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Altering the social learning climate: raising the legal age of tobacco purchase and social learning theory

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ALTERING THE SOCIAL LEARNING CLIMATE:
RAISING THE LEGAL AGE OF TOBACCO PURCHASE
AND SOCIAL LEARNING THEORY

by
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Abstract

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In 2005, New Jersey enacted the Smoke Free Air Act to deter the onset of smoking of high school students by raising the legal age of tobacco purchase from 18 to 19 (Cave, Holl, & Schweber, 2005). This was intended to reduce smoking in this population by restricting virtually all high school students' access to cigarettes; however, this legislation also reduced smoking in ways proposed by the concepts of Ronald Akers' Social Learning Theory (1979). The present study postulated limiting access to cigarettes would reduce all measures of cigarettes use, resulting in fewer smoking associates to model smoking behavior, fewer favorable definitions of cigarettes, and less reinforcement of the behavior. Using the data from the New Jersey Youth Tobacco Survey for the years 2004 and 2008, this study found that a statistically significant difference exists before and after this legislation in terms of *Prevalence*, *Frequency*, and *Intensity* of adolescent cigarette use. These differences also showed support for Social Learning Theory in this context and the theory's ability to predict cigarette use in this population.

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Chapter 1

Introduction

Nicotine addiction through cigarette smoking is the most common form of drug addiction in the United States (Elders, Perry, Erikson, & Giovini, 1994). Decreasing the prevalence of smoking among teenagers is an important issue since research shows that cigarette smoking is a behavior that is predominantly initiated during adolescence (Alexander, Marina, Mekos, & Valente, 2001; Lauer, Akers, Massey, & Clarke, 1982; Woodruff, Candelaria, Laborin, Sallis, & Villasenor, 2003). The Surgeon General reports that nearly all first use of tobacco occurs before high school graduation (Elders et al., 1994). Data suggest that between 80% and 90% of adult smokers began smoking by age 18 (Alexander et al., 2001). Thus, measures to prevent this onset of smoking in adolescence could potentially prevent these individuals from ever smoking. It has been estimated that between 33% and 50% of young people who try smoking become regular smokers, a process that takes an average of 2 to 3 years (Elders et al., 1994). Deterring adolescent smoking has become a focus in recent years since first experiments with cigarettes usually occur in the early teenage years and are driven primarily by psychosocial motives.

It is now understood that social and personal influences play an important role in determining who will begin smoking before the drug effects can maintain the behavior. In the words of Phillip Morris, "as the force from the psychosocial symbolism subsides, the pharmacological effect takes over to sustain the habit" (Jarvis & Britton, 2004: 277). Nicotine has pervasive effects on brain neurochemistry; it actually activates receptors in the brain and induces the release of dopamine. This effect is comparable to that of other

drugs presently misused (such as amphetamines and cocaine) and is considered to be a critical feature of brain addiction mechanisms (Jarvis & Britton, 2004). Adolescent smokers, like adult smokers, can become addicted to nicotine. This addiction consists of nicotine dependence and nicotine withdrawal, manifested through a syndrome of physiological symptoms brought on by cessation or reduction of nicotine (Elders, et al., 1994). Adolescents have reported being unable to quit despite wanting to, and they experience withdrawal symptoms similar to those reported by adult smokers attempting to quit (Elders et al., 1994).

In an attempt to deter the onset of smoking by decreasing the opportunity for teenagers to obtain cigarettes, New Jersey enacted the New Jersey Smoke-Free Air Act in 2005. The Act contains two important provisions regarding tobacco: (1) a public smoking ban and (2) an increase of the minimum age for purchasing tobacco products from 18 to 19 (Cave, Holl, & Schweber, 2005). The New Jersey Governor at the time, Richard Codey, proposed the law and made the state join Alabama, Alaska, and Utah in having a 19-year old minimum age requirement (Cave et al., 2005). Mr. Codey claimed that schools would benefit from the increase in legal purchasing age and vendors would have an easier time identifying those who are underage: "By raising the age limit just one year, it will become illegal for virtually all high school students to buy cigarettes. More importantly, fewer will be able to share them with their classmates" (Cave et al., 2005: 5).

Schools already do not permit students to smoke cigarettes on school premises even if they are of legal age to purchase tobacco products. Schools will presumably benefit from the age increase because it will, ideally, make this ban more effective. Not

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only will smoking on school grounds be against the rules, but restricting access to tobacco (making fewer students legally able to purchase tobacco) will further limit their opportunity to obtain cigarettes both commercially through vendors and, subsequently, socially by providing them to each other. Additionally, this research will examine whether this ban was effective in decreasing the number of students who smoke by reducing the psychosocial motives for smoking in this population.

The theory behind this research is Ronald Akers' Social Learning Theory. If reducing the number of students who can legally purchase cigarettes reduces the prevalence, frequency, and intensity of smoking in this environment, essentially students will be exposed to fewer smoking peers to serve as models for smoking behavior and thus learn fewer definitions favorable to smoking and experience less reinforcement of the behavior. Therefore, this legislation is expected to decrease adolescent smoking not only by reducing the opportunity to obtain cigarettes, but also by altering the social learning climate of the high schools. The present study will measure the effectiveness of this legislation on reducing smoking in the adolescent population by utilizing existing data on adolescent smoking in New Jersey (derived from the New Jersey Youth Tobacco Survey) before and after the enactment of the New Jersey Smoke-Free Air Act.   Then this analysis will examine whether any decrease in smoking behavior was affected by changes in Social Learning variables once controlling for the decrease in access to cigarettes. Thus, *Prevalence*, *Frequency* and *Intensity* of smoking, access to cigarettes, and constructs from social learning theory will be examined.

Chapter 2

Literature Review

Social Learning theory

Since the adoption of smoking during adolescence is considered a key factor in smoking during adulthood, it is clear that preventative measures during this critical time would be beneficial in the campaign to prevent individuals from ever smoking. The social dynamic behind the initiation of smoking is a salient factor in the onset of smoking behavior since the presence of certain psychosocial factors will cause a higher likelihood of smoking long before the addictive properties of cigarettes will maintain this behavior. Ronald Akers identified these psychosocial factors which manipulate individuals into adopting a certain behavior in his Social Learning Theory (SLT). In his Social Learning Theory, Akers identified the specific mechanisms by which associates exert influence on the behavior of others; expressly, they serve as models to imitate, supply definitions or norms, and provide social reinforcement or punishment for a given behavior (Akers, Krohn, Lanza-Kaduce, & Radosevich, 1979). The concepts of this theory specify the processes by which people learn most any behavior; in this case, smoking.

Early studies aimed at directly testing Akers' version of Social Learning Theory start by explaining how this theory was derived from Sutherland's theory. According to learning theorists, all human behaviors, whether they be deviant or conventional, can be learned. Edwin Sutherland's Differential Association Theory suggests that behavior is learned through interaction and communication with associates who present definitions either favorable or unfavorable to the behavior. One criticism of this theory is that it lacks specific details on the mechanisms by which the behavior is learned. Behaviorism

includes the central premise that behavior is shaped through conditioning and reinforcement. Akers' Social Learning Theory incorporates modern behaviorism and components of Sutherland's theory to explain how a behavior is learned and maintained. Social Learning Theory suggests that there is a process by which people learn to behave a certain way and either continue or discontinue behaving in that manner. This process is accomplished by the progression of certain variables, identified by Akers, which occur in a specific order and interact with each other (Akers et al., 1979).

The first occurring variable, derived from Sutherland's theory, is *differential association*. This refers to the interaction and contact with certain people and social environments that exercise direct or indirect influence over the individual (Krohn, Skinner, Massey, & Akers, 1985); although, it has been determined that not all associations influence an individual in the same capacity. The more time spent with the associates both in frequency and duration, the stronger the relationship, and the earlier in life those associations are formed, the more influential they are (Akers et al., 1979; Kobus, 2003). These differential associations have a strong effect on both the initiation and maintenance of any behavior since they provide a source for the remainder of the variables: *imitation* of models, exposure to *definitions,* and *social reinforcement* of behavior (Akers et al., 1979).

Social behavior is acquired through the modeling or imitation of other's behavior; although imitation becomes a less important factor for the continuance of the acquired behaviors. In addition to the adoption of a behavior, imitation is also important in that it provides exposure to definitions. The concept of definitions is derived from Sutherland's Differential Association Theory. These definitions are the norms, attitudes, and beliefs

expressed by one's associates either verbally or through social cues. If definitions define a particular behavior as good or desirable (positive definition) or acceptable (neutral definition), as opposed to unacceptable or undesirable (negative definition), a person is more likely to engage in the conduct. Once adopted, the behavior is strengthened or weakened through reinforcement. This notion stems from the Behaviorism perspective which declares that behavior is shaped through conditioning, specifically by the stimuli or consequences that follow a specific behavior. Reinforcements can be provided socially through associates or non-socially (Akers et al., 1979).

The Original Study of Social Learning Theory

Akers' approach was important because prior studies determined that social influences (like peer groups) play a role in influencing behavior but failed to express why this association is so important; they failed to identify the *method* by which the behavior is adopted from these associates (Akers et al., 1996). Akers and his associates (1979) conducted a study in order to test SLT by examining the ability of the concepts to account for marijuana and alcohol use by adolescents. They hypothesized that adolescent marijuana and alcohol use and abuse are related to each of the variables posited by SLT, both individually and in combination with each other. Analysis was conducted to permit an assessment for the overall effect of all of the independent variables collectively, as well as an examination of the individual effects of the social learning variables. Findings showed that differential association accounted for the largest percent of variance. It was argued that, with the exception of imitation, the other variables can stand independently and explain considerable proportions of variance. Overall, the results confirm strong

support for Social Learning Theory and the theory has since been used to explain the onset and continuation of various behaviors.

Using Social Leaning Theory in Research

Social Learning Theory can be used to explain many behaviors of virtually any populace. The Social Learning concepts can be measured in innumerable ways, depending on the focus of the study and the sample population. Though, because the concepts are so grounded in the social context of the subject, the most feasible way of attaining the data to measure the variables is through a surveying technique utilizing self-report data of the sample. Ideally, the best way to test this theory is through longitudinal studies. By studying the sample over time, it can permit a more sufficient analysis of the process of learning behavior and the sequential ordering of the Social Learning variables. Social Learning variables can be applied alone or in combination with concepts from other competing theories to explain behaviors. Ronald Akers and associates have conducted research applying SLT to a range of behaviors, from minor deviance to involvement in serious criminal activity: adolescent substance use and abuse (Akers et al, 1979), consumption of alcohol (Akers, LaGreca, Cochran, & Sellers, 1989), and sexual coercion and rape (Boeringer, Shehan, & Akers, 1991). Overall, there seems to be empirical support for the theory and the flexibility of its variables in accounting for correlations with numerous behaviors.

Social Learning Theory and Cigarette Smoking

It has been established that smoking begins as a social phenomenon because psychosocial forces are responsible for the initiation of smoking long before the drug effects can maintain the behavior. Many researchers have explicitly used Social Learning Theory to explain cigarette use in the adolescent population (Akers et al., 1996; Krohn et al., 1985; Monroe, 2004; Spear & Akers, 1988). Other research, which has only focused on the study of adolescent smoking without specifically testing Social Leaning Theory, have nevertheless provided support for the concepts derived from the theory (Alexander et al., 2001; Aloise-Young et al., 1994; Bricker et al., 2007; Charlton & Blair, 1989; Ernett et al., 2010; Flay et al., 1998; Kobus, 2003; Leatherdale et al., 2005a; Leatherdale et al., 2005b;Leatherdale & Manske, 2005, Leatherdale et al, 2005c, Leatherdale et al., 2006a, Leatherdale et al., 2006b; Woodruff et al., 2003). The findings from these studies will be discussed with regard to how they provide empirical support for the Social Learning variables. Categorizing the research in this way will demonstrate the relative importance of each variable on adolescent smoking and provide an understanding of how the variables collectively and independently influence smoking in this population.

Differential Association

Differential association has a paramount effect on the initiation and maintenance of a behavior; after all, it is the interaction with certain groups which exposes an individual to behavioral models, definitions of the behavior, and reinforcement for the behavior. While this component of the theory emphasizes social contacts with others, it does not place equal emphasis on all associations. Individuals are most likely to adopt

the behaviors of those whom they have the greatest amount of contact, both in frequency and duration. As well, relationships that are more intimate and develop earlier in the individual's life are considered to be more important in the social learning process than those that are less intense and come later (Akers, Krohn, Lanza-Kaduce, & Radosevich, 1979; Kobus, 2003). Therefore, family and peer associations are considered the most significant (Akers et al., 1979). The direct influence of parents and peers are classified as primary social influences, while the indirect influences of reference groups, such as the media, are considered secondary (Monroe, 2004).

This concept that the primary social influences of parents and peers are the most influential of all associations is supported in the research with regard to adolescent smoking. Research has established that parental and peer influences are significant in determining which adolescents will smoke (Ernett, Foshee, Bauman, Hussong, Faris, Hipp & Cai, 2010). Monroe (2004) concluded that differential association (a variable measuring parents and peers) is the most important element in explaining adolescent cigarette use. Lauer, Akers, Massey, and Clarke (1982) found that abstinence and smoking by adolescents were closely related to the smoking behavior of both their parents and peers. Furthermore, they concluded that the influence of parents and peers are direct through providing models to imitate and indirect through reinforcement for smoking.

