2009

Predictors of smoking initiation in African American adolescents

Jennifer Kienzle
Virginia Commonwealth University

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PREDICTORS OF SMOKING INITIATION IN AFRICAN AMERICAN ADOLESCENTS

A dissertation submitted in partial fulfillment of the requirements for the Doctoral degree at Virginia Commonwealth University.

by

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B.S., James Madison University, 2000

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August 2009
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Finally, this dissertation is dedicated to the person who was literally with me day-in and day-out, every day for the past nine and a half months, including many days of data collection, the day of the project's completion, the preparation for defense, and the day of the project's defense: my soon-to-be-born son, Owen.
# Table of Contents

<table>
<thead>
<tr>
<th>Acknowledgements</th>
<th>ii</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of Tables</td>
<td>vii</td>
</tr>
<tr>
<td>List of Abbreviations</td>
<td>ix</td>
</tr>
</tbody>
</table>

## Chapter

1. Introduction .................................................................................................................. 1
   - Overview ...................................................................................................................... 1
2. Literature Review ......................................................................................................... 5
   - Health effects associated with smoking ................................................................. 5
     - Nicotine dependence .............................................................................................. 5
     - Cardiovascular and Respiratory diseases ............................................................. 6
     - Cancer ...................................................................................................................... 7
3. Smoking during adolescence ......................................................................................... 7
4. Reducing adolescent smoking via prevention efforts .................................................... 8
   - Social policy .............................................................................................................. 9
   - School-based programs ............................................................................................ 9
   - Anti-smoking campaigns ......................................................................................... 10
5. Reducing adolescent smoking via cessation efforts .................................................... 12
   - Brief intervention ................................................................................................... 12
   - Contingency management ....................................................................................... 14
   - Pharmacotherapies ................................................................................................. 15
Data analysis..............................................................................................................47

3 Results..................................................................................................................48

Participant group assignment and demographic and tobacco use characteristics ........................................................................................................48

Data preparation for discriminant analysis.................................................................49

Model 1..........................................................................................................................54

Model 2..........................................................................................................................56

Models 3 and 4 .............................................................................................................60

4 Discussion.................................................................................................................73

Overview .....................................................................................................................73

Findings for predictor variables (independent variables)...........................................74

The use of computerized screening for smoking in adolescents.............................78

Study contributions and limitations..............................................................................83

Overall conclusion.......................................................................................................86

References.....................................................................................................................88

Appendices.....................................................................................................................102

A Informed Consent Form for Participants 18 years of age........................................102

B Parental Informed Consent Form for Participants 12-17 years of age...............106

C Informed Assent Form for Participants 12-17 years of age.................................110

D Subjective Questionnaires......................................................................................113
### List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1</td>
<td>Demographic characteristics of participants (N=150)</td>
<td>49</td>
</tr>
<tr>
<td>Table 2</td>
<td>Demographic characteristics of African American adolescent ever smoker participants</td>
<td>51</td>
</tr>
<tr>
<td>Table 3</td>
<td>Correlations for predictors of smoking initiation in African American Adolescents</td>
<td>54</td>
</tr>
<tr>
<td>Table 4</td>
<td>Means and Standard deviations of all predictor variables as a function of ever smoking status</td>
<td>56</td>
</tr>
<tr>
<td>Table 5</td>
<td>Predictor variables in stepwise discriminant function analysis (Model 1)</td>
<td>57</td>
</tr>
<tr>
<td>Table 6</td>
<td>Correlations between discriminating variables and discriminant function (function structure matrix) and standardized discriminant function coefficients (Model 1)</td>
<td>58</td>
</tr>
<tr>
<td>Table 7</td>
<td>Classification analysis for ever smoking status (Model 1)</td>
<td>60</td>
</tr>
<tr>
<td>Table 8</td>
<td>Predictor variables in stepwise discriminant function analysis (Model 2)</td>
<td>61</td>
</tr>
<tr>
<td>Table 9</td>
<td>Correlations between discriminating variables and discriminant function (function structure matrix) and standardized discriminant function coefficients (Model 2)</td>
<td>63</td>
</tr>
<tr>
<td>Table 10</td>
<td>Classification analysis for ever smoking status (Model 2)</td>
<td>64</td>
</tr>
<tr>
<td>Table 11</td>
<td>Predictor variables in stepwise discriminant function analysis (Model 3)</td>
<td>65</td>
</tr>
<tr>
<td>Table 12</td>
<td>Correlations between discriminating variables and discriminant function (function structure matrix) and standardized discriminant function coefficients (Model 3)</td>
<td>66</td>
</tr>
<tr>
<td>Table 13</td>
<td>Classification analysis for ever smoking status (Model 3)</td>
<td>67</td>
</tr>
<tr>
<td>Table 14</td>
<td>Predictor variables in stepwise discriminant function analysis (Model 4)</td>
<td>69</td>
</tr>
<tr>
<td>Table 15</td>
<td>Correlations between discriminating variables and discriminant function (function structure matrix) and standardized discriminant function coefficients (Model 4)</td>
<td>70</td>
</tr>
</tbody>
</table>
Table 16: Classification analysis for ever smoking status (Model 4) ................................72
Table 17: Structure coefficients for discriminant analyses (Models 1 through 4) .............73
Table 18: Summary of classification analysis for Models 1 through 4 .........................74
Table 19: Qualitative comparison for study findings from state and national data ...........78
List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>African American</td>
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<tr>
<td>APA</td>
<td>American Psychological Association</td>
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<tr>
<td>BID</td>
<td>twice a day</td>
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<td>CBT</td>
<td>cognitive-behavioral therapy</td>
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<td>CDC</td>
<td>Centers for Disease Control</td>
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<tr>
<td>CM</td>
<td>contingency management</td>
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<tr>
<td>CO</td>
<td>carbon monoxide</td>
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<td>DZ</td>
<td>dizygotic</td>
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<td>MACC</td>
<td>Minnesota Adolescent Community Cohort</td>
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<tr>
<td>mg</td>
<td>milligram</td>
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<td>mg/d</td>
<td>milligrams per day</td>
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<tr>
<td>mg/hr</td>
<td>milligrams per hour</td>
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<tr>
<td>MZ</td>
<td>monozygotic</td>
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<td>NCI</td>
<td>National Cancer Institute</td>
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<td>NNK</td>
<td>4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone</td>
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<tr>
<td>NRT</td>
<td>nicotine replacement therapy</td>
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<tr>
<td>NSDUH</td>
<td>National Survey on Drug Use and Health</td>
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<td>OR</td>
<td>odds ratio</td>
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<td>PAH</td>
<td>polycyclic aromatic hydrocarbons</td>
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<tr>
<td>ppm</td>
<td>parts per million</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>----------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>SAMHSA</td>
<td>Substance Abuse and Mental Health Services Administration</td>
</tr>
<tr>
<td>SES</td>
<td>socioeconomic status</td>
</tr>
<tr>
<td>TSN</td>
<td>tobacco-specific nitrosamines</td>
</tr>
<tr>
<td>US</td>
<td>United States</td>
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<tr>
<td>US DHHS</td>
<td>United States Department of Health and Human Services</td>
</tr>
<tr>
<td>YRBS</td>
<td>Youth Risk Behavior Survey</td>
</tr>
</tbody>
</table>
Abstract

PREDICTORS OF SMOKING INITIATION IN AFRICAN AMERICAN ADOLESCENTS

By JENNIFER G. KIENZLE, M.S.

A dissertation submitted in partial fulfillment of the requirements for the Doctoral degree at Virginia Commonwealth University.

Virginia Commonwealth University, 2009

Major Director: Dace S. Svikis, Ph.D.
Professor, Department of Psychology and Institute for Drug and Alcohol Studies

Cigarette smoking and other forms of tobacco use are responsible for over 440,000 deaths per year in the U.S. Health consequences associated with cigarette smoking include cardiovascular disease, respiratory disease, and cancer. Despite awareness of the health risks, approximately 21% of the U.S. adult population smokes. Efforts to-date to reduce smoking-related disease and illness have focused on prevention and intervention strategies that encourage cessation.

Adolescence is a critical period for both intervention and prevention. Because more than three-fourths (80%) of adult smokers reported starting to smoke prior to the age of 18, prevention and brief intervention is likely to be most effective during this early period of time. In addition, earlier age of onset for smoking is associated with greater
subsequent dependence severity, more substantive health sequelae, and less successful outcomes following subsequent quit attempts.

