Balster, R.L. (2000). Initial tobacco use episodes in children and adolescents: current knowledge, future directions. *Drug and Alcohol Dependence, 59,* S41-S60.

Elders, M.J., Perry, C.L., Eridsen, M.P., & Giovino, G.A. (1994). The report of the surgeon general: Preventing tobacco use among young people. *American Journal of Public Health, 84,* 543-547.

Engels, R.C., Knibbe, R.A., & Drop, M.J. (1999). Predictability of smoking in adolescence: Between optimism and pessimism. *Addiction, 94,* 115-124.

Farrell, A.D., Danish, S.J., & Howard, C.W. (1992). Relationship between drug use and other problem behaviors in urban adolescents. *Journal of Consulting and Clinical Psychology, 60,* 705-712.

Flay, B.R. (1993). Youth tobacco use: Risks, patterns and control. In J. Slade & C.T. Orleans (Eds.), *Nicotine addiction: Principles and management.* London: Oxford University Press.

Gilpin, E.A., Choi, W.S., Berry, C., & Pierce, J.P. (1999). How many adolescents start smoking each day in the united states? *Journal of Adolescent Health, 25,* 248-255.

Griesler, P.C., & Kandel, D.B. (1998). Ethnic differences in correlates of adolescent

cigarette smoking. *Journal of Adolescent Health, 23,* 167-180.

Harrell, J.S., Bangdiwala, S.I., Deng, S., Webb, J., & Bradley, C. (1998). Smoking initiation in youth. *Journal of Adolescent Health, 23,* 271-279.

Headen, S.W., Bauman, K.E., Deane, G.D., & Koch, G.G. (1991). Are the correlates of cigarette smoking initiation different for black and white adolescents? *American Journal of Public Health, 81,* 854-858.

Henriksen, L., & Jackson, C. (1999). Reliability of children's self-reported cigarette smoking. *Addictive Behaviors, 24,* 271-277.

Hirschman, R.S., Leventhal, H., & Glynn, K. (1984). The development of smoking behavior: Conceptualization and supportive cross-sectional survey data. *Journal of Applied Social Pscyhology, 14,* 184-206.

Hu, F.B., Flay, B.R., Hedeker, D., Siddiqui, O., & Day, L.D. (1995). The influences of friends' and parental smoking on adolescent smoking behavior: The effects of time and prior smoking. *Journal of Applied Social Psychology, 25,* 2018-2047.

Hughes, J.R., Gust, S.W., Skoog, K., Keenan, R.M., & Fenwick, J.W. (1991). Symptoms of tobacco withdrawal: A replication and extension. *Archives of General Psychiatry, 48,* 52-59.

Jackson, C., Bee-Gates, D.J., & Henriksen, L. (1994). Authoritative parenting, child competencies, and initiation of cigarette smoking. *Health Education Quarterly, 21,* 103-116.

Jackson, C. (1997). Initial and experimental stages of tobacco and alcohol use during late childhood: Relation to peer, parent, and personal risk factors. *Addictive Behaviors, 22,* 685-698.

Jessor, R., & Jessor, S.L. (1977). *Problem behavior and psychosocial development: A longitudinal study of youth.* San Diego, CA: Academic Press.

Julien, R.M. (1995). *A primer of drug action: A concise, nontechnical guide to the actions, uses, and side effects of psychoactive drugs* (7th ed.). New York: W.H. Freeman and Company.

Kandel, D.B. (1996). The parental and peer contexts of adolescent deviance: An algebra of interpersonal influences. *Journal of Drug Issues, 26,* 289-315.

Kandel, D.B., & Andrews, K. (1987). Processes of adolescent socialization by parents

and peers. *The International Journal of the Addictions, 22,* 319-342.

Khuder, S.A., Dayal, H.H., & Mutgi, A.B. (1999). Age at smoking onset and its effect on smoking cessation. *Addictive Behaviors, 24,* 673-677.

Lakier, J.B. (1992). Smoking and cardiovascular disease. *The American Journal of Medicine, 93,* 8S-12S.

Leventhal, H., & Cleary, P.D. (1980). The smoking problem: A review of the research and theory in behavioral risk modification. *Psychological Bulletin, 88,* 370-405.

Levin, E.D. (1992). Nicotine systems and cognitive function. *Psychopharmacology, 108,* 417-431.