While some research has examined the combined effects of parents and peers on smoking behavior, other research has measured the separate effects of these groups and found that peer association is more influential than parents. Monroe (2004) describes a study by Stanton and McGee (1996) which reported that adolescents who smoke are

primarily influenced by peer groups and secondarily by family members. Furthermore, peers influence smoking regardless of the extent to which an individual smokes. Flay et al. (1998) found that the likelihood of being an experimenter or a regular smoker increased when the number of smoking friends increased. Monroe (2004) found that associations with peers who smoked was significantly correlated with both the number of adolescents who ever smoked, as well as the frequency of smoking among adolescents who continued to smoke.

A considerable body of empirical research has found peer influence to be significantly associated with adolescent smoking, and it is considered one of the most powerful predictors of smoking behavior in adolescence (Alexander et al., 2001; Charlton and Blair, 1989; Chassin, Presson, Bensenberg, Corty, Olshasky, and Sherman, 1981; Flay, Hu, and Richardson, 1998; Leatherdale, Cameron, Brown, and McDonald, 2005; Spears and Akers, 1988). In addition to the frequency, duration, intensity, and priority of the relationships having differential influencing power, the influential nature of peer groups also depends on the number of sources and whether the opinions of these sources are common or in conflict. Having multiple friends who encourage or engage in identical behavior will impact an individual to a different degree than having only one friend encouraging a behavior or multiple friends advocating for different, perhaps opposing, behaviors (Kobus, 2003). Lauer et al. (1982) contends that often the parents influence the child in one direction and peers in another, but in instances where there is no conflict and the influence of these two groups are in the same direction (either towards abstinence or smoking) the effect on behavior is dramatically increased.

Associations with peers and others are most often formed around attractions, friendships and circumstances (such as neighborhood proximity and classroom assignment), and not concerning involvement in some form of deviant behavior. Therefore, in most instances, an association precedes the development of deviant patterns (Akers et al., 2006). However, SLT incorporates the possibility of more complex sequential and feedback effects in the social learning process. Feedback effects are incorporated into the concept of differential association. After the onset of deviant activity and the consequences of the behavior are experienced, the associational patterns may themselves be altered so that future interaction with others is based, at least in part, on whether they too participate in the deviant behavior and to what degree. Moreover, the process proposed by the Social Learning Theory allows for both definitions and peer associations to be reciprocally affected by the commission of deviant acts (Akers & Lee, 1996). However, Akers and Lee (1996) found that the reciprocal effects of smoking are clearer between peer association and deviant acts than between definitions and deviant acts.

Differential association is significant in the initiation and continuance of smoking since it provides an individual with a source for the remaining variables of SLT. However, not all associations have the same potential to influence. While the primary social influences of parents and peers have the largest effect on the adoption of a behavior, in the case of smoking, the primary social influence of peers groups is more powerful than that of the parents. The greater a friendship is with regard to frequency, duration, intensity and priority, the greater influential power those peers will have. In addition, having more peers who partake in smoking will increase the likelihood that an

individual will also adopt the behavior. Thus, it is imperative to examine, and possibly

alter, the social peer dynamic of smoking in an attempt to hinder smoking practices in the

adolescent population.

Imitation

Social behavior is acquired through the modeling or imitation of others behavior.

However, after the initial adoption of a behavior, imitation becomes a less important

factor in the continuance of the acquired behavior. Imitation is also significant for the

reason that definitions are learned through imitation. The likelihood of imitation taking

place is increased when the model is admired, when he/she is similar to the observer,

higher in prestige, or considered higher in status and expertise than the observer. The

probability of initiation is also increased when several models engage in the same

behavior (Monroe, 2004). When considering the behavior of smoking, imitation is

paramount since the initial act of smoking is relevant to its continuance: you must first

begin smoking before you become susceptible to the addictive properties of the cigarette

which will support the continuance of smoking.

Research supports the proposal that exposure to peer and parent models of

smoking increases the likelihood that adolescents will try smoking (Biglan, Duncan, Ary,

& Smolkowski, 1995; Ernett et al., 2010; Flay et al, 1998; Lauer et al., 1982). However,

imitation decreases in ability to influence behavior after the initial use of the behavior

although facilitative effects of the model may remain (Krohn et al., 1985). In the original

study by Akers in 1979, imitation accounted for the least proportion of variance for

explaining the use and abuse of marijuana and alcohol. When Akers and associates again

re-examined the explanatory power of Social Learning Theory in 1985 on cigarette use, once again imitation accounted for the least percentage of variance. It was posited that while smoking is considered deviant, it is nevertheless a minor form of misconduct; therefore, experimentation with cigarettes may not require a specific model to imitate since examples of this behavior are readily available in the general social environment (Krohn, et al., 1985). Spear and Akers (1988) found that each of the social learning variables had a significant effect on adolescent smoking in the expected direction with the exception of imitation.

However, examples of the influential capacity of models on adolescent smoking have been illustrated in current research. Monroe (2004) found that the availability of role models in the household who smoked was one of the statistically significant variables in explaining the variation in the frequency of adolescents who ever smoked cigarettes and the variation in the frequency of adolescents who continued to smoke cigarettes. Ernett et al. (2010) used concepts from Social Learning Theory and Social Control Theory to examine the contributions of family, peer, school, and neighborhood contexts to adolescent cigarette use. They found that in the school and neighborhood contexts, only modeling of smoking significantly predicted increased adolescent smoking. Another study that specifically examined the concept of modeling within the context of adolescent smoking was conducted by Kniskern, Biglan, Lichtenstein, Ary, and Bavry in 1983. This study examined how young smokers were influenced to adapt their smoking behavior to conform to that of another teenage smoker. They used adolescent smokers as confederate models of smoking behavior. This study revealed that when smoking teenagers were exposed to the confederate smoker, they altered their smoking behavior in ways that

conformed with the behavior of the model, including the number of cigarettes smoked and puff frequency.

Although imitation is prominent in the initial adoption of a behavior it becomes less important in accounting for the continuance of behavior. It is evident that certain qualities of the model provide a higher likelihood that imitation will occur. When the model is admired, higher in prestige, or regarded as higher in status than the observer, there is a higher probability that the behavior of the model will be duplicated; this effect is enhanced when several models engage in the behavior. In the case of adolescent smoking, we find that peer associations are the most important in accounting for the adoption of the behavior (Monroe, 2004). That being said, senior students in the high school environment are ideal models since they are most commonly regarded as higher in status, prestige, and generally looked up to by the younger students. Therefore, according to SLT, the behaviors of these senior students will most likely have a significant influence on the remainder of the student population. Thus, reducing smoking in this group (through the New Jersey Clean Air Act) will likely cause fewer junior students to engage in smoking by essentially depriving them of respected models to imitate.

Definitions

Through the social learning process, definitions, which are provided by associates, can influence the decision of whether or not a person will engage or continue to engage in a certain behavior. These attitudes or beliefs can be expressed verbally or act as more of a social cue. The more individuals define a particular behavior as good, or

even justified or excusable, the more likely the individual is to adopt and continue the behavior. Following the same logic, expressing negative beliefs or attitudes opposing a behavior will deter an individual from engaging in that behavior (Akers et al., 1979). In the Akers et al. (1979) study, definitions accounted for the second highest percent of variance in the abstinence and frequency of marijuana and alcohol use.

Within the theoretical framework for Social Learning Theory, an adolescent's definitions towards smoking could be altered by their individual peers and by the larger social environment. If a school has a high smoking prevalence which reflects that smoking is a social norm, popularity or social prestige will perhaps be closely aligned with cigarette smoking making this behavior more desirable (Alexander et al., 2001). There is evidence to suggest that when definitions of smoking are favorable, by peer and parent approval or when perceptions of smoking are high, youth are more likely to smoke (Chassin et al, 1984; Kobus, 2003; Monroe, 2004). For instance, if many seniors at a school engage in smoking, it is conceivable that the junior students at the school will adopt more favorable definitions of smoking. Individual peers or desired individuals who smoke can make smoking appear "cool", socially attractive, and normative, resulting in positive perceptions of smoking (Leatherdale & Manske, 2005). Definitions have shown to be influential in the degree to which an adolescent smokes. Spear and Akers (1988) reported that habitual smoking is significantly associated with the adolescent's own positive attitudes toward smoking.

Research has suggested that definitions do not affect everyone in the same manner or to the same degree. Studies have determined that definitions of smoking differentially impact adolescents based on their gender. Charlton and Blair (1989) conducted a study

to identify factors which influence girls and boys to initially try smoking. They found that holding positive beliefs about smoking were very important and statistically significant for girls, but were expressed by very few boys. Findings from Flay et al. (1998) show that friends' approval of smoking significantly predicted experimental and regular use only among female and not among male teenagers.

Definitions are learned through associates and impact whether or not an individual will maintain the behavior. Definitions can be verbally expressed by associates which are then internalized by the individual or an individual may internalize a definition based on their own perception of their environment. In the case of cigarette smoking among high school students, if an individual sees many other students smoking, especially students who are particularly desirable (like the seniors), they may perceive smoking in a positive way because they are correlating smoking with an attractive image or viewing it as the social norm. These positive views of smoking will increase the probability that adolescents will continue to smoke.

Differential Reinforcement

Whether or not a behavior will be sustained depends a great deal on the reinforcement, or rather, the past, present and anticipated future rewards and punishments of that behavior (Akers et al., 1979). Whether behavior (either deviant or compliant) is acquired and sustained depends on past and present rewards or punishments for the behavior as well as the rewards and punishments for the alternative behavior. Behavior is strengthened socially through rewards (positive reinforcement) or evasion of punishment (negative reinforcement); behavior is weakened socially through the introduction of

undesirable or negatively-valued stimuli (positive punishment) or the loss of desired or valued stimuli (negative punishment). Behavior can also be reinforced non-socially by, for instance, the physiological effects of drugs (Krohn et al., 1985). Akers et al (1979) looked at abuse as well as use of marijuana and alcohol, and found that with regard to the abusive patterns for marijuana and alcohol, the second highest explanatory power (after differential association) comes from the differential reinforcement variables.

In a study by Lauer, Akers, Massey and Clarke (1982) where smoking behaviors and related factors were studied in adolescents, it was concluded that smoking was related to the anticipated or actual sanctions of parents and friends. Expressly, 55% of those who received or expected a permissive reaction from parents were occasional or regular smokers and 68% of those who anticipated a discouraging parental reaction were nonsmokers. Of those whose friends were perceived as permissive, 53% were occasional or regular smokers, while 77% anticipating discouraging reactions from peers had never smoked. This study showed that the influence of parents and peers is not only indirect by providing smoking or nonsmoking models, but also direct through the perceived rewarding or punishing reactions to smoking. Furthermore, transition to increased levels of smoking by adolescents has been linked to peer encouragement and approval. Flay et al. (1998) found that friends' smoking and approval were among the most important predictors of the transition from trial (smoking one cigarette) to experimental use (smoking more than one cigarette but not in the week preceding the survey) of cigarettes.

Differential reinforcement was found to be one of the most important ways associates influence behavior. Krohn et al. (1985) conducted a longitudinal study to test Social Learning Theory and adolescent cigarette use. Specifically they wanted to

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designate the causal models of the theory for the initiation and maintenance of adolescent cigarette smoking. The most significant finding of this study is that differential reinforcement actually mediated the effect of differential association. This is an important finding since differential association has been continuously supported throughout the research as the predominant factor, having the most influence on smoking behavior in adolescents.

Differential reinforcement in terms of the perception of positive consequences and lack of negative consequences were identified as being significantly associated with being a current smoker (smoking in the past month) by Monroe (2004) and habitual smoking (smoking daily) by Spear and Akers (1988). Positive social reinforcement has been shown to impact adolescent smoking; friendship rewards like group membership (Aloise-Young, Graham, and Hansen, 1994; Leatherdale & Manske, 2005), a "cool" image (Leatherdale et al., 2005), and social status and popularity (Kobus, 2003) have been identified as reasons why adolescents smoke. All can be considered reinforcements of the behavior.

Reinforcement for smoking is an essential aspect in the continuance of the behavior given that it is one of the most important ways in which associates influence behavior (Krohn et al., 1985). The non-social rewards of smoking occur later in the smoking progression when addiction is experienced and the pharmacological properties support the prolongation of smoking. Until these addictive agents begin to underpin the behavior, the social reinforcements are an important rationale for the continuance of smoking, and may continue to provide reinforcements even after addiction has been established. Relative to adolescent smoking, it is important to consider the social

reinforcements given to this population that provide reasons to continue the behavior before the addictive properties come into play. Social reinforcements are paramount since this age group is specifically prone to succumb to peer pressure. Unlike the direct peer pressure to smoke, adolescents report an internal pressure to smoke if they are surrounded by others who do. Therefore, even if the adolescent is not offered a cigarette by a peer or taunted for not smoking, they experience pressure to smoke by simply being around others who are smoking. This frame of mind is centered on the avoidance of potential exclusion by peers, to gain social approval, and to facilitate social interactions (Aloise-Young et al., 1994; Kobus, 2003; Leatherdale & Manske, 2005; Leatherdale et al., 2005b). Additionally, social reinforcements can be aligned with social status and popularity (Kobus, 2003) and a positive social image (Leatherdale & Manske, 2005; Leatherdale et al., 2005b) which are particularly important in the high school population and most certainly provide reinforcement for the continuance of smoking.

School Environment

Research has also determined that the school environment, with relation to school-level social modeling, is related to youth smoking. Schools are a relevant example of a social system which provides young people with ties to numerous individuals, and the risk of adolescent smoking is significantly associated with an increased level of school smoking (Alexander et al, 2001; Bricker, Anderson, Rajan, Sarason, & Peterson, 2007; Leatherdale et al., 2005a-c; Leatherdale & Manske, 2005). Though these studies are not explicitly testing Social Learning Theory, the variables they studied are similar to SLT variables. Leatherdale & Manske (2005) found that students

are at an increased risk for smoking if they often see students smoking near their school,

if they reported students smoking where they were not allowed, and if there is a relatively

high smoking rate among seniors. Leatherdale et al. (2005a) reported that non-smoking

students, even with friends who disapprove of smoking, were more likely to become

susceptible to smoking if they attend a school with students smoking on the periphery.