Several studies have explored potential demographic and psychosocial variables that may help predict the likelihood adolescents may initiate smoking. Interestingly, many of these studies have focused predominately on Caucasian populations. Thus, is it unclear whether such findings hold true with population subgroups such as African American youth. In research to-date, AA and Caucasian groups differ in rates of smoking initiation, subsequent levels of nicotine dependence, and tobacco cessation efforts. Additionally, as adults, AA bear a disproportionate weight of smoking-related adverse health effects. Previous studies posit that certain variables (demographics, social/peer influences) may differentially influence smoking in AA adolescents. Clearly, more research is needed comparing predictors of AA adolescent smoking to those published with predominantly Caucasian adolescent samples.

The present study (N=150) employed a computer-directed assessment to examine smoking in an urban sample of AA adolescents recruited through their primary care provider. The assessment included demographic and psychosocial variables previously found to predict the likelihood of an adolescent trying a cigarette in Caucasian adolescent samples (e.g., peer smoking, adult smoking in the home, self-esteem, and self-efficacy). Findings indicated that AA adolescent smokers (ever smokers) were more likely to have friends who have tried smoking, were more likely to have adult smokers in the home, and scored lower in self-efficacy skills germane to avoiding situations where smoking was present, as compared to nonsmokers. Additionally, computerized assessment for tobacco
use was found to be useful in clinic settings. Study findings can aid in the development of specialized prevention and cessation campaigns for minority populations.
Introduction

Overview

Tobacco use is responsible for over 440,000 deaths per year in the United States (Centers for Disease Control [CDC], 2008a). Cigarette smoking is the most popular form of tobacco use in the United States, making the health consequences of smoking the leading cause of preventable deaths in the United States (CDC, 2008a). Health consequences associated with cigarette smoking include, but are not limited to, cardiovascular disease, respiratory disease, and cancer (CDC, 2008a). Annual health costs associated with these illnesses are estimated at $97 billion (CDC, 2008a).

The best approach to avoid the health and financial costs associated with smoking is to avoid initiation. For regular smokers, the most effective way to prevent tobacco-related deaths is to stop all tobacco use (United States Department of Health & Human Services [US DHHS], 1990). For example, an individual’s mortality risk from a smoking-related illness if he/she stops smoking by age 50 is reduced by 50% relative to someone who continues to smoke (US DHHS, 1990). Benefits of smoking cessation can be seen even among older adults between the ages of 60-65. If they stop smoking, they experience a 10% decrease in mortality risk from smoking-related illness for the subsequent 15 years of life (US DHHS, 1990). Despite demonstrable benefits of tobacco cessation, regular smokers find that quitting is difficult and relapse is common (Cohen & Lichtenstein, 1990). Relapse is in part due to nicotine dependence, which is generally associated with chronic tobacco use (John, Meyer, Hapke, Rumpf, & Schumann, 2004; US DHHS, 1988).
The frequent relapse associated with smoking cessation, and the overwhelming evidence that smoking cigarettes increase users’ risk of cancer and other diseases (CDC, 1993, 2002; USDHHS, 1986, 1964), has prompted the public health community to seek ways to reduce tobacco-related illness and death. Prevention campaigns and cessation interventions have been cornerstones in the public health approach to tobacco harm reduction for adults (CDC, 1999; US DHHS, 1990, 1994; Stratton, Shetty, Wallace, & Bondurant, 2001). These approaches are also used in the adolescent population, with an emphasis on prevention of smoking initiation. For adolescents who have already initiated smoking, cessation interventions are recommended. Adolescence is a particularly important time to intervene, as approximately 80% of current adult smokers initiated smoking prior to the age of 18 (US DHHS, 1994).

Social policy (i.e., legislative measures), antismoking media campaigns, and school programs are used to deter youth from trying smoking (Farrelly, Nonnemaker, Davis, & Hussin, 2009; CDC, 2007; Hersey et al., 2003; Farrelly et al., 2002; US DHHS 2000, 1994, 1989, 2000; Pentz, 1999). Results from these prevention efforts are mixed (Cummings, Sciandra, Pechacek, Orlandi, and Lynn, 1992). For example, tobacco control laws to limit minors' access to buying tobacco are not uniformly enforced (Cummings et al., 1992). Additionally, it is difficult to assess the reach of prevention programs; and efforts to inform the group may overlook the needs of individual who may be more at risk for smoking (Pentz, 1999).

For adolescents who have started smoking, cessation interventions focus on behavioral and pharmacological interventions (i.e., Killen et al., 2004; Hanson, Allen,
Jensen, & Hatsukami, 2003; Hurt et al., 2000; Smith et al., 1996). Specifically, school-based programs (Pentz, 1999), brief interventions (Yarnall, Pollak, Ostbye, Krause, & Michener, 2003), and contingency management (Roll, 2005) are used to aid adolescents with smoking cessation. For pharmacological interventions, nicotine replacement therapy (NRT) and bupropion have been used with concurrent brief counseling sessions in order to help teens quit smoking; yet, as with prevention efforts, findings have been mixed (Hurt et al., 2000; Smith et al., 1996). Specific details on prevention and cessation efforts for adolescent smoking are described in detail later in this introduction.

Etiologically, smoking behaviors are influenced by heritability. Twin and sibling research has explored the contribution of genetics to tobacco use in adolescents (Kendler, Schmitt, Aggen, Prescott, 2008; Maes et al., 2004; Rhee et al., 2003). One study assessed tobacco initiation in adolescent twins and siblings (Rhee et al., 2003). Monozygotic twin pairs (MZ), dizygotic twin pairs (DZ), biological siblings, and adoptive siblings completed interviews that included questions about tobacco initiation were from the Monitoring the Future Survey of the National Institute on drug abuse. Tobacco initiation was heavily influenced by heritability, as MZ twins were almost three times more likely to both smoke than adoptive sibling pairs (OR= 0.90 and 0.36, respectively). Interestingly, environmental variables also influenced smoking initiation in MZ twins only (Rhee et al., 2003).

In another heritability study, 1796 male-male twin pairs from the Virginia Twin Registry at Virginia Commonwealth University were interviewed about lifetime smoking (Kendler et al., 2008). Demographics, age of initiation, environmental factors, lifetime
use, and average daily cigarettes smoked per year were collected. The authors concluded that while middle adult smoking was more influenced by heritability (i.e., thirty years of age) in MZ twins, the influence of heritability among DZ twins and smoking begins to decline around age sixteen. Interestingly, smoking initiation was almost exclusively influenced by environmental variables, such as peer smoking, regardless of MZ or DZ classification (Kendler et al., 2008), suggesting heritability may play a larger role in persistent smoking rather than initiation.

Environmental and psychosocial factors also influence an adolescent's decision to start smoking. Researchers have explored and targeted several predictors for adolescent smoking, including self-esteem, self-efficacy, peer influences, and home environment (i.e., Bricker et al., 2006a; Botvin, Botvin, Baker, Dunesbury, & Goldberg, 1992; Conrad, Flay, & Hill, 1992). However, it is not known if the variables from predictor models are relevant among different groups of smokers and nonsmokers. Specifically, minority groups may not be represented in adequate sample sizes; thus, study findings may not generalize to these populations. For example, the most recent national census reports that Caucasians make up an estimated 74% of the United States population; and African Americans (AA) constitute approximately 13% of the population (Census, 2008). Several published longitudinal studies explore demographic and psychosocial variables as predictors to smoking, yet participants are predominately Caucasian (e.g., 85-98%; see Kodl & Mermelstein, 2004; Bricker et al., 2003, Chassin, Presson, Rose, Sherman, & Prost, 2002). Hence, findings from these studies may not be relevant to minority
populations, including AA. Studies within the AA population are needed to understand psychosocial variables that may contribute to smoking.

The overall aim of this proposed dissertation is to explore differences in psychosocial factors between AA adolescent Ever smokers (Smokers) and Never smokers (Nonsmokers). The following sections will discuss several topics in greater detail: adverse health effects associated with cigarette smoking, current adolescent smoking, and factors that are thought to influence the likelihood of adolescent cigarette smoking initiation and progression to daily smoking: self-esteem, self-efficacy, peer smoking, and parental smoking.

Literature Review

*Adverse Health Effects Associated with Smoking*

Cigarette use exposes smokers to numerous dangerous substances, including nicotine, CO, and other toxicants collectively known as “tar” (technically, nicotine-free, dry particulate matter; Federal Trade Commission, 2000). The following section will explore some of the adverse health effects and consequences associated with cigarette smoking.