Luepker, R.V., Perry, C.L., McKinlay, S.M., Nader, P.R., Parcel, G.S., Stone, E.J., Webber, L.S., Elder, J.P., Feldman, H.A., Johnson, C.C., Kelder, S.H., & Wu, M. (1996). Outcomes of a field trial to improve children's dietary patterns and physical activity: The child and adolescent trial for cardiovascular health (catch). *Journal of the American Medical Association, 275,* 768-776.

Mayhew, K.P., Flay, B.R., & Mott, J.A. (2000). Stages in the development of adolescent smoking. *Drug and Alcohol Dependence, 59,* S61-S81.

Melby, J.N., Conger, R.D., Conger, K.J., & Lorenz, F.O. (1993). Effects of parental behavior on tobacco use by young male adolescents. *Journal of Marriage and the Family, 55,* 439-454.

Noland, M.P., Kryscio, R.J., Hinkle, J., Riggs, R.S., Linville, L.H., Ford, V.Y., & Tucker, T.C. (1996). Relationship of personal tobacco-raising, parental smoking, and other factors to tobacco use among adolescents living in a tobacco-producing region. *Addictive Behaviors, 21,* 349-361.

Perry, C.L., & Staufacker, M.J. (1996). Tobacco use. In R.J. Diclemente, W.B. Hansen, & L.E. Ponton (Eds.), *Handbook of adolescent health risk behavior.* New York, NY: Plenum Press.

Peto, R., Darby, S., Deo, H., Silcocks, P., Whitley, E., & Doll, R. (2000). Smoking, smoking cessation, and lung cancer in the uk since 1950: Combination of national statistics with two case-control studies. *British Medical Journal, 321,* 323-329.

Pierce, J.P., Choi, W.S., Gilpin, E.A., Farkas, A.J., & Merritt, R.K. (1996). Validation

of susceptibility as a predictor of which adolescents take up smoking in the united states. *Health Psychology, 15,* 355-361.

Robinson, L.A., Klesges, R.C., Zbikowski, S.M., & Glaser, R. (1997). Predictors of risk for different stages of adolescent smoking in a biracial sample. *Journal of Consulting and Clinical Psychology, 65,* 653-662.

Stacy, A.W., Sussman, S., Dent, C.W., Burton, D., & Flay, B.R. (1992). Moderators of peer social influence in adolescent smoking. *Personality and Social Psychology Bulletin, 18,* 163-172.

Urberg, K.A., Degirmencioglu, S.M., & Pilgrim, C. (1997). Close friend and group influence on adolescent cigarette smoking and alcohol use. *Developmental Psychology, 33,* 834-844.

Vartiainen, M.P., & Puska, P. (1996). Predicting adult smoking: the influence of smoking during adolescence and smoking among friends and family. *Helath Education Research: Theory and Practice, 11,* 309-315.

Virginia Middle School Youth Risk Behavior Survey. (1993).

Table 1

Demographics of Participants in the Sixth Grade (N=2247) and in the Follow-Up Seventh Grade Year (N=1794)

Variable	Percent in 6th Grade (N=2247)	Percent in 7th Grade (N=1794)
Gender		
Boys	49.6 %	49.1 %
Girls	50.4 %	50.9 %
Ethnicity		
Caucasian	53.2 %	55.7 %
African American	38.6 %	37.0 %
Other	8.2 %	7.3 %

Table 2

Smoking Behavior of Participants in the Sixth Grade (N=2247) and in the Follow-Up Seventh Grade Year (N=1794)

Variable		Percent in 6th Grade (N=2247)	Percent in 7th Grade (N=1794)
Tried Cigarettes, even 1 or 2 puffs		28.2 %	44.9 %
Frequency of days smoked in the past 30 days			
	None / Do Not Smoke	92.8 %	87.4 %
	1-2 days	3.7 %	5.8 %
	3-9 days	1.8 %	3.3 %
	10-29 days	0.9 %	1.7 %
	All 30 days	0.9 %	1.8 %
Amount of cigarettes per day the past month			
	None / Do Not Smoke	92.6 %	86.9 %
	Less than 1	3.5 %	5.7 %
	1-5 cigarettes	2.8 %	5.5 %
	6-10 cigarettes	0.6 %	0.9 %
	11-20 cigarettes	0.2 %	0.5 %
	More than 20	0.3 %	0.5 %

Table 3

Individuals in the Participants' Environment Who Smoke As Reported By Participants in the Sixth Grade (N = 2247) and in the Follow-Up Seventh Grade Year (N=1794)