This illustrates the importance of the school environment on adolescent smoking since

this contextual factor influences smoking even without direct peer association with

smokers (which has been continually identified as the most salient factor in determining

which adolescent will smoke). Based on this research, it can be reasoned that by

decreasing the availability of cigarettes, fewer students will be able to smoke on school

property, thereby reducing the prevalence of smoking in the student population.

In accordance with Social Learning Theory, research has shown that higher status

individuals can be more influential than same status or lower-status individuals;

therefore, younger adolescents are more motivated to model the behaviors of older

schoolmates who are higher in the social hierarchy of the school (Bricker et al., 2007).

Consistent with this ideology, research has been conducted to test the influence of

smoking older schoolmates on the younger students. It has been concluded that the

smoking prevalence of older students at a school is directly related to the smoking onset

of younger students at that school (Leatherdale & Manske, 2005; Leatherdale et al.,

2005b-c). Leatherdale et al. (2005b) reported that each 1% increase in smoking rate

among high school seniors increased the odds that a junior student was an experimental

versus a tried-once smoker. Additionally, Alexander et al. (2001) reported that as the

prevalence of smoking among older students increase, the social reinforcement for

smoking increases. As the commonness of older student smoking increases, it is likely that smoking will seem more normative and acceptable, popularity or social prestige of being a smoker will increase, the chances of developing friendships with smokers will increase, and the social availability of cigarettes to experiment with will increase (Leatherdale & Manske, 2005; Leatherdale et al., 2005b); all making an adolescent more apt to try smoking. Therefore, beyond the provision of smoking models to imitate, senior smoking can also impact differential associations with more smokers, definitions favorable to smoking, and reinforcements for smoking. It could be deduced from this research that reducing the prevalence of senior smoking in high schools will subsequently reduce smoking in the school population.

It has been established that having family and friends who engage in smoking is the largest risk factor for experimenting with smoking in adolescence. The prevalence of smoking among senior students has been shown to moderate the effect of having close friends who smoke (Leatherdale & Manske, 2005). They found that a "low-risk student" (no family or friends who smoked) was over twice as likely to try smoking if he/she attended a school with a high senior smoking rate. Though, Leatherdale, Manske, and Kroeker (2005) determined that the prevalence of older student smoking at school is more influential among younger female students, whereas the smoking behavior of close friends appears to influence boys more. One may assume that non-smoking older schoolmates function as non-smoking models and help buffer the experimentation with smoking. However, Bricker et al. (2007) found that the influence of one smoking older schoolmate is stronger than the influence of one non-smoking older schoolmate. This

shows that older smoking schoolmates have more of an influential power in the onset of smoking than their non-smoking counterparts on not smoking.

These findings regarding the influence of the school environment on adolescent smoking, particularly those which identify the powerful influence of senior smoking, are of particular importance to the current study since this study posits that by reducing the availability of cigarettes in this senior population the prevalence of smoking by seniors will decrease and will directly and indirectly reduce the prevalence of smoking in the high school population.

Sources for Cigarettes

Despite legislation across the United States banning the provision of tobacco to minors, tobacco is easily accessible to young people. Wolfson, Forster, Claxton, & Murray (1997) reported adolescents consistently responded in surveys that they have little difficulty obtaining tobacco products and youths consistently cite commercial sources as important sources for tobacco products. Recent studies show that adolescents increasingly rely on non-commercial sources, including friends and other underage youths and adults who (knowingly or not) provide cigarettes or purchase cigarettes for them (Ribsil, 2003). A Minnesota survey of over 6,000 students ages 13-16 revealed that 74% of the ever-smokers obtained their most recent cigarette from a social source (Forster, Chen, Blaine, Perry, & Tommey, 2003). It has been determined that most sources are other teenagers rather than other adults, and parents are the least likely to be a source of cigarettes (Forster, 2003). Not only do social sources provide a medium for adolescents to obtain cigarettes, but these non-commercial sources also increase initial

use. Woodruff and associates (2003) examined the association between cigarette availability and first time use and found that offers from friends and classmates were the only significant cross-sectional predictor of trial smoking.

Although data have suggested that, in general, adolescents use their social network far more frequently than commercial sources to attain cigarettes, adolescents who are regular smokers more consistently report purchasing packs of cigarettes versus receiving single cigarettes from peer-to-peer social sources (Ribsil, 2003). Forster et al. (2003) discovered a connection between commercial access and social access to cigarettes: use of commercial sources is the strongest predictor of participation in social exchange. Youth who reported purchasing their most recent cigarette were the most likely to provide cigarettes to other teens. Thus social sources extend the reach of commercial sources. Results from this study illustrate that social sources are dependent on commercial sources; therefore, reducing the commercial access to cigarettes will reduce social sources as well. Following this logic, interventions that effectively decrease the commercial accessibility of cigarettes will suppress social sources and possibly reduce the incidence and prevalence of adolescent smoking by simply denying the means to obtain cigarettes to smoke.

The New Jersey Smoke-Free Air Act will essentially reduce adolescent smoking by limiting access to cigarettes in the high school population by raising the legal age from 18 to 19. By doing this, in accordance with Social Learning Theory, the social learning climate will also be altered: students will be exposed to fewer smoking peers who act as models for smoking behavior, learn fewer definitions favorable to smoking and experience less reinforcement for the behavior. Furthermore, based on the research

pertaining to the school environment and senior smoking, it can be deduced that limiting access to cigarettes and reducing the smoking in the senior population will have a trickle-down effect that will reduce smoking in the entire student population. Fewer senior smokers will not only provide fewer desirable smoking models but may also decrease positive perceptions of smoking, supply less reinforcement for smoking and thereby limit the number of smoking associates in addition to reducing the social availability of cigarettes. To date, no research has been conducted to determine the effectiveness of this legislation on decreasing smoking prevalence or incidence in the adolescent population. The present study will draw on concepts derived from SLT and utilize existing data on adolescent smoking practices in New Jersey before and after the New Jersey Smoke-Free Air Act was enacted to examine the effectiveness of this legislation on reducing smoking in the high school population.

Chapter 3

Methodology

The New Jersey Smoke Free Air Act (2006) included S2783 which amended New Jersey's statute annotated 2A:170-51.4 and raised the age for purchasing tobacco from 18 to 19. After this statute was put into effect on April 15, 2006, virtually all high school students were denied legal commercial access to cigarettes. Based on prior research, limiting access to cigarettes and reducing the smoking in the senior population should reduce smoking in the entire student population. Since it is established that there is an association between adolescents who purchase cigarettes and providing cigarettes to their fellow students, plausibly, by limiting opportunities to gain cigarettes through commercial sources, social access to cigarettes in the adolescent population will also be reduced. Limiting the availability of cigarettes both commercially and socially may not be the only mechanism which will reduce smoking in adolescence after the legislation. In accordance with Social Learning Theory (SLT), smoking behavior also should be reduced because students will be exposed to fewer smoking peers who serve as role models, promote definitions favorable to smoking, and positively reinforce smoking behavior.

The present study drew on concepts derived from SLT and utilized existing data on adolescent smoking practices in New Jersey by conducting secondary data analysis. The analysis of these data allowed the determination of whether this legislation reduced smoking in high schools. Furthermore, it ascertained if the reduction was achieved in the ways proposed by Social Learning Theory. So essentially, there were two objectives in this study. The first was to ultimately conclude if smoking was reduced in high schools

after the enactment of the legislation. The second was to deduce *why* cigarette use decreased. Was it simply the denial of access to cigarettes? Or was the decrease in accordance with Social Learning theory? Therefore, the second objective was to examine whether the social learning climate of the school was altered (affecting the social learning variables) and to determine the explanatory power of the social learning variables on cigarette use.

In order to satisfy both objectives, the present study was conducted in two phases. The first phase addressed the first objective by determining if there was actually a reduction in adolescent smoking, and began to address the question of why by examining whether there were significant changes in access and in the social learning variables after the Act took effect. This was accomplished by comparing cigarette use and the explanatory variables before and after the legislation. Therefore, the independent variable in this phase was the year (2004 and 2008) and the dependent variables were the *Prevalence*, *Frequency* and *Intensity* of cigarette use, access to cigarettes and the social learning variables.

The second phase of the study further explored why changes in cigarette use took place after the legislation by examining the relative impact of access to cigarettes and the social learning variables. This phase determined how access to cigarettes and the social learning variables contributed to smoking behavior by examining access and the social learning variables of differential association, imitation, definitions, and reinforcement together in Multiple Regression analysis. Analysis of these variables determined whether or not smoking behavior was affected in accordance with Social Learning Theory, how these variables relate to smoking behavior, and the strength of the relationships. Here the

dependent variables were *Prevalence*, *Frequency*, and *Intensity* of smoking and the

independent variables were the "explanatory variables" (social learning variables and

access to cigarettes).

In sum, the present study examined the *Prevalence*, *Frequency*, and *Intensity* of

smoking, access to cigarettes, and the SLT variables before and after the legislation. This

study will tell us if after the legislation the social learning variables were decreased,

access to cigarettes was decreased, and if smoking was reduced as predicted. Chi-square

analysis was conducted on the variables identified to conclude if a statistically significant

difference exists for all of the variables before and after the legislation. Logistic

regressions using the 2008 data was also conducted in order to observe the relative

impact of the access and social learning variables.

Population and Sample

The sample for this study consists of New Jersey high school students. New

Jersey is a northeastern state and, according to the U.S. Census Bureau, was composed of

7,417.34 square miles and a population of 8,685,920 in 2007. The proportion of men and

women in New Jersey in 2007 almost exactly represents that of the United States; New

Jersey having 49.0% males and 51.0% females and the U.S. with 49.1% males and 50.9%

females. The racial breakdowns of New Jersey in 2007 compared to U.S. are as follows:

69.5% and 75.1% White; 13.7% and 12.3% Black or African Americans; 2.8% and 0.9%

American Indian/Alaskan Native; 7.5% and 3.6% Asian; 0.0% and 0.1% Native

Hawaiian/Pacific Islander; and15.9% and 12.5% Hispanic/Latino, respectively. In 2007,

23.7% of New Jersey residents were below 18 years of age compared to 25.7%

nationally. The median household income of New Jersey in 2007 was higher than that of

the United State, $67,035 compared to $41,994 and there were also fewer families living

below the poverty level in New Jersey in 2007 compared to the U.S., 6.3% and 9.2%,

respectively (2007 American Community Survey, U.S. Census Bureau).

Data for this study were originally collected by the New Jersey Department of

Health and Senior Services (NJDHSS) in the New Jersey Youth Tobacco Survey

(NJYTS). This survey was conducted in 1999, 2001, 2004, 2006, and 2008. The NJYTS

was developed in order to provide a comprehensive source of information regarding

smoking in adolescence; specifically designed to identify trends in the attitudes,

knowledge, and conduct of middle and high school students in New Jersey with regards

to tobacco. The NJYTS instrument was constructed based on existing instruments: Center

for Disease Control Youth Tobacco Survey, National Youth Tobacco Survey, and the

California Independent Evaluation High School Tobacco Survey. The survey instrument

addresses eight content areas: tobacco prevalence, access to tobacco products, smoking

cessation, smoking intention, perceived consequences of tobacco use, mass media,

awareness of tobacco industry strategies, and environmental tobacco smoke (Delnevo,

Hywna, Chee, & Momperousse, 2005).

For the purposes of this study, only data collected from the 2004 and 2008 sample

will be analyzed. Since the legislation was passed and went into effect in 2006, this will

allow the assessment of the smoking practices before and after the legislation was

enacted. Utilizing the 2006 data would be an inadequate measure of the legislation's

impact since it will not allow sufficient time for the legislation to take effect. Therefore,

the 2008 data will be used to determine whether the legislation was responsible for any observed changes.

The 2004 and 2008 samples for the NJYTS were collected using a two-stage cluster design in order to obtain a representative sample in assessing state wide trends (Delnevo, C., Hrywna, M., Chee, J., & Momperousse, D., 2005; Jordan, H., Delnevo, C., Gundersen, D., Hrywna, M., 2009). In 2004, the first stage sampling frame was created from all public, private, charter, and vocational middle and high schools in New Jersey; however, the 2008 sampling frame was created using only public middle and high schools and then stratified by percent minority enrollment. In both years, the schools were selected so that the mix of schools of different sizes in the sample would reflect the statewide proportions of schools of different sizes. In 2004, this resulted in a total of 40 high schools and 40 middle schools and, in 2008, a total of 71 high schools and 71 middle schools (Delnevo et al., 2005; Jordan et al., 2009). The differences in the composition of the 2004 and 2008 samples (the latter not including private, charter, and vocational schools) will represent a limitation in the present study since it was not possible based on the dataset to limit the analysis to only public schools in the 2004 sample in an attempt to address this inadequacy.

In 2004, the survey was administered to 2,187 middle school students (grades 7-8) and 2,390 high school students (grades 9-12) (Delnevo et al., 2005). In 2008, the survey was administered to 3,051 middle school students (grades 7-8) and 3,010 high school students (grades 9-12) (Jordan et al., 2009). By multiplying the school participation rate by the student participation rate the overall participation rates were attained. The data were weighted to adjust for non-response and the results were representative of New

Jersey's 7th-12th grade student population. In 2004, the overall participation rate of 84% and 85% were achieved in the middle and high schools, respectively; in 2008, the rate was 81% for both middle and high schools.