*Nicotine Dependence*

Nicotine is the major psychoactive constituent in tobacco, and acute effects of nicotine administration include increased systolic blood pressure and increased heart rate (US DHHS, 1988). For chronic users, abstinence produces adverse symptoms such as anxiety, restlessness, and difficulty concentrating (Hughes & Hatsukami, 1986; Gross & Stitzer, 1989; Hatsukami, Skoog, Huber, & Hughes, 1991; APA, 2000). In chronic
cigarette smokers, these symptoms can appear as soon as only a few minutes after smoking a cigarette and peak in about one to four days of abstinence (Schuh & Stitzer, 1995; Hughes & Hatsukami, 1986; APA, 2000; Buchhalter, Acosta, Evans, Brelan, & Eissenberg, 2005). The aversive symptoms that occur when chronic tobacco use is terminated are generally thought to reflect an underlying level of nicotine dependence (Eissenberg, 2004), especially given that administration of pharmaceutically pure nicotine can suppress some of them (e.g., Gross & Stitzer, 1989; Hatsukami et al., 1991; Evans, Blank, Sams, Weaver, & Eissenberg, 2006). Thus, because chronic tobacco use appears to induce nicotine dependence, nicotine is considered an important motivating force behind continued tobacco use and relapse, even when users are confronted with the high financial and health costs of their behavior.

Interestingly, the health costs associated with tobacco use are not related directly to nicotine. It is the other toxicants associated with tobacco use, such as carbon monoxide (CO) and carcinogens, like polycyclic aromatic hydrocarbons (PAHs) and tobacco-specific nitrosamines (TSNs), which are responsible for the high incidence of smoking-related illness and the early death of many tobacco users.

**Cardiovascular and Respiratory Disease**

CO exposure is linked to cardiovascular (Lakier, 1992) and respiratory disease (Stewart, 1975), the second and third leading causes of death for smokers (cancer is the leading cause of death; CDC, 2008). Indeed, cardiovascular disease and respiratory illness account for approximately 126,000 and 92,900 tobacco-related deaths each year, respectively (CDC, 2008a). Once entering the body, CO is absorbed quickly by the lung
and attaches to hemoglobin (Stewart, 1975). The resultant effect is a decrease in oxygen availability in the body. This creates distress on arteries and veins, and damages the linings of body organs (Krupski, 1991).

Cancer

Tobacco cigarette smokers are exposed to 4800 different chemicals, of which 69 are considered carcinogens (Hoffman & Hoffman, 1997). The “tar” in cigarette smoke contains sixty-nine known carcinogens, including PAHs and TSNs (Hoffman, Hoffman, & El-Bayounny, 2001). Cancer --specifically, lung cancer-- is the leading cause of death for smokers (CDC, 2005). When introduced to the body, these compounds form adducts with DNA, and the presence of these adducts can result in mutagenesis, and eventually lead to cancer (Dipple, 1995; Hecht, 1998; Hecht, 2002). PAHs are a group of lung carcinogens found in foods and burned organic material, such as cigarette smoke (Hoffman et al., 1997). TSNs are compounds formed in the curing and fermentation processes of tobacco preparation. TSNs are found exclusively in all forms of tobacco products and are the most prevalent group of carcinogens found in tobacco (Hoffman & Hoffman, 1997). 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK) is sequestered in the lung (Hecht, Carmella, Ye, Le, Jensen, Zimmerman, et al., 2002) and is thought to be one of the most volatile compounds of the group (Hoffman & Hecht, 1985).

Smoking During Adolescence

The CDC estimates that approximately 3,000 youth become daily smokers each day (Gilpin, Choi, Berry, & Pierce, 1999). For middle school-aged youth, the prevalence rate for current smokers is 13.3%, while high school-aged youth report smoking at a
prevalence rate of 28.2% (CDC, 2006). Monitoring the prevalence of smoking during adolescence is important, as 80% of current adult smokers reported cigarette smoking initiation prior to turning 18 years old (US DHHS, 1994). Additionally, early adolescent tobacco use often goes undetected before progression to daily smoking and most adolescents who report daily smoking have become nicotine dependent (US DHHS, 1994). As discussed in the previous section, nicotine dependence is a strong motivator in continued cigarette smoking, despite smokers' awareness of adverse health effects. The following sections will describe prevention and cessation efforts by the public health community to decrease cigarette smoking prevalence in the adolescent population in the United States.

Reducing adolescent smoking via prevention efforts

Healthy People 2010 set a goal of reducing the prevalence rate for smoking in adolescents to 16% by 2010 (CDC, 2008b). Currently, the national average for all adolescent smoking is 21.9% (CDC, 2008b). Because the majority of smokers initiate smoking as adolescents, most prevention campaigns target this age group (US DHHS, 1994). Ideally, prevention efforts will reach an individual prior to smoking initiation, but prevention also refers to the attempt to intercept new smokers before they progress into nicotine-dependent, daily smokers. Social policy (i.e., legislative measures), school-based programs, and antismoking campaigns are used to deter youth from trying smoking (Farrelly et al., 2009; CDC, 2007; Hersey et al., 2003; Farrelly et al., 2002; US DHHS 2000, 1994, 1989; Pentz, 1999); and this section will discuss each prevention approach.
Social policy. Social policy includes legislative measures put into place to restrict minors' access to tobacco. For example, the age of purchase law, a legislative measure, is in place in order to prevent the sale of cigarettes to minors (US DHHS, 2000, 1994, 1989). Recent data show that adolescents living in communities with strict smoking regulations were less likely to smoke cigarettes by the time they reached high school (Botello-Harbaum et al., 2009). Thus, regulations in place limiting tobacco access to minors would appear effective. However, there are data suggesting that smoking regulation may not be as effective as hoped. For example, with the age of purchase law, adolescent smokers across twelve communities throughout the United States completed a survey about smoking behaviors, including how they gain access to cigarettes (Cummings et al., 1992). Sixty-seven percent of current adolescent smokers reported being able to purchase their own cigarettes; and purchase sites included large and small stores, as well as vending machines (Cummings et al., 1992). In the Global Youth Tobacco Surveillance Survey covering the years 2000-2007, 70% of American adolescent respondents reported being able to purchase cigarettes at some point during the month preceding the survey (CDC, 2008b). Taxes and price increases of cigarettes are other attempts to deter adolescents from gaining access to cigarettes. However, a recent study found that higher price on cigarettes via taxation was more likely to elicit cessation attempts, but was not likely to result in decreases in smoking initiation (DeCicca, Kenkel, & Mathios, 2008).

School-based programs. School-based programs include information sessions on the health effects of tobacco use, social influences that may encourage smoking, and
ways to handle social pressures where smoking may be involved (US DHHS, 1994). Many studies have found short-term decreases in reported cigarette smoking in adolescents who participate in school-based interventions (Rooney & Murray, 1996; US DHHS, 1994). Additionally, there is support that school-based prevention efforts can be effective in the long-term, if the prevention programs include addressing social influences, span an adequate length of time (i.e., are a minimum of fifteen sessions), and have robust short-term effects (for a review, see Flay, 2009; Wiehe, Garrison, Christakis, Ebel, & Rivara, 2005; Skara & Sussman, 2003). The most effective method for deterring smoking initiation in adolescents may be the use of evidence-based programs that address smoking in multiple facets of an adolescent's life, such as at school, home, and with friends (Krowchuk, 2005; Pentz, 1999). Indeed, in an evaluation of unsuccessful school-based programs, failure of the programs was attributed to an overall lack of attention to social context and individual smoker characteristics (Johnson et al., 2007).

_Antismoking campaigns._ National and state-level antismoking campaigns are useful in shaping knowledge, attitudes, and beliefs about smoking, including smoking behaviors (National Cancer Institute [NCI], 2008; Pierce, 2007; Farrelly, Davis, Haviland, Messeri, & Healton, 2005; Hersey et al., 2003; Wakefield, Flay, Nichter, & Giovino, 2003). On the state-level, it is estimated that a combined one billion dollars are spent on such campaigns (Siegel, 2002). A major national campaign, truth®, was developed from a prototype (used in Florida) by the Master Settlement Agreement with the tobacco industry and forty-six states in 2000 and has had promising preliminary effects (Farrelly, Nonnemaker, Davis, Hussin, 2009; Davis et al., 2007; Farrelly et al.,
A longitudinal study of adolescent smoking initiation and the truth® campaign indicated that exposure to the campaign was associated with increases of negative opinions on smoking, as well as a lower rates of smoking initiation (Farrelly et al., 2005). Responses from the National Institute on Drug Abuse' Monitoring the Youth Survey on the prevalence and opinion of smoking were compared before and after the introduction of the truth campaign in several media markets around the country. The level of exposure to the campaign varied between media markets. Between 1999 and 2002, prevalence rates declined from 25% to 18% nationally. With exposure to truth® campaign ads, it was estimated that 22% of the decline in prevalence could be attributable to the truth® campaign (Farrelly et al., 2005). Indeed, program evaluations of truth® estimate that approximately 450,000 adolescents have not initiated smoking due to exposure to truth® ads (Farrelly et al., 2009). The program appears to be cost-effective as well, as the program cost $324 million to develop, deliver, and evaluate the truth campaign; yet it is estimated that the campaign saved $1.9 billion in societal medical costs (Holtgrave, Wunderink, Vallone, & Healton, 2009).