Variable	Percent in 6th Grade (N=2247)	Percent in 7th Grade (N=1794)
Best friend smokes	13.7 %	23.9 %
Mother smokes	34.8 %	34.0 %
Father smokes	41.2 %	40.8 %
Sister/Brother smokes	18.6 %	24.6 %

Table 4

Percentage of Participants Who Completed Both Time Points (N=2222)

Variable	Percent Completed Both Time Points
Gender	
Boys	78.8 %
Girls	81.3 %
Ethnicity*	
Caucasian	82.8 %
African American	77.2 %
Other	77.7 %
Tried Cigarettes, even 1 or 2 puffs*	
Yes	75.9 %
No	81.9 %
Days smoked in the past 30 days*	
None / Do Not Smoke	81.3 %
1-2 days	75.0 %
3-9 days	69.2 %

10-29 days	52.6 %
All 30 days	29.4 %
Amount of Cigarettes/Smoking Status*	
Nonsmoker	81.3 %
Experimental Smoker	75.0 %
Regular Smoker	56.0 %

*Differences are significant at $p<.01$.

Table 5

Demographics of Sixth Graders Who Reported Never Having Tried Smoking

(N = 1592)

Variable	Percent
Gender	
Boys	46.8 %
Girls	53.2 %
Ethnicity	
Caucasian	55.8 %
African American	36.5 %
Other	7.7 %

Table 6

Smoking Behavior of Seventh Grade Participants From Sixth Grade "Never Triers" (N=1304)

Variable		Percent
Tried Cigarettes, even 1 or 2 puffs		28.5 %
Frequency of days smoked in the past 30 days		
	None / Do Not Smoke	93.7 %
	1-2 days	3.4 %
	3-9 days	1.4 %
	10-29 days	0.4 %
	All 30 days	1.1 %
Amount of cigarettes smoked per day the past month		
	None / Do Not Smoke	93.6 %
	Less than 1	2.8 %
	1-5 cigarettes	2.7 %
	6-10 cigarettes	0.3 %
	11-20 cigarettes	0.3 %
	More than 20	0.2 %

Table 7

Individuals in the Sixth Grade "Never-Triers'" Environment Who Smoke As Reported By Participants in the Sixth Grade (N=1592) and in the Follow-Up Seventh Grade Year (N=1304)

Variable	Percent in 6th Grade (N=1592)	Percent in 7th Grade (N=1304)
Best friend smokes	5.8 %	15.8 %
Mother smokes	31.3 %	30.6 %
Father smokes	36.9 %	37.3 %
Sister/Brother smokes	13.3 %	19.6 %

Table 8

Intercorrelations Among Variables for Sixth Graders Who Never Tried Smoking (N= 1297)

Variable	1	2	3	4	5	6
1. Tobacco County	__	.37**	-.08**	-.03	.28**	-.05
2. State	.37**	__	.01	.01	.34**	-.08**
3. Intervention Status	-.08**	.01	__	-.01	-.01	.05
4. Gender	-.03	.01	-.01	__	-.04	.05
5. Ethnicity (AA)	.28**	.34**	-.01	-.04	__	-.21**
6. Ethnicity (Other)	-.05	-.08**	.05	.05	-.21**	__
7. Best Friend Smoking	.02	.00	.03	.09**	.00	.01
8. # of Friends Smoking	.03	.02	-.02	.06*	-.04	.01
9. Mother Smoking	-.01	.00	.06*	-.02	-.10**	.06*
10. Father Smoking	-.02	.02	.04	-.03	.02	.05
11. Sibling Smoking	.04	-.01	.00	-.03	-.03	.06*
12. # In Home Smoking	.05	.06*	.07*	-.01	.04	.05
13. Self-Efficacy	.10**	.05	-.10**	.03	.13**	.03
14. Tried Smoking (7^{th} Gr)	.15**	.08**	.06*	.04	.10**	-.01