Since this study is concerned with only the cigarette use by adolescents, the analysis will exclude members of the sample from the middle school population. This exclusion is justified since the New Jersey Smoke Free Air Act eliminated virtually all high school students who could legally purchase cigarettes by raising the legal age of tobacco purchase from 18 to 19 (with this exact consequence in mind), whereas middle school students, who were never of age to purchase cigarettes, were unaffected by this change. Research has also shown that smoking cigarettes is more of a problem in high schools than in middle schools. The Center for Disease Control and Prevention reported that in 2012, only 6.7% of middle school students, currently used tobacco products, including cigarettes; as opposed to 23.3% of high school students (Center for Disease Control, 2010). Additionally, the present study is unable to differentiate from middle schools which are attached to high schools and those which are separate buildings or separate locations. It would be unfair to compare middle schools without taking this into account for two reasons: (1) those which are attached to high schools would have students more influenced by the high school students according to Social Learning Theory and (2) the legislation would differentially affect the middle school because of this close proximity to the high school students and their exposure to more smoking models. Therefore, this study will examine data from a representative sample of high school students in New Jersey, as collected by the NJYTS, before and after the legislation was enacted.

Hypotheses

The first set of hypotheses was generated from the general idea that the New Jersey Smoke Free Air Act will have an effect on the smoking behaviors of New Jersey high school students. Specifically, in accordance with the rationale for the law, high school students were smoking cigarettes at a decreased rate after the enactment of the New Jersey Smoke Free Air Act compared to students enrolled in high school before the passing of this legislation. Because there is already a nation-wide decrease in cigarette use in adolescents from 2004 to 2008 (Johnston, O'Malley, Bachman & Schulenberg, 2009), the present study predicts that the decrease in *Prevalence* of smoking in this population after this legislation went into effect will exceed the decrease in national trends. This study posits that the decrease will be evident in the number of students who used cigarettes, and in the *Frequency* and the *Intensity* of smoking.

H1: *After the New Jersey Smoke Free Air Act went into effect there will be a decrease in the number of high school students who smoke (Prevalence).*

H2 (a): *After the New Jersey Smoke Free Air Act went into effect there will be a decrease in how many days high school students smoke (frequency).*

H2 (b): *After the New Jersey Smoke Free Air Act went into effect there will be a decrease in the number of cigarettes high school students smoke per day (*Intensity*).*

In order to accurately assess if the New Jersey policy was effective in reducing adolescent smoking, consideration of the compliance and enforcement of the legislation is imperative. The absence of an association between the legislation's enactment and adolescent smoking rates could be due to the effects of non-compliance and lenient

enforcement practices. In other words, if the legislation is shown to make no substantial

impact on adolescent smoking rates, it could be due to commercial vendors' non-

compliance with the laws by continuing to provide cigarettes to persons less than 19

years of age, and not proof that the law is ineffective in reducing adolescent smoking.

The next hypothesis was created to address this issue and proposes that the legislation

was effective in reducing commercial access of cigarettes in accordance with state law.

H3: *After the New Jersey Smoke Free Air Act went into effect there will be a*

decrease in ability to obtain cigarettes from commercial sources.

The present study posits that any reduction in adolescent cigarette use in high

schools would result not only by denying commercial access to virtually all high school

students through the New Jersey Smoke Free Air Act, but also that this reduction was

indirect in accordance with the concepts of Social Learning Theory. By reducing the

availability of cigarettes, the social learning climate of the high schools in New Jersey

was altered in ways conducive to non-smoking behavior: fewer smoking associates,

fewer desirable smoking models to imitate, a decrease in positive perceptions of smoking,

and a decrease in reinforcement for cigarette use.

H4 (a): *After the New Jersey Smoke Free Air Act went into effect, students will*

report having fewer close friends who smoke.

H4 (b): *After the New Jersey Smoke Free Air Act went into effect there will be a*

decrease in the percentage of students who report having positive perceptions of

smoking.

H4 (c): *After the New Jersey Smoke Free Air Act went into effect there will be a decrease in the percentage of students who report being positively reinforced for smoking.*

Finally, it is hypothesized that the prevalence and incidence of smoking was related to social learning variables as well as to availability of cigarettes. Phase II will test the following hypotheses:

H5 (a): *The number of friends who smoke, the positive perceptions of smoking, and the positive reinforcements for smoking will be negatively related to the prevalence of smoking, after controlling for availability of cigarettes, gender, smoking in household, and age.*

H5 (b) *The number of friends who smoke, the positive perceptions of smoking, and the positive reinforcements for smoking will be negatively related to the Frequency of smoking, after controlling for availability of cigarettes, gender, smoking in household, and age.*

H5 (c) *The number of friends who smoke, the positive perceptions of smoking, and the positive reinforcements for smoking will be negatively related to the Intensity of smoking, after controlling for availability of cigarettes, gender, smoking in the household, and age.*

Explanatory, Dependent and Control Variables

The present study examined if the Smoke Free Air Act reduced smoking in New Jersey high school students. It was predicted that this legislation would reduce smoking in this population by restricting access to cigarettes among all high school students. However, this study suggests that this restriction also would alter the social learning climate since fewer students would be smoking and encouraging others to smoke and therefore reduce smoking in accordance with social learning theory. Examining the data before and after the legislation determined if this legislation worked as intended, and whether it was in accordance with SLT.

The two phases of analysis presented in this study determined *if* adolescent smoking was reduced after the legislation and *why* smoking was reduced. Phase one compared smoking behavior, access, and social learning variables before and after the legislation to see if they decreased after the Smoke Free Air Act. Chi-square analysis was conducted on the variables identified to conclude if a statistically significant difference existed for all of the variables before and after the legislation. Phase II involved conducting a Multiple and Logistic Regressions on the 2008 data to determine the impact of reduced access to cigarettes and the social learning variables.

Independent Variable

Year: The independent variable for most of this study is whether or not the data under examination was collected before or after the enactment of the New Jersey Smoke Free Air Act. This variable was determined by the year in which the data were collected. The data derived from the 2004 NJYTS was coded as *Before* (0) while the data derived

from the 2008 NJYTS was coded as *After* (1). This variable is imperative since this study

is comparing the trends in adolescent smoking, commercial access to cigarettes, and

concepts of social learning theory with regards to adolescent smoking, before and after

the legislation.

Dependent Variables

     Smoking Status: The dependent variable for the first and last set of hypotheses

were the self-reported responses of the students to questions regarding their current use of

cigarettes. Adolescents were defined as those students who were enrolled in high school

at the time of data collection (grades 9-12). Smoking status was broken down into three

categories: *Prevalence, Frequency,* and *Intensity*.

     Prevalence: This variable was a measure of whether a student engages in

smoking. It was a dichotomous level variable; students were classified as smokers or non-

smokers based on their response to *"how many cigarettes have you smoked in your entire*

life?" Although the same question appears in both the 2004 and 2008 survey, the

possible responses for each year were different. The possible responses in the 2004

survey were (a) none; (b) 1 or more puffs but never a whole cigarette; (c) 1 to 19

cigarettes (less than 1 pack); (d) 20-99 cigarettes (1 pack, but less than 5 packs); and (e)

100 or more cigarettes (5 or more packs); while in the 2008 survey the possible responses

were (a) none; (b) 1 or more puffs but not a whole cigarette; (c) 1 cigarette; (d) 2 to 5

cigarettes; (e) 6 to 15 cigarettes; (f) 16 to 25 cigarettes; (g) 26 to 99 cigarettes; (h) 100 or

more cigarettes. For the sake of this study the response categories were collapsed and the

dependent variable was transformed into a dichotomous level variable (smoker/non-

smoker) through the recoding of the responses; (a) and (b) will be combined into the *non-smoker* category. This researcher maintains that having never smoked a whole cigarette cannot qualify someone to be classified as a smoker. The remaining responses (c), (d), and (e) in 2004 and (c), (d), (e), (f), (g), and (h) in 2008 were combined into the *smoker* category. Although it can be argued that smoking 1 cigarette or even less than a pack ever does not qualify someone as a smoker, the way the data were collected, in order to maintain congruent categories between the years for my dichotomous variable, collapsing the responses in this way was the most credible measure of smoking since the responses were not equivalent and did not allow for interval level response coding. The recoding performed allowed a sufficient measure of the percentage (*Prevalence)* of smoking students before and after the legislation.   In an alternative analysis, *Prevalence* was measured differently. In this analysis, the *Prevalence* variable was broken down into four categories based on how many cigarettes were smoked in the student's lifetime. However, this was not the main analysis of the present study since the categories are not equivalent between 2004 and 2008. The purpose of this alternative measure was to address levels of smoking. The results remained statistically significant; the results of this analysis can be found in Appendix A.

Table 3.1
Prevalence of Smoking
Descriptive Statistics

	2004		2008	
	Frequency	**Valid Percent**	**Frequency**	**Valid Percent**
Non-smoker	1643	70.1	2298	76.1
Smoker	700	29.9	723	23.9
Total	2343		3021	

Frequency: This variable was a measure of the extent of adolescent smoking. This study seeks to explore beyond the smoker/non-smoker dichotomy and further examine whether or not the smoking patterns and habits of the students were affected by the legislation. This variable was concerned with the extent of cigarette smoking in terms of how many days the student smokes by their response to the question: *"During the past 30 days, on how many days did you smoke cigarettes?"* Possible responses were (a) 0 days; (b) 1 or 2 days; (c) 3 to 5 days; (d) 6 to 9 days; (e) 10 to 19 days; (f) 20 to 29 days; (g) All 30 days.

Table 3.2
Frequency of Smoking
Descriptive Statistics

	2004		2008	
	Frequency	**Valid Percent**	**Frequency**	**Valid Percent**
0 days	1868	81.6	2561	86.1
1 or 2 days	116	5.1	120	4.0
3 to 5 days	49	2.1	54	1.8
6 to 9 days	40	1.7	36	1.2
10 to 19 days	49	2.1	46	1.5
20 to 29 days	48	2.1	49	1.6
All 30 days	119	5.2	107	3.6
Total	2289		2973	

Intensity: This variable was another measure of the extent of smoking behavior. *Intensity* is a measure of how often the student smokes each day by their response to the question: "*During the past 30 days, on the days you smoked, how many cigarettes did you smoke each day?*" Subjects could respond: (a) I did not smoke cigarettes during the past 30 days; (b) Less than 1 cigarette per day; (c) 1 cigarette per day; (d) 2 to 5 cigarettes per

day; (e) 6 to 10 cigarettes per day; (f) 11 to 20 cigarettes per day; (g) More than 20

cigarettes per day. By further exploring the smoking patterns of the students this study

was not just be able to detect changes in the percentage of student smokers from 2004 to

2008, it was also able to explore whether the smoking behavior, specifically how much

more or less the students who smoked were smoking, changed after the implementation

of the legislation.

Table 3.3
Intensity of Smoking
Descriptive Statistics

	2004		2008	
	Frequency	**Valid Percent**	**Frequency**	**Valid Percent**
None	1844	81.5	2537	86.0
Less than 1 per day	88	3.9	86	2.9
1 cigarette per day	76	3.4	71	2.4
2 to 5 cigarettes per day	169	7.5	164	5.6
6 to 10 cigarettes per day	45	2.0	51	1.7
11 to 20 cigarettes per day	27	1.2	24	0.8
More than 20 cigarettes per day	13	0.6	16	0.5
Total	2262		2949	

This is an important consideration of this research. If there was no statistically

significant reduction in the percentage of adolescents who reported smoking after the

enactment of the legislation, as reflected by the prevalence variable, it may be discovered

that the legislation did have an effect on smoking practices in this population. Although

the number of students who smoked may not be significantly affected, they may have

been smoking at a decreased rate and smoke fewer cigarettes on the days they did smoke.

In other words, a comparable number of students may still have engaged in smoking but they may have been smoking at a significantly lower rate then before the legislation. This study compared the percentages of each of these measures of incidence to determine if the legislation reduced the incidence of smoking in the student population, as indicated by the number of days they smoked (*Frequency)* or the number of cigarettes they smoked (*Intensity)*.

Availability: This variable examined sources of cigarettes and was determined by the responses to the question, *"During the past 30 days, how did you usually get your own cigarettes?"* The possible responses were (a) I did not smoke cigarettes during the past 30 days; (b) I bought them in a store, such as a convenience store, supermarket, discount store or gas station; (c) I bought them from a vending machine; (d) I gave someone else money to buy them for me; (e) I borrowed (or bummed) them from someone else, (f) A person 18 years or older gave them to me (g) I took them from a store or family member; (h) I got them some other way. The responses of (b) and (c) were coded as 1 for *purchased* since both responses designated that cigarettes were purchased from a commercial source. All other responses were entered as 0. This allowed a comparison of percentage of students who were able to purchase their cigarettes from commercial sources in 2008 with the percentage from 2004 in order to assess whether the legislation decreased the sale of cigarettes to adolescents as intended. Since the reasoning behind the New Jersey Smoke Free Air Act was to restrict the sale of tobacco products to high school students (by raising the legal age of purchase), it was expected to see a decrease in the number of students who report purchasing cigarettes from commercial sources in 2008 compared to 2004. Additionally, in order to accurately

assess whether or not the law had an impact on adolescent smoking, it must first be

concluded that the legislation is being implemented properly; that is, denying commercial

availability of tobacco products to person less than 19 years of age.