There are many options for intercepting adolescents before they start smoking, or before they become daily smokers. One critique of prevention programs is that successful programs are not widespread, such as school-based programs; and expansion of effective programs, such as the truth® campaign should be considered. While it is ideal to intercept potential smokers before they initiate smoking and before the progression to daily smoking, this is not always possible. In these situations, adolescent smokers need cessation interventions.
Reducing adolescent smoking via cessation interventions

Data from the national 2007 Youth Risk Behavior Survey (YRBS) report that 61% of 9th-12th grader respondents tried to quit smoking at least once in their lifetime; yet only 12% were successful in quitting smoking completely (CDC, 2009). Interestingly, those who were able to quit smoking reported fewer or less severe nicotine withdrawal symptoms than those who were not able to quit (CDC, 2009). Overcoming nicotine dependence is a major barrier for smoking cessation, as the adverse symptoms associated with nicotine withdrawal makes cessation difficult and relapse frequent (APA, 2000; Hughes & Hatsukami, 1986, Cohen & Lichtenstein, 1990). For adolescent smokers, a great deal of emphasis is placed on brief interventions and behavioral interventions, including contingency management (Curry, Mermelstein, & Sporer, 2009; Schepis et al., 2008; Krishnan-Sarin et al., 2006; Dino et al., 2001). Additionally, pharmacotherapy is being explored as an aid to adolescent smokers for smoking cessation (Stevens et al., 2009; Rubinstein, Benowitz, Auerback, & Moscicki, 2008; Muramoto, Leischow, Sherrill, & Strayer, 2007; Moolchan et al., 2005; Killen et al., 2004; Hanson, Allen, Jensen, & Hatsukami, 2003). This section will discuss brief interventions, contingency management, and pharmacotherapy approaches for adolescent smoking cessation.

Brief interventions. Usually combined with, or similar to, school-based prevention programs, brief interventions often take place in schools, and consist of tobacco information sessions, including ways to turn down cigarettes, and access to quit hotlines or websites (Fritz, Wider, Hardin, & Horrocks, 2008). For school-based brief interventions, some research suggests that normative data and information on the health
consequences of smoking as well as informing smokers on the constituents of cigarettes may be effective in convincing adolescents to quit smoking (Fritz et al., 2008). Current thought is that school-based cessation programs are effective and should be implemented on a wider scale (Pentz, 1999).

Another way to intercept and engage adolescent smokers is through screenings and brief interventions at a primary care provider, or other health care provider (Stevens et al., 2009; Krainuwat, 2005; Yarnall, Pollak, Ostbye, Krause, & Michener, 2003). Assessments that include a brief intervention can be used by providers to determine if their adolescent patient is smoking (i.e., the 5 A's, Fiore et al., 2000; Epps & Manley, 1991). Unfortunately, screenings for tobacco use may not occur, due to limited face-to-face time between the provider and the adolescent. Indeed, a national study reported that if physicians were to perform all health screenings recommended by U.S. Preventive Services Task Force, it would take approximately 7.4 hours of a physician's day (Yarnell et al., 2003). Thus, some screenings are not performed, including screenings for tobacco use (Lando & Hatsukami, 1999; Thorndike, Ferris, Stafford, & Rigotti, 1999). For tobacco use, as with other substance abuse, physicians may not feel comfortable with counseling an adolescent on addiction, or there may be some other barriers (Stevens et al., 2009). Additionally, some physicians report that even if there is time to talk with the adolescent about their smoking behaviors, there is concern of negatively affecting their dialogue, or relationship, with the adolescent; and there is uncertainty on what services or interventions are appropriate for adolescents (Stevens et al., 2009; Lando & Hatsukami, 1999).
Contingency management. For a behavioral intervention, contingency management has shown promise for smoking cessation in adolescents (Schepis et al., 2008; Krishnan-Sarin et al., 2006; Roll, 2005). Contingency management works by rewarding desired behaviors (i.e., abstinence from smoking), and punishing undesired behaviors (i.e., smoking; Higgins & Petry, 1999). Reinforcement for contingency management is usually monetary-based, including cash, gift cards, and vouchers redeemable for goods (Schepis et al., 2008; Krishnan-Sarin et al., 2006; Roll, 2005). Previously implemented in behavioral modification with adult substance users and abusers, contingency management is also being used with adolescent substance users, including smokers (Schepis et al., 2008; Krishnan-Sarin et al., 2006; Roll, 2005). For example, a recent study explored the use of contingency management (CM) in tandem with cognitive-behavioral therapy (CBT) techniques (Krishnan-Sarin et al., 2006). Twenty-eight adolescent smokers interested in quitting were asked to complete a four-week study where they received either CM + CBT or CBT alone. Participants in the CM + CBT group received monetary incentive on an escalated scale for biochemical verification of smoking abstinence. That is, abstinent participants (CO < 8ppm and negative urinary cotinine) received higher amounts of reinforcement each time they came in for subsequent visits. If a participant was not compliant with abstinence from smoking, the reinforcement scale was "reset" to the original amount. Findings showed that the CM + CBT group provided significantly higher rates of verified abstinence at one and four weeks post study entry (76% and 53% versus 7% and 0%, respectively; Krishnan-Sarin
et al., 2006). Contingency management shows promise to be effective in the short- and longer-term for smoking abstinence in adolescents.

Nicotine replacement therapy (NRT). NRT is pharmacologically pure nicotine that can suppress some of the adverse withdrawal symptoms associated with smoking cessation, without exposing the individual to other lethal toxicants. Although behavioral interventions account for the majority of cessation intervention efforts with adolescents, a few studies exist that explore the use of pharmacotherapy to help adolescents quit smoking (Rubinstein, Benowitz, Auerback, & Moscicki, 2008; Muramoto, Leischow, Sherrill, & Strayer, 2007; Moolchan et al., 2005; Hanson et al., 2003). The majority of existing studies support the use of NRT in adolescents, usually in conjunction with brief counseling, as effective in smoking cessation (Moolchan et al., 2005; Hanson et al., 2003; Smith et al., 1996). For example, one study explored the effects of the nicotine patch in twenty-two, 13-17 year old adolescents who smoked a minimum of twenty cigarettes per day (Smith et al., 1996). Participants received 22mg/d nicotine patches with behavioral counseling for six weeks; then the dose was lowered to 11mg/d with counseling for two additional weeks. Abstinence was verified by expired air CO of 8ppm or lower, withdrawal symptoms, and plasma nicotine levels. Results revealed that after eight weeks, 14% of the participants were abstinent (via biochemical verification); and that one participant of the twenty-two was able to remain abstinent for at least six months (Smith et al., 1996).

Another study also reported decreased adverse nicotine withdrawal effects with the nicotine patch use, as well as compliance rates that would indicate that the nicotine
patch would be acceptable for use in the adolescent population (Hanson et al., 2003). One hundred, 13-19 year old adolescent smokers interested in quitting smoking were asked to complete a twelve-week study where participants received either active nicotine patches or placebo patches. Participants who received active nicotine patches reported significantly lower subjective withdrawal measures than those who received the placebo patch (Hanson et al., 2003). This is important because the adverse symptoms associated with nicotine withdrawal are thought to preempt relapse in smokers trying to quit; and avoidance of withdrawal symptoms may be what motivates people to continue smoking.