Variable	7	8	9	10	11	12
1. Tobacco County	.02	.03	-.01	-.02	.04	.05
2. State	.00	.02	.00	.02	-.01	.06*
3. Intervention Status	.03	-.02	.06*	.04	.00	.07*
4. Gender	.09**	.06*	-.02	-.03	-.03	-.01
5. Ethnicity (AA)	.00	-.04	-.10**	.02	-.03	.04
6. Ethnicity (Other)	.01	.00	.06*	.05	.06*	.05
7. Best Friend Smoking	__	.47**	.00	.01	.05	.02
8. # of Friends Smoking	.47**	__	.00	.03	.09**	.10**
9. Mother Smoking	.00	.01	__	.37**	.17**	.59**
10. Father Smoking	.01	.03	.37**	__	.13**	.59**
11. Sibling Smoking	.05	.09**	.17**	.13**	__	.26**
12. # In Home Smoking	.02	.10**	.59**	.59**	.26**	__
13. Self-Efficacy	.05	.09**	-.02	.00	.03	.02
14. Tried Smoking (7^{th} Gr)	.07*	.13**	.13**	.11**	.07*	.15**

Variable	13	14
1. Tobacco County	.10**	.15**
2. State	.05	.08**
3. Intervention Status	-.09**	.06*
4. Gender	.03	.04
5. Ethnicity (AA)	.13**	.10**
6. Ethnicity (Other)	.03	.00
7. Best Friend Smoking	.05	.07*
8. # of Friends Smoking	.10**	.13**
9. Mother Smoking	-.02	.13**
10. Father Smoking	.00	.11**
11. Sibling Smoking	.03	.07*
12. # In Home Smoking	.02	.15**
13. Self-Efficacy	—	.10**
14. Tried Smoking (7^{th} Gr)	.10**	—

Note: Tried Smoking (7^{th} Gr) is whether or not the students tried smoking in the seventh grade; all other variables are from the students as sixth graders; ** = $p<.01$; * = $p<.05$.

Table 9

Percentage of Sixth Grade "Never Triers" Who Completed Both Time Points (N=1583)

Variable	Percent Completed Both Time Points
Gender	
Boys	81.1 %
Girls	82.5 %
Ethnicity*	
Caucasian	84.5 %
African American	78.9 %
Other	79.3 %
Mother Smoking Status**	
Mother Smokes	76.3 %
Mother Does Not Smoke	85.0 %
Father Smoking Status**	
Father Smokes	78.6 %
Father Does Not Smoke	84.5 %

Best Friend Smoking Status	
Best Friend Smokes	75.8 %
Best Friend Does Not Smoke	82.7 %
Sibling Smoking Status*	
Brother/Sister Smokes	76.1 %
Brother/Sister Does Not Smoke	83.1 %

*Differences are significant at $p<.05$.

**Differences are significant at $p<.01$.

Table 10

Comparison of Participants Who Remained "Non-Triers" in 7th Grade To Those Who Tried Smoking in 7th Grade (N=1274)

Variable	Percent Tried Smoking	Percent Remained Non-Smokers
Gender		
Boys	30.2	69.8
Girls	27.0	73.0
Ethnicity*		
White	25.3	74.7
AA	34.1	65.9
Other	27.4	72.6
State*		
NY	21.2	78.8
VA	30.0	70.0
Tobacco County Status		
Tobacco County	37.2	62.8
Non-Tobacco County	22.9	77.1

Best Friend Smokes in 6th Grade*		
Yes	41.8	58.2
No	27.9	72.1
Mother Smokes*		
Yes	37.7	62.3
No	24.8	75.2
Father Smokes*		
Yes	35.3	64.7
No	24.8	75.2
Sister/Brother Smokes*		
Yes	36.8	63.2
No	27.3	72.7

*Differences are significant at $p<.01$

Table 11

Logistic Regression Predicting "Tried Smoking" in the Seventh Grade (N=1152)

Predictor	B	SE	Odds Ratio	95% CI Lower	95% CI Upper	Wald	Partial R	Step df	Step χ^2
Step 1								3	35.59***
Tobacco County	.68	.15	1.97	1.46	2.65	20.13***	.12		
State	-.05	.22	.96	.62	1.47	.04	.00		
Intervention Status	.27	.14	1.30	.99	1.71	3.66	.04		
Step 2								3	5.13
Gender	.13	.19	1.14	.80	1.65	.53	.00		
Ethnicity (AA)	.32	.16	1.38	1.00	1.89	3.95*	.04		
Ethnicity (Other)	.17	.28	1.19	.69	2.04	.38	.00		
Step 3								2	12.18***
Best Friend Smoking	.76	.38	2.14	1.01	4.53	3.95*	.04		
# of Friends Smoking	.05	.07	1.05	.92	1.21	.59	.00		