Table 3.4
Sources of Cigarettes
Descriptive Statistics

	2004		2008	
	Frequency	**Valid Percent**	**Frequency**	**Valid Percent**
Not Purchased	2175	92.8	2857	94.5
Purchased	170	7.2	165	5.5
Total	2345		3022	

Social Learning Variables

Differential Association: This variable assessed peer smoking behavior. The

present study contends that peer association with smokers would decrease after the

enactment of the New Jersey Smoke Free Air Act since access to cigarettes for high

school age students, who are typically under 19, will be restricted   Since this legislation

had no bearing on the smoking of parents or older siblings, the only way to measure the

effect of this legislation on smoking associates would be to examine peer smoking. This

variable was measured by *"How many of your four closest friends smoke cigarettes?"*

The possible responses were (a) None; (b); One; (c); Two; (d) Three; (e) Four; (f) Not

sure. This study compared the percentages of peer smokers before and after the

legislation to determine if the legislation decreased the percentage of smoking associates

in high schools.

Table 3.5
Differential Association
Descriptive Statistics

	2004		2008	
	Frequency	**Valid Percent**	**Frequency**	**Valid Percent**
None	1114	53.0	1693	61.2
One	374	17.8	461	16.7
Two	263	12.5	291	10.5
Three	151	7.2	149	5.4
Four	199	9.5	173	6.3
Total	2101		2767	

Definitions: This variable pertaining to attitudes and beliefs about smoking was measured by *"Do you think smoking cigarettes makes young people look cool or fit in?"* Possible responses were (a) Definitely yes; (b) Probably yes; (c) Probably not; and (d) Definitely not. Having a "cool" image is considered a positive perception of smoking and has been identified in the research as reasons why adolescents use cigarettes (Leatherdale & Manske, 2005). Responses to this question were compared before and after the enactment of the legislation to reveal if positive perceptions of smoking were decreased.

Table 3.6
Definitions
Descriptive Statistics

	2004		2008	
	Frequency	**Valid Percent**	**Frequency**	**Valid Percent**
Definitely No	1433	61.2	2134	71.8
Probably No	490	20.9	432	14.5
Probably Yes	307	13.1	265	8.9
Definitely Yes	113	4.8	141	4.7
Total	2343		2972	

Reinforcement: This variable was measured by *"Do you think young people who smoke cigarettes have more friends?"* Possible responses are (a) Definitely yes; (b) Probably yes; (c) Probably no; and (d) Definitely no. Positive social reinforcement have been shown to impact adolescent smoking; friendship rewards like group membership (Aloise-Young, Graham, and Hansen, 1994; Leatherdale & Manske, 2005) and social status and popularity (Kobus, 2003) have been identified as reasons why adolescents smoke. Responses were compared before and after the New Jersey Smoke Free Air Act to reveal if there was a decrease in the social reinforcement for smoking after the enactment of the legislation.

Table 3.7
Reinforcement
Descriptive Statistics

	2004		2008	
	Frequency	**Valid Percent**	**Frequency**	**Valid Percent**
Definitely No	709	30.5	986	33.1
Probably No	1151	49.5	1307	43.9
Probably Yes	389	16.7	528	17.7
Definitely Yes	77	3.3	157	5.3
Total	2326		2978	

Control Variables

Gender: This was measured by *"What is your sex?"* Gender of the respondent must be controlled since the research has shown that there are gender disparities regarding the psychosocial factors which influence the initiation and continuance of smoking in the adolescent population (Akers & Lee, 1996).

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Smoking in Household: This was measured by *"Does anyone who lives with you now smoke cigarettes?"* Since parent and sibling smoking in the house may facilitate smoking in accordance with SLT and may also present opportunities to obtain cigarettes, the present study controlled for living with persons who smoke.

Age: This was measured by "How old are you?" with the possible responses being (a) 11 years old or younger; (b) 12 years old; (c) 13 years old; (d) 14 years old; (e) 15 years old; (f) 16 years old; (g) 17 years old; and (h) 18 years old or older. This variable was controlled since age may play a role in who engages in smoking; additionally, older students may report smoking more since they could have a less difficult time in purchasing cigarettes even though they were still under the age of legal tobacco purchase.

Table 3.8
Descriptive Statistics
Control Variables

	2004		2008	
	N	**%**	**N**	**%**
Gender	2380		3046	
Female		51.8		50.6
Smoking in Household	2303		2942	
Yes		37.5		36.6
Age	2388		3053	
		Mean = 15.87		**Mean** = 15.71

Analytic Technique

The present study utilized Bivariate Analysis as the initial method of analysis. The first model of analysis which was implemented will be a Chi-square to test for

statistically significant differences between the variables before and after the legislation. Multiple Regression was also conducted in order to observe how the variables act together. This analytic technique will present the strength of the relationship of each independent variable on the dependent variables while controlling for the relevant variables discussed previously in this section. Two different Multivariate Regression techniques were utilized in order to accurately test the relative impact of Social Learning variables on smoking behavior before and after the legislation while controlling for other variables previously mentioned. Multivariate Regression is used when multiple independent variables are present and identifies *why* changes occur and what factors are directly associated with the change while controlling for specified variables. While the initial Chi-square analysis was used to identify if a statistically significance change exists between 2004 and 2008, the Multivariate analysis provided an accurate picture of which variables are the most strongly related to the change. Which Multivariate analysis method is used is based on the dependent variable in the equation.

For the first hypothesis, the dependent variable is *Prevalence*, a dichotomous variable indicating whether the student is a smoker or non-smoker. In this case, since the dependent variable is dichotomous, a Logistic Regression was conducted. The Logistic Regression allows us to determine the impact of the multiple independent variables presented simultaneously on the dichotomous variable (*Prevalence)* and shows the relationships and strengths among the variables to provide the explanation of which of the Social Learning variables had the most effect on smoking in adolescents.

For the following three hypotheses, in which we measured the impact of the variables on *Frequency* and *Intensity* of smoking, a different method of analysis had to be

used since these variables are not dichotomous. Since each of these variables had a

choice between seven categories as a possible response, they are considered ordinal-level

variables. Because these hypotheses are using multiple-level, ordered dependent

variables, the appropriate Multivariate analysis is a Multiple Linear Regression. The

Multiple Linear Regression determined the effectiveness of the model presented (all of

the variables together) as well as the relative contribution of each of the predictors to the

total variance explained. Essentially, it examined the impact of all of the variables

collectively on *Frequency* and *Intensity* of smoking in addition to each individual

variable's impact.

Therefore, by utilizing Bivariate and Multivariate analyses, the present study was

able to identify if a statistically significant difference exists before and after the

legislation for each variable, the strength of the effect of each variable, and the level of

significance.

Chapter 4

Results

As stated in the previous chapter, the present study has two main objectives. The first is to determine if smoking was reduced in high schools after the enactment of the New Jersey Clean Air Act; and if so, the second is to determine *why* cigarette smoking has decreased in this population. This study not only predicts that smoking will be decreased, but furthermore, that the decrease was in accordance with the concepts of Social Learning Theory. Therefore, the present study examined each of the Social Learning variables and their relative effect on adolescent smoking behavior in order to address the second objective. The study was conducted in two phases to ensure that both objectives were satisfied.

In the first phase of the study, the concern was whether a reduction in smoking had occurred after the legislation. In order to make this a more comprehensive examination of adolescent smoking, the present study classified smoking behavior into three categories: (1) *Prevalence* (smoker or non-smoker), (2) *Frequency* (how many days the student smokes), and (3) *Intensity* (how many cigarettes each day). By measuring smoking in this way, there is a better depiction of if and how this legislation affected smoking behavior and consistency of smoking. Additionally in this first phase, commercial availability of cigarettes was compared before and after the legislation, as well as, a preliminary look at the individual Social Learning Variables before and after the legislation. It was predicted that all three categories of smoking, commercial access to cigarettes, and each of the Social Learning variables were reduced from 2004 to 2008.

A Chi-square analysis was conducted to see if statistical differences exist for these variables from 2004 and 2008.

H1: *After the New Jersey Smoke Free Air Act went into effect, there will be a decrease in the number of high school students who smoke.*

Table 4.1:
Chi Square for H1
Prevalence of Smoking Before and After Legislation

	2004	**2008**
Non-Smoker	1643 (70.1%)	2298 (76.1%)
Smoker	700 (29.9%)	723 (23.9%)
Total	2343 (100%)	3021 (100%)
Pearson Chi-Square	23.918	
p **value**	.000	

The first hypothesis predicted that the *Prevalence* of smoking would decrease from 2004 to 2008. The Chi-square analysis showed that there was a statistically significant difference in smoking from 2004 to 2008. The number of smokers decreased from 29.9% in 2004 to 23.9% in 2008; accordingly the number of non-smokers increased from 70.1% in 2004 to 76.1% in 2008. This finding was statistically significant, ($\chi^2 =$ 23.918; $p < .001$) in the expected direction. This change remained statistically significant when using the alternative four-category measure of *Prevalence.* For more detailed information about the results of the alternative analysis, refer to Appendix A.

H2 (a): *After the New Jersey Smoke Free Air Act went into effect, there will be a decrease in the Frequency of smoking in high school students*

Table 4.2
Chi Square for H2(a)
Frequency of Smoking Before and After Legislation

	2004	2008
0 days	1868 (81.6%)	2561 (86.1%)
1 or 2 days	116 (5.1%)	120 (4.0%)
3 to 5 days	49 (2.1%)	54 (1.8%)
6 to 9 days	40 (1.7%)	36 (1.2%)
10 to 19 days	49 (2.1%)	46 (1.5%)
20 to 29 days	48 (2.1%)	49 (1.6%)
All 30 days	119 (5.2%)	107 (3.6%)
Total	2289 (100%)	2973 (100%)
Pearson Chi Square	21.141	
***p* Value**	.002	

The second hypothesis predicted that the *Frequency* (number of days reported smoking) would decrease from 2004 to 2008. The Chi-square analysis showed that students reported smoking on fewer days in 2008 than 2004. The percentage of students who reported smoking "0 days" increased (from 81.6% in 2004 to 86.1% in 2008) while the percentage of students who reported smoking a range of days between 1 and 30 decreased from 2004 to 2008 in every category ("1-2 days": 5.1%-4.0%; "3 to 5 days": 2.1%-1.8%; "6 to 9 days" : 1.7%-1.2%; "10 to 19 days" : 2.1%-1.5%; "20 to 29 days" : 2.1%-1.6%; "all 30 days" : 5.2%-3.6%). These findings were statistically significant (χ^2 = 21.141, $p < .01$) in the expected direction. So, students who are smoking in 2008 are smoking fewer days than smokers in 2004.

H2 (b): *After the New Jersey Smoke Free Air Act went into effect, there will be a decrease in the Intensity of smoking in high school students.*

Table 4.3
Chi Square for H2(b)
Intensity of Smoking Before and After Legislation

	2004	**2008**
None	1844 (81.5%)	2537 (86.0%)
Less than 1 per day	88 (3.9%)	86 (2.9%)
1 per day	76 (3.4%)	71 (2.4%)
2 to 5 per day	169 (7.5%)	164 (5.6%)
6 to 10 per day	45 (2.0%)	51 (1.7%)
11 to 20 per day	27 (1.2%)	24 (0.8%)
More than 20 per day	13 (0.6%)	16 (0.5%)
Total	2262 (100%)	2949 (100%)
Pearson Chi Square	20.536	
***p* Value**	.002	

The third hypothesis stated that there would be a decrease in the *Intensity* of smoking (number of cigarettes smoked each day) from 2004 to 2008. The Chi-square analysis showed that the percentage in every category, with the exception of "none", decreased from 2004 to 2008 ("less than one per day": 3.9%-2.9%; "one cigarette per day": 3.4%-2.4%; "2 to 5 per day": 7.5%-5.6%; "6 to 10 per day": 2.0%-1.7%; "11 to 20 per day": 1.2%-0.8%; "more than 20 per day": 0.6%-0.5%). As predicted, students who are smoking in 2008 are smoking fewer cigarettes each day than smokers in 2004; this finding was statistically significant, ($\chi^2 = 20.536$, $p < .01$) in the expected direction.

Therefore, the Chi-square analysis thus far has concluded that there is a statistically significant decrease in the number of smokers, the *Frequency* of smoking and the *Intensity* of smoking from 2004 to 2008, as predicted. There are fewer smokers in

2008, and those who are smoking are smoking on fewer days and smoking fewer

cigarettes per day.

H3: *After the New Jersey Smoke Free Air Act went into effect, there will be a*

decrease in the percentage of students who reported obtaining cigarettes from

commercial sources.

Table 4.4
Chi Square H3
Sources of Cigarettes Before and After Legislation

	2004	2008
Not Purchased	2,175 (92.8%)	2,857 (94.5%)
Purchased	170 (7.2%)	165 (5.5%)
Total	2,345 (100%)	3,022 (100%)
Pearson Chi Square	7.225	
p **Value**	.007	

Since this legislation raised the legal age of tobacco purchase from 18 to 19, it

was predicted that fewer students would report obtaining cigarettes through commercial

sources in 2008 compared to 2004. Chi-square analysis was then conducted on reported

sources of cigarettes between 2004 and 2008 in order to satisfy H3. The Chi-square

showed that there was a statistically significant difference in how students were obtaining

cigarettes in 2004 than in 2008, with fewer students purchasing cigarettes from

commercial sources ($\chi^2 = 7.225$, $p < .01$) as predicted. The percentage of students who

reported purchasing cigarettes from commercial sources decreased from 7.2% in 2004 to

5.5% in 2008; accordingly, the percentage of students who reported not purchasing their

cigarettes increased from 92.8% in 2004 to 94.5% in 2008.