Conversely, there are studies where findings do not support the use of NRT in adolescents (Rubinstein et al., 2008; Hurt et al., 2000). One study involved one hundred one, 13-17 year old adolescents who smoked a minimum of ten cigarettes per day (Hurt et al., 2000). Participants received 15mg/16hr nicotine patches to use for six weeks and participated in a brief intervention. Follow-up visits were scheduled for twelve weeks and six months post-patch use. Participants were also provided a daily diary to document cigarettes smoked per day and nicotine withdrawal symptoms experienced. Outcome measures included CO (≤ 8ppm considered abstinent), subjective nicotine withdrawal, and plasma nicotine (Hurt et al., 2000). Results showed that 11% of participants were abstinent at the twelve-week follow-up, and only 5% were abstinent at six months. While these rates do not appear to be different than previous studies that support the use of NRT in adolescents (see Smith et al., 1996), the authors concluded that the nicotine patch concurrent with brief interventions was not a viable option for adolescent smokers trying to quit smoking (Hurt et al., 2000).
In another study, the nicotine nasal spray was studied for use in adolescent smokers (Rubinstein et al., 2008). Forty, 15-18 year old adolescents who reported smoking five cigarettes per day for a minimum of six months were asked to complete a twelve-week trial that included either smoking counseling alone (placebo), or counseling in addition to six weeks of *ad libitum* use of a nicotine nasal spray (not to exceed 40 doses in a day). Outcome measures included verified abstinence via expired air CO and salivary cotinine. Results showed no differences in cessation rates, cigarettes smoked per day or salivary cotinine levels (Rubinstein et al., 2008). The authors concluded that the nicotine nasal spray is not useful for smoking cessation in adolescents. More studies are needed on the use of NRT in the adolescent population for smoking cessation.

*Bupropion and Varenicline.* In addition to NRT, non-nicotinic pharmacotherapy has been explored in the adolescent population (Muramoto et al., 2007). Three hundred twelve, 14-17 year old adolescents who reported smoking a minimum of six cigarettes per day with previous quit attempts were asked to complete a six week trial of either bupropion (a nicotine antagonist, trade names are Wellbutrin and Zyban) doses of 150 mg/d, 300 mg/day, or placebo; participants also received concurrent brief counseling (Muramoto et al., 2007). Follow-up visits were completed at twelve and twenty-six weeks. Abstinence was verified via CO (≤ 10ppm) and urinary cotinine levels (≤ 50 mg/L at week two and at week six). Study findings showed that the 300 mg/d dose of bupropion was efficacious in the short-term for adolescents (Muramoto et al., 2007).

In another study with bupropion, two hundred eleven adolescents, 15-18 years of age were asked to complete a twenty-six week, double-blind assessment where they
received either bupropion (150 mg/d) and the nicotine patch or a placebo and the nicotine patch (Killen et al., 2004). Participants visited the lab weekly and outcome measures included abstinence compliance and withdrawal scales. At weeks 10 and 26, findings revealed that abstinence rates did not differ between participants who received bupropion plus the nicotine patch (23% and 8%, respectively) and participants who received placebo plus the nicotine patch (28% and 7%, respectively). Withdrawal scale scores also did not differ between the groups, suggesting there was no treatment effect for bupropion in addition to the nicotine patch.

To date, there is one study on the effects of varenicline (partial nicotinic agonist, trade name is Chantix) in adolescent smokers (Faessel, Ravva, & Williams, 2009). The study is a Pfizer, in-house pharmacokinetics, safety, and tolerance study of varenicline in the adolescent smoking population. Seventy-two adolescents were asked to participate in the two-week study and were sorted into high and low body weight because weight was a factor for tolerability in adult studies (Faessel et al., 2009). High body weight participants received one of the following: placebo, 1.0mg varenicline twice a day (BID), or 0.5mg varenicline (BID). Low body weight participants received one of the following: placebo, or 0.5 mg varenicline twice a day (BID) or 0.5mg varenicline once a day. Overall study findings suggested that varenicline is tolerated by adolescents (Faessel et al., 2009). Independent research is needed before an assessment can be made on the use of varenicline for adolescent smoking cessation.

Overall, it would appear that brief interventions, behavioral interventions, health screenings, and pharmacotherapy with concurrent cognitive therapy for smoking
cessation have some support for use with adolescent smokers. Similar to adult cessation interventions, individual-tailored efforts may be the key to helping the individual adolescent quit smoking. This may include targeting specific variables, such as genetics or psychosocial aspects of the individual in the attempt to increase the likelihood of success with smoking cessation, as well as prevention. The next section looks at variables considered important factors in the uptake of cigarette smoking by adolescents.

Demographic variables that may predict adolescent smoking

Several studies have explored factors that may predict adolescent smoking initiation, progression to daily smoking, and the development of nicotine dependence (Everett et al., 1999; US DHHS, 1994; Wilkinson, Schabath, Prokhorov, & Spitz, 2007; Khuder, Dayal, & Mutgi, 1999; Breslau & Peterson, 1996; Breslau, Fenn, & Peterson, 1993; Rubinstein et al., 2008; DiFranza, 2008; Tyc et al., 2004; O'Loughlin et al., 2003; Rojas et al., 1998; Tyas & Pederson, 1998; Breslau, Fenn, & Peterson, 1993). In review of the literature, demographic variables including parental socioeconomic status, as well as adolescent age and race are accepted as predictors for adolescent smoking initiation and progression to daily smoking (for a review, see Tyas & Pederson, 1998). The following section will review these demographic correlates of cigarette smoking in U.S. adolescents.

Parental socioeconomic status

Another predictor of adolescent smoking is parental socioeconomic status (SES; Bernat, Lazovich, Forster, Oakes, & Chen, 2009; Unger, Sun, & Johnson, 2007; Soteriades & DiFranza, 2003; Conrad et al., 1992; Tyas & Pederson, 1998; Botvin et al.,
Adolescents from lower income homes are more likely to smoke (US DHHS, 1994), leaving them at risk for progression to daily smoking, smoking more cigarettes per day, and other smoking behaviors associated with starting at a younger age (see *Age at onset of smoking* section). In one study, data from the 1993 Massachusetts Tobacco Survey were used to investigate the relationship between parental SES and adolescent smoking (Soteriades & Difranza, 2003). In a sample of 1,308 adolescents between the ages of twelve and seventeen, telephone interview data were collected and analyzed to examine the relationship between adolescent smoking and parental SES. For this study, two measures of parental SES were examined: highest level of education for one parent, and household income (categories ranged from < $10,000 to > $50,000). Research has shown parental education and household income are positively correlated with one another, and each measure was analyzed separately. Findings revealed that parental SES was inversely associated with adolescent smoking. That is, adolescents living in a lower SES household were more likely to smoke cigarettes than those living in a higher SES household. Specifically, adolescents in the lower income levels (< $20,000) were 30% more likely to smoke cigarettes than adolescents in the next household income range ($20,001-30,000), and so forth (Soteriades & Difranza, 2003).

In another study, data from the Minnesota Adolescent Community Cohort (MACC) were used to investigate geographical differences in adolescent smoking in the State of Minnesota (Bernat et al., 2009). A sample of 3,636 adolescents living in sixty areas across the State participated in the research. Via telephone interviews, measures collected included race, median household income, and poverty level. Investigators found
that lifetime smoking prevalence was associated with lower household income and higher poverty levels (Bernat et al., 2009). The authors suggested that SES data could be useful in targeting specific areas with smoking prevention and cessation efforts (Bernat et al., 2009).

Interestingly, not all studies have found a relationship between parental SES and adolescent smoking. In studies of inner-city and minority adolescents, for example, no relationship was found between parental SES and adolescent smoking (Corona, Turf, Corneille, Belgrave, & Nasim, 2009; Faulkner, Escobedo, Zhu, Chrismon, & Merritt, 1996; Botvin, Epstein, Schinke, & Diaz, 1994). For example, one study investigated risk and protective factors for adolescent smoking among AA students (Corona et al., 2009). The sample included 1,056 eighth and tenth graders who completed the 2005 Community Youth Survey in Virginia. The survey focused on four domains: school, community, family, and individual-peer. Findings showed that the strongest predictors for risk of smoking were low grades, peer drug use, and early use of other drugs (Corona et al., 2009). There was only one protective factor, which was pro-social behaviors (school domain). Interestingly, family and community variables, which would include parental SES, were not significantly associated with adolescent smoking (Corona et al, 2009).

Similarly, negative results were obtained from another study, where SES was again found to be unrelated to minority adolescent smoking (Botvin et al., 1994). The sample included 757 seventh grade AA and Latinos. In-class surveys were completed, and items included demographics (i.e., gender, age, parent education level), as well as social and environmental (i.e., peer and perceived peer smoking; parental smoking;
school performance) characteristics. Compared to having one or no smoking parents, adolescents in households where both parents smoked were almost twice as likely to try smoking; and three times as likely if at least half of their friends smoked (Botvin et al., 1994). Additionally, adolescents were seven times more likely to be a current smoker if their parents had a positive or neutral attitude towards smoking (parental smoking was not a predictor for current smoking) and twenty times more likely to be a current smoker if at least half of their friend's smoked (Botvin et al., 1994). Parental SES, as measured by parental education level, was not associated with adolescent smoking (Botvin et al., 1994).