Step 4								4	27.86***
Mother Smoking	.47	.22	1.60	1.03	2.48	4.42*	.04		
Father Smoking	.16	.21	1.17	.77	1.78	.55	.00		
Sibling Smoking	.15	.20	1.16	.78	1.74	.55	.00		
# In Home Smoking	.14	.09	1.15	.97	1.36	2.43	.02		
Step 5								1	6.50*
Self-Efficacy	.16	.07	1.17	1.03	1.33	5.77*	.05		
Step 6								1	.017
# Friends x Self-Eff	.02	.04	1.02	.95	1.09	.27	.00		
Step 7								2	.43
Mother x Gender	-.18	.31	.83	.45	1.54	.33	.00		
Father x Gender	.17	.30	1.19	.66	2.15	.32	.00		
Step 8								2	6.02*
AA x Best Friend	-.61	.59	.54	.17	1.73	1.07	.00		
Other x Best Friend	-2.88	1.37	.06	.003	.82	4.42*	-.04		

Note: Model χ^2 (18) = 93.71, p<.001; *** = p<.001; * = p<.05; B = unstandardized coefficients, SE = standard error of the unstandardized coefficients; CI = Confidence Interval.

Table 12

Logistic Regression Predicting "Higher Level Smoking" in the Seventh Grade (N=1459)

Predictor	B	SE	Odds Ratio	95% CI Lower	95% CI Upper	Wald	Partial R	Step df	Step χ^2
Step 1								3	7.82
Tobacco County	.30	.20	1.35	.91	1.98	2.25	.02		
State	.31	.34	1.37	.70	2.68	.83	.00		
Intervention Status	-.16	.19	.85	.59	1.23	.73	.00		
Step 2								3	2.12
Gender	-.10	.27	.91	.53	1.55	.13	.00		
Ethnicity (AA)	.13	.23	1.13	.73	1.77	.31	.00		
Ethnicity (Other)	.48	.34	1.62	.84	3.13	2.04	.01		
Step 3								2	25.92***
Best Friend Smoking	.36	.39	1.43	.66	3.08	.82	.00		
# of Friends Smoking	.10	.05	1.11	1.01	1.21	4.78*	.06		

Step 4								4	12.17*
Mother Smoking	.68	.28	1.98	1.14	3.46	5.84*	.07		
Father Smoking	.12	.28	1.13	.66	1.94	.19	.00		
Sibling Smoking	.08	.25	1.08	.67	1.76	.10	.00		
# In Home Smoking	-.04	.09	.96	.80	1.15	.19	.00		
Step 5								1	6.26*
Self-Efficacy	.19	.08	1.21	1.03	1.41	5.42*	.06		
Step 6								1	.00
# Friends x Self-Eff	.001	.02	1.00	.96	1.04	.003	.00		
Step 7								2	2.20
Mother x Gender	-.37	.40	.69	.32	1.50	.89	.00		
Father x Gender	.51	.39	1.67	.77	3.60	1.70	.00		
Step 8								2	1.97
AA x Best Friend	.30	.52	1.35	.49	3.70	.34	.00		
Other x Best Friend	-1.23	1.21	.29	.03	3.13	1.03	.00		

Note: Model χ^2 (18) = 58.46, p<.001; * = p<.05; B = unstandardized coefficients, SE = standard error of the unstandardized coefficients; CI = Confidence Interval.

Table 13

Logistic Regression Predicting Experimental Smokers in the Seventh Grade (N=1394)

Predictor	B	SE	Odds Ratio	95% CI Lower	95% CI Upper	Wald	Partial R	Step df	Step χ^2
Step 1								3	13.32**
Tobacco County	.39	.26	1.48	.89	2.46	2.27	.02		
State	.95	.63	2.57	.75	8.86	2.25	.02		
Intervention Status	-.19	.25	.83	.51	1.35	.56	.00		
Step 2								3	2.35
Gender	-.20	.37	.82	.40	1.68	.30	.00		
Ethnicity (AA)	.26	.29	1.29	.73	2.29	.79	.00		
Ethnicity (Other)	-.35	.63	.71	.20	2.45	.30	.00		
Step 3								2	17.63***
Best Friend Smoking	-.001	.58	1.00	.32	3.13	.00	.00		
# of Friends Smoking	.15	.06	1.16	1.04	1.30	7.32**	.10		