H4(a): *After the New Jersey Smoke Free Air Act went into effect, students will report having fewer closer friends who smoke.*

Table 4.5
Chi Square for H4(a)
Differential Association Before and After Legislation

	2004	2008
None	1114 (47.9%)	1693 (56.8%)
One	374 (16.1%)	461 (15.5%)
Two	263 (11.3%)	291 (9.8%)
Three	151 (6.5%)	149 (5.0%)
Four	199 (8.6%)	173 (5.8%)
Total	2325 (100%)	2983 (100%)
Pearson Chi Square	51.103	
p Value	.000	

Differential association is the first, and arguably the most important, concept in Social Learning Theory pertaining to the adoption of a behavior. The influence of peers has been identified as a crucial factor in whether an adolescent will engage in smoking according to Social Learning Theory (Spears & Akers, 1988). The present study posits that students will report having fewer of their closest friends who smoke after the enactment of the legislation. Chi-square analysis was conducted in order to compare the percentage of peer smoking from 2004 to 2008. The Chi-square shows that fewer students reported having between one and four of their closest friends smoking in 2008 than 2004 in each category; ("one": 16.1%-15.5%; "two": 11.3%-9.8%; "three" 6.5%-5.0%; "four": 8.6%-5.8%). Additionally, more students reported that they had zero of their four closest friends smoke; 47.9% in 2004 and 56.8% in 2008. These findings were statistically significant ($\chi^2 = 51.103$, $p < .001$), in the expected direction.

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H4(b): *After the New Jersey Smoke Free Air Act went into effect, there will be a*

decrease in the percentage of students who report having positive perceptions of

smoking.

<div align="center">

Table 4.6
Chi Square for H4(b)
Defining Smoking As Something that Makes Someone
Look Cool or Fit In Before and After Legislation

</div>

	2004	**2008**
Definitely Yes	113 (4.8%)	141 (4.7%)
Probably Yes	307 (13.1%)	265 (8.9%)
Probably No	490 (20.9%)	432 (14.5%)
Definitely Yes	1433 (61.2%)	2134 (71.8%)
Total	2343 (100%)	2972 (100%)
Pearson Chi Square	74.183	
p **Value**	.000	

The Social Learning Theory concept of definitions (one's attitudes and beliefs

towards a behavior) was also examined in terms of adolescent's opinion of smoking and

whether these attitudes were altered after the enactment of this legislation as predicted.

Once again, a Chi-square analysis was employed to see if a difference exists. The survey

imposed a Likert scale to measure these attitudes of smoking with possible responses

being, "definitely yes, probably yes, probably no, and definitely no" to whether smoking

makes someone look "cool" or "fit in". The percentage of students who believed that

smoking "definitely" makes you look cool or fit in decreased from 4.8% in 2004 to 4.7%

in 2008; and "probably yes" decreased from 13.1% in 2004 to 8.9% in 2008. The

percentage who responded "probably no" also decreased from 20.9% in 2004 to 14.5% in

2008; however, the percentage who responded "definitely no" increased from 61.2% in

2004 to 71.8% in 2008. These findings were statistically significant ($\chi^2 = 74$, $p < .001$),

and with the exception of the "probably no" category, all were in the expected direction.

H4(c): *After the New Jersey Smoke Free Air Act went into effect, there will be a*

decrease in the percentage of students who report being reinforced for smoking.

Table 4.7
Chi Square H4(c)
Whether Smoking is Reinforced by Resulting in More
Friends Before and After Legislation

	2004	2008
Definitely Yes	77 (3.3%)	157 (5.3%)
Probably Yes	389 (16.7%)	528 (17.7%)
Probably No	1151 (49.5)	1307 (43.9%)
Definitely No	709 (30.5%)	986 (33.1%)
Total	2326 (100%)	2978 (100%)
Pearson Chi Square	23.801	
***p* Value**	.000	

According to Social Learning Theory, whether or not a behavior will be sustained

depends a great deal on the reinforcement of that behavior. It has been presumed that

there will be a decrease in the percentage of students who report being reinforced for

smoking. In this study, the reinforcement is social and pertains to whether the student

feels that smoking results in more having more friends. The survey allowed students to

answer using a Likert-scale with the possible responses being "definitely yes, probably

yes, probably no, definitely no". A Chi-square analysis was conducted to see if a

difference existed before and after the legislation. Contrary to this prediction, the Chi-

square showed an increase in the percentage of students who reported that students who

smoked cigarettes have more friends in both categories ("definitely yes" increased from 3.3% in 2004 and 5.3% in 2008; and "probably yes" increased from 16.7% in 2004 to 17.7% in 2008). Another finding inconsistent with this hypothesis proved by the Chi-square analysis was the decrease in the percentage of students who believed that students who smoked "probably not" have more friends; 49.5% in 2004 to 43.9% in 2008. However, despite these findings, the remaining response was in the expected direction. There was an increase in the percentage of students who believed that students who believed that smokers "definitely not" have more friends than non-smokers; this percentage increased from 30.5% in 2004 to 33.1% in 2008. All of these finding were statistically significant, ($\chi^2 = 23.801, p < .001$) Another way to interpret these findings is to only observe the "definite" answer responses in which, smokers "definitely yes" have more friends did increase from 2004 to 2008 by 2 percentage points, however; "definitely no" decreased by 2.6 percentage points. Therefore, there was a slightly larger increase in the belief that student smokers definitely did not have more friends than there was an increase in the belief that smokers definitely have more friends.

We have discovered in the first phase of the study that statistically significant differences exists between 2004 and 2008 in the number of students who smoke cigarettes, how many days they smoke, how many cigarettes they smoke each day, and for each of the Social Learning theory variables. However, the first phase does not give an explanation for *why* these changes have occurred. The second phase of the study will be dedicated to finding the relative impact of the social learning variables and access to cigarettes on smoking and the *Intensity* and *Frequency* of smoking. Here the dependent

variables will be *Prevalence*, *Frequency*, and *Intensity* of smoking and the independent

will be the social learning variables and access to cigarettes.

> H5 (a): *The number of friends who smoke, the positive perceptions of smoking,*
>
> *and the reinforcements for smoking will be negatively related to the prevalence of*
>
> *smoking, after controlling for access to cigarettes, gender, age, and smoking in*
>
> *the household.*

Table 4.8
Logistic Regression for H5(a)
Prevalence of Smoking

Independent Variables	β	S.E.	Wald	Sig	Odds Ratio
Year	-.064	.085	.567	.451	.938
Differential Association	.672***	.032	435.233	.000	1.958
Definitions	.335***	.050	44.934	.000	1.398
Reinforcement	.035	.056	.384	.536	1.036
Source	3.176***	.289	120.608	.000	23.960
Gender	-.172*	.085	4.050	.044	.842
Age	.320***	82.365	82.365	.000	1.377
Smoking in Household	.547***	41.307	41.307	.000	1.729
Nagelkerke R^2	.396				

*p< .05, **p< .01, ***p< .001

Logistic Regression was used to test this hypothesis since the dependent variable

(*Prevalence*) is a dichotomous variable (smoker =1, non-smoker =0). Although it is not

included in this chart, Logistic Regression also measures the relative strength of the

model in predicting smoking behavior. It should be noted that being able to predict

smoking *Prevalence* increased from 75.3% to 82.0% by using the model. In other words,

there was a 6.7 percentage point increase in the ability to predict smoking *Prevalence*

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after taking into account all of the variables that were included in the model provided by this study. The Nagelkerke R square shows that 39.6% of *Prevalence* is explained by the model.

The purpose of Logistic Regression is to find out which variables remained significant in predicting smoking once all the variables were presented simultaneously on *Prevalence*. Logistic Regression also provides the knowledge of the relationships and strengths among the variables. The odds ratio (Exp(B)) in the equation shows the relative odds of the occurrence of the outcome of interest (in this case *Prevalence* of smoking), given exposure to the variable of interest. If this number is above 1 the variable increases the likelihood of smoking and if it is less than 1, then the variable decreases the likelihood of smoking.

Looking first at the Social Learning variables, *Differential Association* and *Definitions* were significantly related to smoking after controlling for other variables. In terms of *Differential Association*, the higher the number out of the four closest friends who smoke, the more likely the student was to smoke (Exp(B) = 1.958; $p <.0001$). In terms of *Definitions*, the higher of a "cool" image associated with smoking, the more likely the student was to smoke (Exp(B) = 1.398; $p < .0001$). The variable of *Reinforcement* was not statistically significant after controlling for the other factors in the model ($p = .536$); therefore, we conclude that a student's belief that students who smoke have more friends is not a significant predictor of whether or not a student smokes once controlling for other factors. *Source* of cigarettes is statistically significant ($p < .0001$); which shows that, predictably, a higher percentage of students purchasing cigarettes resulted in a higher percentage of students who smoked (Exp(B) = 23.960). Because of

the unique nature of the Source variable (only pertaining to students who were engaging in smoking), the present study included an alternative analysis on the *Prevalence*, *Frequency*, and *Intensity* variables excluding *Source*. The results of these alternative regression analyses can be found in Appendix B. Gender also was a statistically significant predictor. (p = .044). Females students were statistically more likely to be smokers than male students (Exp(B) = .842). Age was statistically significant; the regression showed that older students were statistically more likely to be smokers than younger students (Exp(B) = 1.377; p <.0001). The regression showed that students who reported living with a smoker in their household were statistically significantly more likely to be a smoker (Exp(B) = 1.729; p <.0001).

In sum, having a higher number of close friends who smoke, believing that smoking has a "cool" image, purchasing cigarettes from commercial sources, being a female, being an older student, and having a smoker in the household were all significant predictors of smoking *Prevalence*, as predicted. Contrary to my hypothesis, however, *Reinforcement* was not a significant predictor of *Prevalence* [as originally predicted]; so students' beliefs that a smoker had more friends than a non-smoker was not a factor in a student smoking.

> H5 (b): *The number of friends who smoke, the positive perceptions of smoking, and the reinforcements for smoking will be negatively related to the Frequency of smoking, after controlling for access to cigarettes, gender, age, and smoking in the household.*

Table 4.9
Multiple Regression for H5(b)
Frequency of Smoking

Independent Variables	B	Std. Error	Beta	Sig.
Year	-.005	.031	-.002	.875
Differential Association	.344***	.013	.308	.000
Definitions	.023	.019	.014	.228
Reinforcement	.037	.020	.021	.068
Source	3.182***	.071	.514	.000
Gender	-.008	.030	-.003	.780
Age	.021	.012	.019	.086
Smoking in Household	.217***	.032	.074	.000
Adjusted R Square	.503			

*$p < .05$, **$p < .01$, ***$p < .001$

The dependent variable for this model is *Frequency*. It has already been identified that the *Frequency* of smoking is a measure of how many days of 30 days the student smoked. Since the measure of this dependent variable had seven possible responses (0 days, 1-2 days, 3-5 days, 6-9 days, 10-19 days, 20-29 days, all 30 days), an OLS multiple regression analysis was used. Using this analytic technique will allow the determination of each independent variable's relative contribution to *Frequency,* as well as, the combined effect of all of the variables on *Frequency*. The results show that the independent variables in the model explain 50.3% of variance of *Frequency* ($R^2 = .503$). The Multiple Regression results demonstrate that only *Source, Differential Association,* and *Smoking in Household* were statistically significant in causing a higher *Frequency* of smoking. According to the Standardized Coefficients, the Betas, *Source* explained the most variance of *Frequency* (Beta = .514). Purchasing cigarettes was a statistically significant predictor of F*requency* ($p < .0001$); as purchasing cigarettes increased, so did the number of days smoking. *Differential Association* explained the next highest

variance of *Frequency* (Beta = .308). Specifically, as the number of closest friends who

smoked increased, so did the number of smoking days, as predicted; this was statistically

significant ($p < .0001$). *Smoking in the Household,* accounted for the least variance of the

three significant predictors (Beta = .074; $p < .0001$). As smoking in the household

increased, the number of days smoking also increased. All other variables

(*Reinforcement, Definitions, Gender,* and *Age)* were not statistically significant predictors

of smoking *Frequency.*

> H5 (c): *The number of friends who smoke, the positive perceptions of smoking,*
>
> *and the reinforcements for smoking will be negatively related to the Intensity of*
>
> *smoking, after controlling for access to cigarettes, gender, age, and smoking in*
>
> *the household.*

Table 4.10
Multiple Regression for H5(c)
Intensity of Smoking

Independent Variables	B	Std. Error	Beta	Sig.
Year	.004	.023	.002	.878
Differential Association	.271***	.010	.324	.000
Definitions	.052***	.015	.042	.000
Reinforcement	.035*	.015	.027	.022
Source	2.244***	.054	.483	.000
Gender	-.021	.023	-.010	.357
Age	.021*	.009	.025	.022
Smoking in Household	.158***	.024	.072	.000
Adjusted R Square	.493			

*p< .05, **p< .01, ***p< .001

The variable of *Intensity* is a measure of how many cigarettes were smoked each

day. The Multiple Regression analysis show that the independent variables in the model

account for 49.3% of the variance ($R^2 = .493$). With the exception of *Gender*, all of the

variables were statistically significant predictors of *Intensity*. The Beta Standardized Coefficient shows which variables have the most explanatory power on the dependent variable. According to the Beta, *Source* explains the most variance of *Intensity* (Beta = .483; $p < .0001$). This follows logically that students who reported purchasing their own cigarettes were smoking more cigarettes each day. *Differential Association* explained the next highest variance for *Intensity* (Beta = .324; $p < .0001$). As the number of four closest friends increase, the number of cigarettes smoked each days also increases. *Smoking in the Household* explained the next highest variance for *Intensity* (Beta = .072; $p < .0001$). Students who reported having a smoker living with them, smoked more cigarettes per day. The *Definitions* variable also was a significant predictor of *Intensity* (Beta = .042; $p < .0001$). Students who had a higher positive perception smoked more cigarettes per day. Students who felt that smoking cigarettes made the smoker look "cool" had a higher *Intensity* of smoking as expected. *Reinforcement* had the least effect on smoking *Intensity* of the Social Learning Variables (Beta = .027; $p = .022$), although still statistically significant. Students who thought that smokers had more friends than non-smokers smoked more cigarettes per day. *Age* explained the least variance of *Intensity* (Beta = .025; $p = .022$), however, it was still a statistically significant predictor, in that, older students smoked more cigarettes per day. *Gender* had no statistically significant impact on *Intensity* ($p = .357$).