Taken together, studies to-date yield mixed findings on the contribution of parental SES to the risk of adolescent smoking initiation. One possible explanation for such discrepant findings is that parental SES may be a moderator between smoking outcomes in adolescents and other demographic variables, rather than a direct predictor for adolescent smoking. For example, age at initiation of smoking is a strong predictor of progression to daily smoking; yet parental SES may influence progression because younger adolescent initiators from lower SES are more likely to become daily smokers than younger adolescent initiators from higher SES areas (Bernat et al. 2009). Furthermore, other variables, such as age at onset of smoking may be such strong predictors, that any additional contribution made by SES to the variance between groups may go undetected.

*Age at onset of smoking*
The majority of studies to-date finds age at smoking initiation to be a potent predictor of subsequent smoking behavior, including progression to daily smoking, development of nicotine dependence, and inability to stop smoking (Wilkinson et al., 2007; Everett et al., 1999; Khuder et al., 1999; Miller, Burgoon, Grandpre, & Alvaro, 2006; US DHHS, 1994). In one study, data from the CDC's Youth Risk Behavior Survey (YRBS) were used to investigate the influence of age at onset of smoking on current and past smoking behaviors (Everett et al., 1999). The investigator found that the younger the age at which an adolescent initiates smoking, the more likely he/she is to progress to daily smoking. Moreover, younger initiators smoke for more years than older initiators, and they smoke more cigarettes per day (Everett et al., 1999).

Additionally, adolescents who initiate smoking at a younger age (i.e., prior to age 16) report higher levels of nicotine dependence and are less likely to be successful with smoking cessation attempts (Wilkinson et al., 2007; Khuder et al., 1999; Breslau & Peterson, 1996). A sample of 1,007 young adults, between the ages of 21-30, was surveyed about current and past smoking behaviors (Breslau & Peterson, 1996). Of the entire sample, 414 (41%) reported smoking daily for a minimum of one month in their lifetime. Participants within this subgroup were then asked at what age they tried their first cigarette and their current smoking status. Participants who reported starting to smoke after the age of thirteen were almost three times more likely to be former smokers than those who initiated smoking prior to the age of thirteen (4.4% and 11.6%, respectively; Breslau & Peterson, 1996).
A potential explanation for why some youth start smoking at a younger age than others may be due to social impressions and susceptibility (Andrews et al., 2008; Miller et al., 2006; Tyc et al., 2004). For example, 712 second through fifth graders were surveyed in school (Time 1) about several demographic and psychosocial predictors for adolescent smoking initiation and then contacted for six follow-up interviews over a seven year period (Time 2-6; Andrews et al., 2006). Across these visits, participants would answer questions about their knowledge of what cigarettes are, other children they know who smoke, and the participant's behavioral intentions to smoke in the future, (either as an older child or adult). By Time 5, 20% of the participants expressed intention to smoke in the future, and 40% expressed a willingness to try cigarettes. At Time 6, 13.5% reported smoking at least once a month for the past year. Younger adolescents were more susceptible to social pressures, including smoking pressures; suggesting the influence of opinions and impressions about smoking behaviors on adolescent smoking behaviors may develop in early childhood (Andrews et al., 2008). Specifically, younger children who have more favorable impressions of smoking and who admit to have a higher willingness to try smoking are more likely to smoke in adolescence (Andrews et al., 2008). These data would support smoking prevention efforts in pre-adolescent populations, including early elementary school youth.

Race

Numerous studies to-date on adolescent smoking report that smoking prevalence rates, age at onset of smoking, number of cigarettes smoked per day, and nicotine dependence levels vary by race. The 2005 National Survey on Drug Use and Health
(NSDUH; Substance Abuse and Mental Health Services Administration [SAMHSA], 2006) found that Caucasian adolescents between the ages of 12 and 17 were nearly twice as likely to smoke cigarettes (12.8%) compared to AA adolescents (6.5%), and Hispanic rates fell in the middle (9.1%; SAMHSA, 2006). By high school, differences within gender with recent smoking are also observed: 40% Caucasian females reported smoking compared to 17% of AA females. Comparatively, 40% Caucasian males and 28% AA males smoke (CDC, 1998). Current smoking was defined as smoking on at least one day in the past 30 (CDC, 1998). Additionally, Caucasian adolescents tend to initiate smoking at a younger age, smoke for more years and become more dependent on nicotine than other racial and ethnic groups (Kandel, Kiros, Schaffran, & Hu, 2004; Griesler & Kandel, 1998; US DHHS, 1998, 1994). AA adolescents initiate cigarette smoking at a later age than Caucasians (14 versus 12 years of age, respectively; Headen, Bauman, Deane, & Koch, 1991) and are less likely to become daily smokers (Kandel, Kiros, Schaffran, & Hu, 2003). One explanation for the differences between Caucasian and AA adolescent smoking may be differences in nicotine dependence (Kandel & Chen, 2000). In the National Household Surveys on Drug Abuse (SAMHSA, 1991-1993), DSM-IV criteria for nicotine dependence was explored for racial differences in prevalence and severity (Kandel & Chen, 2000). Results showed that while adolescent rates of nicotine dependence were comparable to adults despite fewer cigarettes smoked per day, rates of nicotine dependence were higher for Caucasians than AA (Kandel & Chen, 2000). The higher level of nicotine dependence found with Caucasian adolescents may make
smoking more difficult to cease, and tolerance associated with dependence progression may lead to more cigarettes smoked per day.

Another factor that may partially explain racial differences in adolescent smoking is parental involvement. There is evidence that the degree of AA adolescent connectedness to their parents and experiences at home including dialogues about smoking may decrease AA adolescent risks for smoking (Butler, Kegler, & Escoffery, 2009; Dornelas et al., 2005; Lloyd-Richardson, Papandonatos, Kazura, Stanton, & Niaura, 2002; Clark, Scarisbrick-Hauser, Gautam, & Wirk, 1999). Comparatively, a lack of anti-tobacco messages in the home and other parental participation with Caucasian adolescents may increase the risk of smoking (Cleveland, Gibbons, Gerrard, Pomery, & Brody, 2005; Griesler et al., 2002). In one study of moderated focus groups, it was found that many parents do not deliver anti-tobacco messages in the home, particularly in Caucasian homes (Clark et al., 1999). The discrepancy may explain, at least in part, why the prevalence rate for Caucasian adolescents is higher than for AA (Clark et al., 1999); because a lack of anti-tobacco messages from parents may leave a child susceptible to pro-smoking influences. Similarly, another study interviewing AA adolescents revealed that closeness to family was a protective factor against smoking initiation (Lloyd-Richardson et al., 2002).

Taken together, initiation of cigarette smoking in adolescents varies as a function of several demographic variables. Specifically, age at onset of smoking and race are strong predictors of smoking; and group differences are quite robust. The influence of parental SES on adolescent smoking is not as consistent. Additionally, no combination of
demographic variables creates a perfect predictive model for adolescent smoking. Thus, other aspects of an adolescent's life, be they individual, home, peer, or social, are likely to contribute to the risk of smoking initiation. The following sections will discuss four psychosocial variables that appear to influence the likelihood of an adolescent experimenting with cigarette smoking. The variables include: self-esteem, self-efficacy, peer smoking, and parental/home smoking.

**Psychosocial variables that may predict adolescent smoking**

**Self-esteem and Mood in Adolescent Smoking**

Self-esteem is defined as a self-determined global assessment of one's value or worth (Petty & Cacioppo, 1996); and is thought to influence the likelihood of an adolescent trying smoking. Specifically, adolescents with high self-esteem may be less likely to smoke cigarettes (Huebner et al., 2005; Carvajal, Wiatrek, Evans, Knee, & Nash, 2000; US DHHS, 2000; Tyas & Pederson, 1998; Botvin et al., 1994), thereby serving as a protective factor. One study explored psychosocial variables and smoking behaviors in 2,029 seventh to twelfth grade adolescent females who were categorized as current, former, or never smokers (Huebner et al., 2005). Each participant completed an in-class survey on measures including lifetime cigarette smoking and self-esteem. Former smokers were defined as those who had smoked at least one cigarette in their lifetime but reported no smoking in the 30 days prior to completing the survey. Data showed that former and never smokers had similar levels of self-esteem and that scores for both groups were higher than those obtained by current smokers (Huebner et al., 2005). In theory, adolescents with high self-esteem are: less likely to flee from a situation where
they are offered a cigarette, less likely to accept another's opinion over their own, and more likely to refuse a cigarette and explain why. Conversely, adolescents with low self-esteem are likely to avoid the situation or be persuaded to smoke (Dumont & Provost, 1999).