Step 4								4	8.22
Mother Smoking	.95	.36	2.59	1.27	5.28	6.91**	.10		
Father Smoking	-.03	.36	.97	.48	1.94	.01	.00		
Sibling Smoking	-.06	.33	.94	.49	1.80	.04	.00		
# In Home Smoking	-.04	.12	.96	.75	1.21	.13	.00		
Step 5								1	6.43*
Self-Efficacy	.28	.10	1.32	1.08	1.60	7.56**	.10		
Step 6								1	.48
# Friends x Self-Eff	-.02	.03	.98	.94	1.03	.48	.00		
Step 7								2	2.83
Mother x Gender	-.65	.53	.52	.19	1.48	1.49	.00		
Father x Gender	.73	.52	2.07	.74	5.78	1.94	.00		
Step 8								2	1.17
AA x Best Friend	.70	.69	2.02	.52	7.83	1.04	.00		
Other x Best Friend	.80	1.40	2.22	.14	34.80	.32	.00		

Note: Model χ^2 (18) = 52.42, p<.001; ** = p<.01; B = unstandardized coefficients, SE = standard error of the unstandardized coefficients; CI = Confidence Interval.

Table 14

Logistic Regression Predicting Seventh Grade Nonsmokers Intending to Try Smoking in the Next Six Months (N=1394)

Predictor	B	SE	Odds Ratio	95% CI Lower	95% CI Upper	Wald	Partial R	Step df	Step χ^2
Step 1								3	2.44
Tobacco County	-.59	.56	.56	.19	1.66	1.11	.00		
State	.73	.66	2.08	.58	7.52	1.25	.00		
Intervention Status	-.55	.46	.58	.23	1.43	1.43	.00		
Step 2								3	..80
Gender	.06	.35	1.07	.54	2.10	.03	.00		
Ethnicity (AA)	-.16	.41	.85	.38	1.91	.15	.00		
Ethnicity (Other)	.26	.59	1.30	.41	4.10	.20	.00		
Step 3								2	29.42***
Best Friend Smoking	.96	.39	2.61	1.21	5.62	5.98*	.12		
# of Friends Smoking	.04	.06	1.04	.93	1.17	.51	.00		

Step 4								4	1.11
Mother Smoking	-.06	.44	.94	.39	2.24	.02	.00		
Father Smoking	.07	.41	1.07	.48	2.38	.03	.00		
Sibling Smoking	.22	.42	1.25	.55	2.83	.28	.00		
# In Home Smoking	.08	.23	1.08	.69	1.69	.11	.00		
Step 5								1	42.58***
Self-Efficacy	.73	.15	2.08	1.55	2.78	23.70***	.28		
Step 6								1	.45
# Friends x Self-Eff	.02	.03	1.02	.97	1.07	.43	.00		

Note: Model χ^2 (14) = 76.80, p<.001; *** = p<.001; * = p<.05; B = unstandardized coefficients, SE = standard error of the unstandardized coefficients; CI = Confidence Interval.

Appendix A

Peer Smoking Behavior

Does your best friend smoke? ..... YES NO

Would you say most of your friends smoke? ..... YES NO

How many of your friends smoke? _____
(fill in number)

Parent Smoking Behavior

Does your mother or stepmother smoke? ..... YES NO

Does your father or stepfather smoke? ..... YES NO

Sibling Smoking Behavior

Do you have a sister or brother who smokes? ..... YES NO

Smoking in the Home Environment

How many people in your home smoke? _____
(fill in number)

Adolescent Smoking Behavior

Have you ever tried cigarette smoking, even one or two puffs?

Yes
No

During the past month, on how many days did you smoke cigarettes?

I do not smoke
I did not smoke a cigarette during the past 30 days
1 or 2 days
3 to 9 days
10 to 29 days
all 30 days

Self-Efficacy to Refuse Cigarettes

I am sure I can refuse cigarettes if someone offered them to me.	Strongly Disagree [1]	Disagree [2]	Not Sure [3]	Agree [4]	Strongly Disagree [5]

Intention to Smoke

Do you think that you may try smoking within the next 6 months..... YES NO

Do you think that you may try smoking in the next 30 days? ..... YES NO

Demographics

Please check if you are a BOY or a GIRL.

Boy
Girl

Please check the one that best describes YOU.

Asian American or Oriental
African American or Black
Hispanic or Latino
White, Caucasian American or European
American Indian
Other

Vita