Chapter 5

Conclusion

Discussion

Many researchers have used Social Learning Theory to explain cigarette use in the adolescent population (Akers et al., 1996; Krohn et al., 1985; Monroe, 2004; Spear and Akers, 1998). Other researchers have studied adolescent smoking without specifically testing Social Learning Theory yet have provided support for the concepts derived from the theory in their findings (Alexander et al., 2001; Aloise-Young et al., 1994; Bricker et al., 2007; Charlton & Blair, 1989; Ernett et al., 2010; Flay et al., 1998; Kobus, 2003; Leatherdale et al., 2005a; Leatherdale et al., 2005b; Leatherdale & Manske, 2005, Leatherdale et al, 2005c, Leatherdale et al., 2006a, Leatherdale et al., 2006b; Woodruff et al., 2003). Social Learning Theory posits that all behavior is learned through our associates (*Differential Association*), the behavior is then copied (*Imitation*) and the behavior will be continued or abandoned depending on the attitudes and beliefs learned from our associates regarding the behavior (*Definitions*), and the presence or absence of reinforcement for the behavior (*Reinforcement*), (Akers et al., 1979). In 2005, New Jersey implemented new legislation that raised the legal age of tobacco purchase from 18 to 19, virtually eliminating all high school students from being legally able to purchase cigarettes. This legislation provided the perfect intervention to examine Social Leaning Theory with regard to adolescent smoking. By limiting access to cigarettes, this law essentially reduced the presence of smoking associates and provided the basis of the present study using data from the New Jersey Youth Tobacco Survey.

The present study measured the effectiveness of the New Jersey Smoke Free Air Act on reducing adolescent smoking in accordance with the concepts of Social Learning Theory. However, in order to gain a more in-depth perspective on smoking, this study went beyond simply the smoker/non-smoker dichotomy (*Prevalence*). Smoking was additionally examined in terms of the number of days the adolescent smoked *(Frequency)* and the number of cigarettes smoked each day *(Intensity)*, predicting that both would be significantly reduced. The results of this study show that, as predicted, the *Prevalence, Frequency,* and *Intensity* of smoking decreased from 2004 to 2008. So, after the legislation went into effect, all three categories of smoking were reduced; there are not only fewer smokers, but those who were smoking are smoking on fewer days and smoking fewer cigarettes each day.

There was also a decrease in the number of students who reported purchasing their cigarettes after the legislation went into effect. An interesting insight is that non-commercial sources are being utilized more after the legislation for obtaining cigarettes, with more students reporting obtaining cigarettes through non-commercial sources in 2008 than in 2004. Interestingly, for all three measures of smoking behavior (*Prevalence, Frequency,* and *Intensity*) purchasing cigarettes (*Source)* was the highest predictor, followed by the number of four closest friends who smoke (*Differential Association)*, followed by living with someone who smokes (*Smoking in the Household)*. It seems very plausible that sources of cigarettes would have such a substantial impact on smoking practices. Availability of cigarettes would logically impact greatly who smokes, and how frequently and intensely they smoke. If cigarettes were unavailable, presumably, all three measures of smoking would decrease from a lack of cigarettes to smoke. As

previously mentioned, the analyses on *Prevalence*, *Frequency*, and *Intensity* were

conducted without the *Source* variable. The statistical significance of the variables on the

number of students who smoked (*Prevalence*) and how many cigarettes were smoked

each day (*Intensity*) did not change when *Source* was removed. However, the Social

Learning variables of *Reinforcement* and *Definitions* became statistical significant

predictors of how many days a student smoked (*Frequency*) once *Source* was eliminated

from the analysis. A more detailed explanation of these results can be found in Appendix

B.

With regard to *Differential Association*, this study demonstrates the influential

effect of others as posited by Social Learning Theory. Consistent with prior research, the

present study found that the influence of peer groups has a substantial impact on

adolescent smoking (Alexander et al., 2001; Akers et al., 1979; Charlton and Blair, 1989;

Chassin et al., 1981; Ernett et al., 2010; Flay et al., 1998; Lauer et al., 1982; Leatherdale

et al., 2005; Monroe, 2004; Spears and Akers, 1988).   As predicted, the analysis shows

that as the number of closest friends who smoke increases, so does the percentage of

smokers (*Prevalence*). However, *Differential Association* does not just predict who will

engage in smoking and who will not; it further influences the smoking behavior of the

adolescent insofar as, how many days the adolescent will smoke (*Frequency*) and how

many cigarettes each day (*Intensity*). *Differential Association* was the second largest

predictor of smoking in all three categories. Therefore, the influence of close friends on

smoking extends beyond the scope of the decision to simply smoke or not to smoke; it

continues to influence the smoking habits formed by the adolescent. Not only are these

findings consistent with previous research for adolescent smoking, but they also further

support *Differential Association* being the most salient of the concepts of Social Learning Theory in accounting for the adoption of a behavior. This is especially important since Social Learning Theory maintains that associates provide a source for the remaining variables of Social Learning Theory.

Having a smoker living with the adolescent had the third largest influence on smoking behavior. *Smoking in the Household* was a statistically significant predictor on the *Prevalence* of smoking, as well as, the *Frequency* and *Intensity* of smoking. This may be due to the availability of cigarettes; in other words, those who live with a smoker are supplementing their habit by having a constant non-commercial source of cigarettes from which they can obtain cigarettes on a regular basis. This steady supply of cigarettes could increase how many days they smoke and how often each day. However, another explanation for the high explanatory power of this variable would coincide with the concepts of Social Learning Theory. Specifically, when the adolescent is surrounded by people in their home who are smokers, they eventually imitate the smoking behavior, and because they are in the midst of smokers they develop positive definitions of smoking. For the sake of this study, this variable was not subsumed into the variable measuring *Differential Association* because the scope of this study was to determine the efficacy of the New Jersey Smoke Free Air Act on adolescent smoking in accordance with Social Learning Theory. Having a smoker in the household was not affected by raising the legal age of tobacco purchase, nor would the legislation be effective in changing the non-commercial sources of cigarettes (i.e. stealing them from home), and there would be no measure to differentiate those who were influenced by the smoking behaviors of the

household member and those who simply use the household smoker as a source to obtain cigarettes.

The two remaining Social Learning variables of *Definitions* and *Reinforcement* were not nearly as significant in smoking behavior as *Differential Association.* After controlling for the other variables in the model, the variable of *Definitions* was the fourth highest statistically significant variable for explaining both smoking *Prevalence* and *Intensity.* However, *Definitions* was not a statistically significant predictor of smoking *Frequency.* Therefore, the belief that smoking made someone look "cool" or fit in only impacted whether or not a student smoked and how many cigarettes they smoked each day, but not how many days they smoked. The variable of *Reinforcement* accounted for the least explanatory power of the Social Learning variables examined. *Reinforcement* was not statistically significant in predicting smoking *Prevalence* or *Frequency* of smoking when controlling for all other variables. Although it was statistically significant in explaining *Intensity* of smoking, it was the second weakest predictor of all the variables in the model. *Reinforcement* was not significant in accounting for adolescent smoking or the number of days the adolescent smoked, and was of the weakest variables in explaining how many cigarettes are smoked each day. This is particularly interesting in the present study since *Reinforcement* did not change in the expected direction. The initial Chi-square analysis showed that there was an increase in students who reported that people who smoke cigarettes have more friends in 2008 than 2004; therefore, this may explain why *Reinforcement* did not significantly impact smoking behavior in this study.

Limitations

One cannot interpret these results too zealously, however. There were many limitations in the current study that must be identified and possibly addressed in future research. Using a secondary data analysis set limitations in how the Social Learning variables were measured, only allowing one measure for each variable that was used, one of the Social Learning variables to be excluded from the analysis, and no way to effectively control for race. The samples for the examined years were not equal, and in some instances, the response categories for the survey questions were not identical from 2004 to 2008. Additionally, it is unclear to what extent the national declines of cigarette use by adolescents contributed to the observed declines in this present study.

Using a secondary data analysis in the present study to test Social Learning Theory concepts carries the inherent limitations that come with using secondary data in any research that aims to answer questions or test concepts other than those for which the study was originally intended. The data for this study were collected by previous researchers of the NJHSS who were not focused on testing Social Learning Theory. This hinders the ability to pose questions that directly measure the variables of interest in this study. That is, the questions from the New Jersey Youth Tobacco Survey were not designed to measure and test concepts of Social Learning Theory. This research, however, selected questions that adequately encapsulate the concepts of the theory and resemble questions posed by other researchers to specifically test the SLT variables. Thus, for all intents and purposes, the evaluation of certain questions in this survey

instrument can be an accurate measure of these concepts. However, although each of

these variables, except imitation, were able to be examined using a question form the

survey, the data only provided this researcher with one measure for each variable.

Moreover, the way in which the data were collected in the survey created problems for

the present analysis; these will be discussed in more details later in this section.

In addition to the inherent problems that arise from utilizing secondary data,

there were issues with the secondary data analysis that were specific to the present study.

First, involves issues that stems from the questionnaire of the Youth Tobacco Survey.

For the purposes of this study, the variable of *Prevalence* was transformed into a

dichotomous variable where the adolescent was classified as a *smoker* or *non-smoker*

based on their response to how many cigarettes they smoked in their entire life. The

problem is that the question responses were measured in ordinal ranges instead of a ratio-

level variable. Additionally, the response categories were not identical for 2004 and

2008, which only exacerbated the problem (*See table below)*. This complication was

remedied by including students who have only smoked one cigarette to be classified as a

smoker. As previously mentioned, the *Prevalence* variable was broken down into four

categories in an alternative analysis to further measure the changes between the levels of

smoking instead of only *smoker* and *non-smoker*; these results can be found in Appendix

A.

Response	2004	2008	*Prevalence*
A	None	None	Non-smoker
B	1 or more puffs but not a whole cigarette	1 or more puffs but not a whole cigarette	Non-smoker
C	1-19	1 cigarette	Smoker
D	20-99	2-5	Smoker
E	100 or more	6-15	Smoker
F		16-25	Smoker
G		26-99	Smoker
H		100 or more	Smoker

Disparities in Response Categories
Prevalence Variable
2004 – 2008

*Non-smoker = 0 **Smoker = 1

Also, the 2004 and 2008 samples were different because the latter does not include private, charter, and vocational schools. Therefore, the present study is essentially comparing private, charter, vocational, and public schools in 2004 to only public schools in 2008. The data did not allow the exclusion of the private, charter, and vocation schools in the 2004 sample; however, the majority of the schools in the 2004 sample were public

Because the data were not designed to test Social Learning Theory, this researcher was only able to test three of the four Social Learning Theory variables. The Social Learning concept of *Imitation* was not able to be measured and therefore was excluded from the analysis. The New Jersey Youth Tobacco Survey did not provide data for the researcher to accurately assess this variable. However, although this leaves one of the Social Learning variables unmeasured, the exclusion of this variable does not leave this

study lacking in the evaluation of Social Learning Theory in terms of adolescent smoking. Drawing on previous research of Social Learning Theory, after the initial adoption of a behavior, imitation becomes a less important factor in the continuation of a behavior (Monroe, 2004). In the original Social Learning Theory study in 1979 by Akers, imitation accounted for the least proportion of variance regarding use of marijuana and alcohol. In 1985, Akers and colleagues re-examined Social Learning Theory and analyzed its ability to predict cigarette use and, once again, found that imitation accounted for the least proportion of variance. Spear and Akers (1988) found that each of the Social Learning variables had a significant effect on adolescent smoking in the expected direction with the exception of imitation.

Another limitation is that the present study did not include a control variable for race. This is due to the fact that race was measured inconsistently in 2004 and 2008. In both years, the students were asked what race best described them and they were given the option to choose one or more than one of the responses. However, in the 2004 survey, they were additionally asked which race best describes them and asked to only select one answer from the category; they were not asked this additional question in 2008. Therefore, there was no way to determine the race that best describes the person in 2008, leaving no consistent way to measure race from 2004 to 2008 when the respondent choose more than one response. Moreover, research has shown that once socioeconomic status is taken into account, race alone is not a significant predictor of smoking (Mathur, Erickson, Stigler, Forster, & Finnegan, 2013; Soteriades & DiFranza, 2003). The present study would have included a variable for socioeconomic status, but no data were available.

Another limitation of this research worth noting is with regard to the variable of *Reinforcement.* The current study has only one measure for the variable: whether or not people who smoke cigarettes have more friends. Based on previous research of adolescent smoking, this is an accurate measure of *Reinforcement.* Studies have identified that social reinforcement of peers has a significant influence on adolescent smoking; specifically, friendship rewards of group-membership (Aloise-Young et al., 1994) and social status and popularity (Kobus, 2003). However, there are many other measures of reinforcement that could be employed other than social-peer reinforcement; for instance, punishment from parents for smoking. The findings from this study showed that this limited measure of *Reinforcement* did not change in the expected direction and was also not found to be statistically significant in influencing all the measures of smoking behavior, as predicted. Perhaps with more data available to measure this variable more comprehensively, the results would show a more significant impact of this variable on adolescent smoking.