In a study of middle school-aged adolescents, self-esteem was examined as a predictor for likelihood of smoking initiation (Carvajal et al., 2000). A sample of 2,500 sixth, seventh and eighth graders completed in-school surveys that queried about smoking status and self-esteem. The Rosenberg Self-esteem scale was used to assess levels of self esteem (Rosenberg, 1965). Older adolescents and adolescents from lower income homes reported lower levels of self-esteem, and were more likely to have smoked a cigarette than their higher self-esteem peers (Carvajal et al., 2000).

Affect is related to self-esteem and negative affect is thought to be related to smoking initiation as well as persistent smoking (Stevens, Colwell, Smith, Robinson, & McMillan, 2005). In one study, 721 adolescents participated in four, 2-hour sessions using workbooks and CBT from the Adolescent Tobacco Use Awareness and Cessation Program (ATCP). The purpose of the program is to have individuals monitor their smoking behaviors and work towards cessation (Stevens et al., 2005). Interestingly, participants completed the program as part of local court program for adolescents under the age of eighteen who were caught using tobacco. Workbooks were used to assess various items, including affect, "triggers" for smoking, and smoking history. Outcomes were compared between adolescents classified with presence or absence of a negative affect. Affect was determined by self-report of triggers for smoking in participant's
workbooks (i.e., I smoked when I was angry). Findings showed that adolescents with negative affect were more likely to report intention to smoke in the future (Stevens et al., 2005). Interestingly, negative affect also seems to influence self-efficacy; as negative affect adolescents reported lower confidence in being able to quit smoking (Stevens et al., 2005). Self-efficacy is described in more detail in the next section. Negative affect should be addressed with prevention and cessation efforts, as negative mood may interfere with intervention outcomes (Stevens et al., 2005).

Another topic associated to self-esteem is self-image and social status among one's peers. Specifically, it is thought that adolescents who view themselves as similar to smokers and stereotypes of smokers are likely to try smoking (Aloise-Young, Hennigan, & Graham, 1996). In that study, 1,200 fifth through eighth grade adolescents completed an in-school survey focused on self-image and smoking status. Smoking status was assessed at one year follow-up (Aloise-Young et al., 1996). Adolescents who identified with smokers at baseline were twice as likely to have initiated smoking during the 12 month follow-up period (Aloise-Young et al., 1996).

In addition, there is evidence that social status among peers is important with adolescent smoking, as peer-rejected adolescents and adolescents labeled "controversial" by their peers are more likely to report smoking initiation (Aloise-Young & Kaeppner, 2005). This negative peer or social image, however, was not predictive of progression from experimentation to regular use (Aloise-Young & Kaeppner, 2005).

*Self-Efficacy and Adolescent Smoking*
In general, self-efficacy is defined as an individual's perceived ability to accomplish a task or overcome a challenge (Bandura, 1977). Applied to smoking, self-efficacy refers to the ability for an individual to avoid smoking, including initiation, in various situations (Landrum Sterling et al., 2007; Tucker, Ellickson, & Klein, 2002; Botvin et al., 1994). Valid and reliable measures have been developed to assess self-efficacy with smoking cigarettes in smokers as well as nonsmokers (i.e., Lawrance & Rubinson, 1986). Self-efficacy also refers to smoking cessation and is defined as "the confidence, perceived capacity, and perceived ability that a teen possesses to quit smoking" (Heale & Griffin, 2009). As with persistent smoking, those who believe they can avoid smoking in various situations, such as when peers are smoking in their presence or if offered a cigarette when at the mall with friends, are more likely to be successful in quitting smoking (Woodruff, Conway, & Edwards, 2008; Landrum Sterling et al., 2007; Solomon, Bunn, Pirie, & Flynn, 2006). For example, a study surveyed one hundred thirty six adolescent smokers via computers in order to assess self-efficacy in the ability to quit smoking (Woodruff et al., 2008). Participants either received several online intervention sessions about smoking cessation plus surveys; or completed online surveys only. Surveys items included demographics, recent smoking behaviors, and psychosocial variables, such as self-efficacy for quitting smoking (Woodruff et al., 2008). Study findings revealed that if an individual's self-efficacy for smoking cessation was high, they were twice as likely to have been abstinent from smoking in the past week (Woodruff et al., 2008).
In another study, adolescent smokers participated in a study looking at a mass media smoking cessation campaign and smokers' affect towards smoking (Solomon et al., 2006). Adolescents were asked to complete a school-based survey and were contacted via telephone for follow-up one year later. At follow-up, there was an association between negative affect subscales of self-efficacy measures, outcome expectation measures, and weekly smoking. That is, when faced with the negative affect and social expectations to smoke, those with higher levels of self-efficacy for smoking cessation smoked fewer cigarettes than their lower self-efficacy counterparts (Solomon et al., 2006). Again, findings suggest that higher ratings of self-efficacy may predict lower levels of subsequent cigarette smoking and higher likelihood of success in cessation efforts among adolescents.

Peer smoking

Eighty percent of adult smokers initiated smoking before the age of 18 (US DHHS, 1994); hence, the majority of experimentation with cigarette smoking occurs during adolescence. Peer influence is considered a strong risk factor for initiation of teen smoking (Tyas & Pederson, 1998; US DHHS, 1994; Conrad, Flay, & Hill, 1992). Several studies indicate that peer influence and perceived rates of peer smoking can contribute to initiation of adolescent smoking (Hoffman, Monge, Chou, & Valiente, 2007; Bricker et al., 2006b; Brown, Teufel, Birch, Izenberg, & Lyness, 2006; Gritz et al., 2003; Unger, Rohrbach, Howard-Pitney, Ritt-Olson, & Mouttpa, 2001; Botvin, Botvin, Baker, Dunesbury, & Goldberg, 1992; Conrad, Flay, & Hill, 1992). This section will briefly
review studies of peer influence and perceptions of peer smoking on an adolescent's decision to initiate smoking.

Adolescence is a time of socialization outside of the home, and many teens are influenced by the behaviors of their peers. Cigarette smoking appears to be one of these behaviors (Hoffman, Monge, Chou, & Valente, 2007; Bricker et al., 2006b; Brook et al., 2006; Gritz et al., 2003; Botvin et al., 1994; Conrad et al., 1992). For example, 659 fifth, eighth, and twelfth graders completed a survey to determine their lifetime smoking status (i.e., ever or never smokers; Gritz et al., 2003). Those categorized as "never smokers" at baseline were followed for one year and then reassessed with questions about smoking status and variables that may have influenced a decision to start smoking, if they initiated during that time. Having at least one close friend who smoked was the strongest predictor of a teen's susceptibility to initiating smoking during the 1-year follow-up as well as ever smoking (OR = 3.74). Additional predictors included school trouble (OR =1.93) and living with a smoker (OR = 1.60; Gritz et al., 2003).

Interestingly, it may not be actual peer smoking, but rather the perception of normative peer smoking, which exerts the strongest influence on the smoking habits of adolescents. Several studies have found that teens think smoking prevalence is much higher among their peers than what is actually the case (Brown et al., 2006; Unger et al., 2001; Botvin et al., 1992). For example, survey data from almost seven thousand California students found that elevated perceived peer smoking status increased the likelihood of an adolescent experimenting with cigarettes (Unger et al., 2001). In another study, 916 adolescents participated in a questionnaire study that assessed participant
smoking as well as participant normative estimates of peer smoking (Botvin et al., 1992). Survey findings showed that adolescents who estimated that 50% or more of their peers smoked were significantly more likely to smoke cigarettes than those who estimated a lower proportion (Botvin et al., 1992).

The overestimation of perceived peer smoking may leave an adolescent susceptible to smoking because they view smoking as normative behavior for their age group. Interventions that provide normative data to adolescents appear to help correct misperceptions about perceived peer smoking prevalence rates (Davis et al., 2007). For example, one study reported that adolescents thought approximately 38-48% of their peers smoked (Davis et al., 2007). This estimate was significantly higher than the actual national rate of approximately 8% for middle school students and approximately 22% for high school students (CDC, 2002). One study found that when some of these youth were exposed to media campaigns showing that adolescent smoking prevalence was much lower than their estimated 38-48%, they changed their estimates with new values closer to actual national smoking rates (Davis et al., 2007).