A limitation also exists within the measure of *Differential Association.* The present study measured this variable using only data that examined peer association with smokers before and after the enactment of the New Jersey Smoke Free Air Act. A measure of smoking in the household was used as a separate control variable. This was important to include since Social Learning Theory posits that parents and siblings, as with peers, are part of the primary social influence group that influence adolescent behavior it was important to include. Research has found that abstinence and smoking by adolescents were closely related to the smoking behavior of both their parents and peers (Lauer et al., 1982). However, the data in the present study only indicate if anyone in the

household currently smoked cigarettes; therefore, it is impossible to disentangle the influence of parents versus siblings, or other family members, who reside in the home. Since this legislation will had no influence on the smoking of parents or older siblings, smoking in the household was not used to create the *Differential Association* variable. The only way to measure the effect of this legislation on smoking associates would be to only examine peer smoking because they were the only associates known to be affected by the increase in the age of tobacco purchase. This is not as detrimental as it seems at first glance because other research has measured the separate effects of these groups and found that peer association is more influential than parents. Monroe (2004) describes a study by Stanton and McGee (1996) that reported that adolescents who smoke are primarily influenced by peer groups and secondarily by family members. Furthermore, peers, unlike parents, influence smoking regardless of the extent to which an individual smokes. Therefore, the measure for smoking within the household was not used as a measure of *Differential Association* before and after the enactment of this legislation, but as a separate control variable.

Finally, another limitation that should be addressed in future research is the extent to which national trends in smoking directly impacted the decline in adolescent smoking. Cigarette use among adolescents in high school was declining nationally from 2004 to 2008 (Johnson, O'Malley, Bachman & Schulenberg, 2009). If it is determined that the decrease in adolescent smoking found in the present study was in accordance with the national decline, then it could be concluded that this decrease in cigarette use cannot be attributed to the legislation which raised the legal age of tobacco purchase. This can be partly addressed by comparing the results of this study in New Jersey to Monitoring the

Future data. Monitoring the Future is an ongoing national study of the behaviors and attitudes of secondary school students and young adults. Each year, approximately 50,000 8th, 10th, and 12th grade students are surveyed and asked questions on a range of behaviors pertaining to drug and substance use. The results of the Monitoring the Future data on cigarette use nationally in high school students show a decline from 2004 to 2008. For 10th grade students, cigarette use dropped from 16.0% in 2004 to 12.3% in 2008; and in 12th graders from 25.0% in 2004 to 20.4% in 2008. This shows a 3.7% drop in sophomore students and a 4.6% drop in senior students who used cigarettes nationally (Johnston et al., 2009). Whereas, the present study found a 6% drop in cigarette use in high school students; a slightly more significant decrease in *Prevalence* for New Jersey than the national average from 2004 to 2008 after the New Jersey Smoke Free Air Act went into effect.

Although the decrease in *Prevalence* of smoking in the present study was not that much greater than the national trend, it is important to note that the results of this study are not directly comparable to the Monitoring the Future results. These two studies were looking at different sample sizes, differences in geographic location of the samples, differences in the age groups of the samples, and had different measures for cigarette use. Monitoring the Future measured cigarette use nationally by asking whether the student had smoked a cigarette within the previous 30 days; while the present study measured *Prevalence* for one state by how many cigarettes had been smoked in their entire life. Additionally, the present study, measured the cigarette use of freshman through senior students, while the Monitoring the Future only measures the 10th and 12th grade student's cigarette use. In sum, it should be noted that cigarette use in the adolescent population

decreased nationally without legislation which raised the legal age of tobacco purchase; therefore, it is unclear how much of the decline in *Prevalence* found in this study can be attributed to the New Jersey legislation.

Unfortunately, the questions used in the Monitoring the Future survey did not include any questions that were comparable to those that were used in the current study to measure *Frequency* and *Intensity*. However, it is encouraging to note that the results in Appendix A showed that the greatest decrease in New Jersey from 2004 to 2008 was for adolescents smoking more than 100 cigarettes per day. The reduction in the percentage in smoking more than 100 cigarettes in the previous 30 days was 3.9%, compared to roughly 1% for those smoking a lesser amount.

It is also important to reiterate that other major goals of the present study were to conclude if the Social Learning climate of the high schools was altered, and to measure the Social Learning variables' impact on cigarette smoking. Beyond determining how much of the decline in cigarette use was attributable to the legislation, the results showing fewer smoking associates to model smoking behavior, the adoption of fewer favorable definitions of cigarettes and less reinforcement for smoking, along with the relations these variables had with smoking behavior, lend support to Social Learning Theory.

Suggestions for Future Research

Further research could be conducted to determine if this legislation has been effective in other states in reducing adolescent smoking. Currently, Alabama, Alaska, and Utah have also imposed legislation that increased the legal age of tobacco purchase from 18 to 19 years-of-age. Research like the present study would be beneficial for these

states to see if they, like New Jersey, experienced a decrease in cigarette use in the adolescent population beyond that found in the national data. Additionally, the research could conclude if the reduction was in accordance with the concepts of Social Learning Theory depending on the data available. It could also be determined if the Social Learning variables affect the adolescent population in the same way with regard to cigarette use in the different states. A comparison between the states could also be examined. Gathering data for each state, then comparing all of the states before and after the legislation would show if a similar pattern exists.

In addition to studying multiple states, extending the scope of the longitudinal data to include more years prior to the legislation as well as data after its implementation would be valuable. This would allow the research to show a longer term trend in adolescent cigarette use patterns in this population. Comparing the states that implemented this legislation to states that did not increase the tobacco-purchasing age in a longitudinal manner could also be beneficial. This research would show if the legislation was effective in reducing cigarette use or if cigarette use is also decreasing to the same extent without such legislation.

Future research could be conducted which would allow for the more vigorous testing of the Social Learning variables in this condition. It has been addressed that a limitation of the present study is that the data used was not collected with the intended use of exploring the Social Learning variables. With this in mind, other data could be explored that can permit more than one measure of each of the SLT variables. Also, other survey data may have a question that could accurately measure the variable of *Imitation* which was excluded in the present study and have more measures for the variable

Reinforcement. Exploring other surveys that have been administered to high school students before the legislation could be beneficial if they have questions and responses that encapsulate the Social Learning variables.

Combining this research with the current study could be beneficial in not only the study of Social Learning theory and adolescent smoking, but also in the rationale for new policies that are directed at reducing cigarette use in this population, as well as, defense of the effectiveness of the current legislation in New Jersey.

Policy Implications

Research has shown that smoking is a behavior that is primarily adopted during adolescence (Alexander et al., 2001; Lauer et al., 1982; Woodruff et al., 2003). Data suggests that between 80% and 90% of adult smokers begin smoking by age 18 (Alexander et al., 2001) and between 33% and 50% of young people who try smoking become regular smokers into adulthood (Elders et al., 1994). The nicotine in cigarettes is highly addictive (Jarvis & Britton, 2004). Discouraging teenagers from initially smoking will reduce adult smokers since they will never be exposed to the nicotine and subsequently become addicted. Therefore, legislation and policies designed to discourage smoking during this stage is imperative in reducing smoking.

The present study has shown that smoking in New Jersey high schools was decreased after state-wide legislation that raised the age of tobacco purchase to 19. Not only was the percentage of high school smokers reduced, but they were smoking on fewer days and fewer cigarettes each day. It is possible that other states could benefit from similar legislation with the goal of reducing adolescent smoking. Policies that are

aimed at making sure the commercial vendors of tobacco products are abiding by the law can also be implemented. Reducing the availability of cigarettes through legislation can only be effective if the commercial vendors are compliant. Stringent polices could be set in place that not only test vendor compliance, but could also establish penalties for non-compliance, such as fines. The threat of a fine for non-compliance may deter defiance of the legislation and increase its effectiveness.

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Appendix A: Alternative Prevalence Analysis

Because using the *smoker/non-smoker* dichotomy was not ideal for the measure of *Prevalence* as previously discussed, the present study conducted an analysis further breaking down the *Prevalence* variable. This categorization was not initially used because (as previously mentioned in the Methods Chapter and as shown in the table below) the 2004 and 2008 data were not equivalent in their possible responses, making matching these categories across years impossible. However, in order to be as thorough as possible, the present study examined this variable by performing a Chi-square analysis on *Prevalence* categorized in four roughly equivalent levels. Again, there is an increase in the number of non-smokers, and decreases in all three categories of smoking between 2004 and 2008. The largest decrease in this analysis was in the students who were smoking the most. Students who reported smoking more than 100 cigarettes showed the largest decrease from 2004 to 2008. This finding is especially noteworthy since it shows the most substantial decrease in the category which has the heaviest smokers. So not only were altogether fewer students smoking, but after the legislation, there are considerable fewer smokers who are considered to be the most serious smokers. These findings remained statistically significant ($\chi^2 = 31.089$, p < .001).

Table 6.1
Alternative Prevalence Variable

	2004	**2008**
Non-Smoker	None	None
	1 or more puffs but not a whole cigarette	1 or more puffs but not a whole cigarette
Less than 1 pack	1-19	1 cigarette
		2-5
		6-15
More than 1 pack	20-99	16-25
		26-99
More than 100 cigarettes	100 or more	100 or more

Table 6.2
Chi-Square
Alternative Prevalence

	2004		**2008**	
	Frequency	**Valid Percent**	**Frequency**	**Valid Percent**
Non-smoker	1643	70.1	2298	76.1
Less than 1 pack	279	11.9	326	10.8
More than 1 pack	155	6.6	170	5.6
More than 100 cigarettes	266	11.4	227	7.5
Total	2343		3021	

Appendix B: Alternative Prevalence, Frequency, & Intensity Analysis

In the interest of conducting a thorough analysis to test the effectiveness of raising the legal age of tobacco purchase on adolescent smoking in the high school population, the present study controlled for how the student obtained cigarettes. Specifically, in order to accurately test whether or not the law had an impact on adolescent smoking, it is important to include a measure for whether commercial access was reduced in this population after the enactment of the law. However, since this variable essentially only pertains to the students who are engaging in smoking cigarettes (since presumably, non-smoking students are not obtaining cigarettes through commercial or social sources), it is possible that eliminating this variable from the analysis would present different results than the model which included a *Source* variable. Therefore, the present study ran the analysis on *Prevalence*, *Frequency*¸ and *Intensity* again excluding the *Source* variable.

Without the *Source* variable in the Logistic Regression, there were no changes in the statistical significance of any of the variables on *Prevalence*. Having a higher number of close friends who smoke (*Differential Association*), believing that smoking has a "cool image" (*Definitions*), being a female, being an older student, and having a smoker in the household all remained statistically significant in predicting *Prevalence*. Additionally, the belief that students who smoked had more friends (*Reinforcement*) remained insignificant in predicting *Prevalence* after *Source* was removed.

The *Source* variable was also removed from the Multiple Regression for *Intensity*. There were no changes in any of the variables' statistical significance when *Source* was removed. As with the regression which included *Source*, all of the variables in the model

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with the exception of *Gender* remained statistically significant predictors of *Intensity*. The number of four closest friends who smoked (*Differential Association*), having a smoker in the household, having a higher positive perception of smoking (*Definitions*), thinking that smokers have more friends (*Reinforcement*), and being older all remained statistically significant predictors of *Intensity*.

Interestingly however, the *Frequency* of smoking (how many days a student smoked) was the only variable which experienced a change in the statistical significance of certain variables once *Source* was removed. Specifically, the variables of *Reinforcement* and *Definitions* became statistical significant predictors of *Frequency* only when *Source* was not taken into account in the analysis. In the original Multiple Regression for *Frequency* which included the *Source* variable, only *Source, Differential Association*, and *Smoking in the Household* were statistically significant in predicting *Frequency*. Once the *Source* variable was removed, the regression showed that as the four closest friends increased (*Differential Association*), having a smoker in the household, having a positive perception of smoking (*Definitions*), thinking that smokers have more friends (*Reinforcement*), and being older were all significant in predicting *Frequency* of smoking.

Table 6.3
Logistic Regression
Prevalence of Smoking Without Source Variable

Independent Variables	β	S.E.	Wald	Sig	Odds Ratio
Year	-.095	.081	1.358	.244	.910
Differential Association	.754	.031	608.135	.000	2.126
Definitions	.350	.048	53.753	.000	1.419
Reinforcement	.067	.054	1.536	.215	1.069
Gender	-.181	.082	4.910	.027	.834
Age	.372	.034	120.647	.000	1.450
Smoking in Household	.563	.081	47.747	.000	1.756
Nagelkerke R^2	.343				

*p< .05, **p< .01, ***p< .000

Table 6.4
Multiple Regression
Frequency of Smoking Without Source Variable

Independent Variables	B	Std. Error	Beta	Sig.
Year	-.020	.037	-.007	.593
Differential Association	.533	.015	.473	.000
Definitions	.048	.024	.028	.042
Reinforcement	.063	.025	.035	.011
Gender	-.010	.037	-.004	.779
Age	.084	.015	.074	.000
Smoking in Household	.269	.038	.091	.000
Adjusted R Square	.277			

*p< .05, **p< .01, ***p< .001

Table 6.5
Multiple Regression
Intensity of Smoking Without Source Variable

Independent Variables	B	Std. Error	Beta	Sig.
Year	-.002	.027	-.001	.928
Differential Association	.405	.011	.482	.000
Definitions	.072	.017	.058	.000
Reinforcement	.051	.018	.039	.005
Gender	-.017	.027	-.008	.519
Age	.064	.011	.076	.000
Smoking in Household	.194	.028	.088	.000
Adjusted R Square	.294			

*p< .05, **p< .01, ***p< .001