**Parental smoking**

Parental variables can also influence adolescent smoking initiation. Specifically, parent history of smoking, current parental smoking status, and parental attitudes about smoking have all been found to correlate with adolescents starting to smoke (Butler et al., 2009; Gilman et al., 2009; Bricker et al., 2007; Bricker et al., 2006a, 2006b; Peterson et al., 2006; Hill, Hawkins, Catalano, Abbott, & Guo, 2005; Kodl & Mermelstein, 2004; Bricker et al., 2003; Chassin et al., 2002; Kegler et al., 2002; Clark et al., 1999; Kandel &
Having at least one smoking parent in an adolescent’s home increases the teen’s risk to start smoking and the progression to daily smoking (Gilman et al., 2009; Forrester, Biglan, Severson, & Smolkowski, 2007; Wilkinson et al., 2007; Bricker et al., 2006a, 2006b; Peterson et al., 2006; Hill et al., 2005; Kodl & Mermelstein, 2004; Tyc et al., 2004; Bricker et al., 2003; Kandel & Wu, 1995). For example, in a survey study of lifetime smoking behaviors with 564 adolescents between the ages of 12 and 17 and at least one of their parents, the presence of parental smoking was associated with two-fold increased risk of adolescent smoking initiation (Gilman et al., 2009). The authors described it as a “dose-response” relationship; with the longer parental smoking history, the more likely their adolescent offspring was to initiate cigarette smoking (Gilman et al., 2009).

Another study of the relationship between parental smoking and adolescent smoking initiation also reported a dose-related association (Kandel & Wu, 1995). In this particular study, 201 triads, which included a first-born adolescent between the ages of nine and seventeen along with his/her mother and father were recruited to study the relationship between parental and adolescent smoking. Survey measures included parental and adolescent smoking status and adolescent gender. As in the previous study, parental smoking, especially maternal smoking, was associated with increased likelihood of an adolescent initiating cigarette smoking (Kandel & Wu, 1995). Interestingly, it is not just a parent's current smoking status that can influence a teen's choice to start smoking, but also changes in parental smoking. For example, parental smoking cessation can also influence an adolescent's smoking behavior.
Parental smoking cessation seems to have a protective effect on adolescent smoking (Bricker et al., 2003; Chassin et al., 2002). In one study, 3,000 pre-adolescents and their parents were asked to participate in a questionnaire study about parent and offspring smoking (Bricker et al., 2003). Measures included parental smoking status when their children were 8-9 years of age and again when their children were 17-18 years of age (Bricker et al., 2003). By the time offspring had reached twelfth grade, the overall smoking rate was 24%. For offspring who had both parents smoke, one parent smoke, and no parents smoke, prevalence rates were 37%, 26%, and 14%, respectively (Bricker et al., 2003). The data showed that odds of an adolescent becoming a daily smoker decreased by as much as 39% if both parents quit smoking. If both parents never smoked, the odds of their offspring becoming daily smokers decreased 71% (Bricker et al., 2003).

A similar relationship between parental smoking cessation and adolescent smoking status were reported by Chassin and colleagues (2002). In a cross-sectional study, a survey administered to 446 adolescents and their parents with a focus on smoking status (current and lifetime). Compared to households where both parents smoked, adolescents were 1.5 times more likely to smoke than if both parents were ex-smokers (OR = 4.19 and 2.78, respectively). However, the decrease in smoking was not found if there was another smoking parent in the house, particularly if the other smoker was the mother (OR = 4.21; Chassin et al., 2002). Findings from both studies support the idea that if a smoking parent quits smoking at some point during their adolescent's life, the likelihood of the adolescent becoming a daily smoker decreases. However, the risk
will remain higher than that found if both parents never smoked, and the effect was diminished if both parents smoked and one continued to smoke while the other quit.

Finally, research has shown that parental attitudes and beliefs about cigarette smoking can also influence adolescent smoking. Specifically, certain parenting approaches seem to diminish the effects of anti-tobacco socialization in the home (Kodl & Mermelstein, 2004). For example, Kodl & Mermelstein (2004) conducted a brief in-class survey with 345 adolescents (6th, 8th, and 10th graders) and one of their parents (who completed a survey via the mail). The parent survey included items on smoking status, parenting self-efficacy, and beliefs about youth smoking. Parents with weaker parenting self-efficacy and weaker anti-smoking beliefs were more likely to have adolescents who smoked cigarettes than those with strong self-efficacy and anti-smoking beliefs (Kodl & Mermelstein, 2004).

Taken together, the summary above affirms that a variety of psychosocial variables, including self-esteem, self-efficacy, peer smoking, and parental smoking predict smoking initiation and progression in adolescents. Specifically, adolescents with lower levels of self-esteem, weaker self-efficacy, report at least one close friend who smokes, perceive peer smoking to be higher than it actually is, and/or have a parent who smokes in the home are more likely to initiate smoking that adolescents who do not have these risk factors. To date, however, the majority of studies have focused on Caucasian families and less is known about these psychosocial measures and AA adolescents. More research is needed to determine if similar patterns are found in AA populations, and how
the various psychosocial variables interact with race and other demographic variables to affect risk for smoking initiation and progression to regular/daily smoking.

Statement of the Problem

The medical, social and economic consequences of cigarette smoking in the United States are substantial. While many smokers attempt to quit each year, most are unsuccessful. High relapse rates, coupled with increased mortality and morbidity rates associated with smoking, have produced a public health crisis with renewed prevention and interventions efforts focused on reducing prevalence rates of cigarette smoking.

The majority of regular smokers smoke their first cigarette prior to the age of eighteen. Studies have consistently shown that an earlier age of onset for smoking is associated with greater dependence severity, more substantive health sequelae, and less successful outcomes following quit attempts. As a result, many prevention programs seek to delay onset of cigarette smoking. Smoking is not uniformly distributed across the US population, however, and several demographic and psychosocial variables have been found to distinguish between smokers and nonsmokers. For example, AA and Caucasian groups differ in their rates of smoking initiation, subsequent levels of nicotine dependence, and tobacco cessation efforts. Additionally, AA bear a disproportionate weight of the tobacco-related health effects associated with smoking. Previous studies posit that certain variables (personal characteristics, social/peer influences) may differentially influence smoking in AA as compared to Caucasian individuals. Understanding such differences may help to guide and tailor prevention and intervention efforts.
The Present Study

The purpose of this doctoral thesis was to compare demographic and psychosocial variables associated with smoking initiation in a sample of AA adolescents. Specifically, the proposed research recruited AA adolescents through an urban teen health clinic. Participants were surveyed about their tobacco use history and were categorized as either “smokers” (those who have tried smoking at least once, even if just a puff on a cigarette) or “nonsmokers” (those who have never tried smoking a cigarette, not even a puff).

Smoking histories and demographic as well as psychosocial questions were administered using a computer-directed assessment tool. Psychosocial domains were selected based on the research literature and include measures of self-esteem and self-efficacy as well as parental and peer smoking. Study findings are expected to provide new data that can help to inform future development of prevention and intervention efforts specific to AA adolescents.

Statement of Hypotheses

The study had five specific aims:

Aim 1. To determine the prevalence rate of smoking initiation (even one or two puffs in lifetime) in an urban medical clinic sample of AA adolescents.

Hypothesis 1: The prevalence rate for “ever smoking” in the urban clinic sample will be similar to national prevalence rates for similar demographic groups.

Aim 2. To create the frequency distribution for age at first trying a cigarette

Hypothesis 2: AA adolescents initiate smoking at later ages than Caucasian adolescents and the mean age of onset will be similar to those reported in national studies
with similar demographic groups. Specifically, the majority of AA adolescents who have tried a cigarette will report initiating smoking after the age of 14.


*Hypothesis 3:* Smokers will have lower self-esteem scores and a more negative mood states compared to Nonsmokers.

Aim 4. Compare AA Smokers and Nonsmokers on levels of self-efficacy to avoid smoking

*Hypothesis 4:* AA Smokers will be less likely to successfully avoid smoking and report lower levels of self-efficacy from smoking than AA Nonsmokers.

Aim 5. To compare social influences and environments for AA Smokers and Nonsmokers.

*Hypothesis 5:* AA Smokers will be more likely to report having at least one close friend who smokes and have at least one parent who smokes than AA Nonsmokers.
Method

The purpose of the doctoral thesis was to compare demographic and psychosocial variables in AA adolescents categorized as Smokers or Nonsmokers. The research project had five specific aims:

1) To determine the prevalence rate of smoking initiation in an urban clinic sample of AA adolescents.
2) To construct a frequency distribution for the ages at which Smokers tried their first cigarette.
3) To compare Smokers and Nonsmokers on measures of mood and self-esteem.
4) To compare Smokers and Nonsmoker adolescents on levels of self-efficacy for smoking.
5) To compare social and environmental influences that affect Smoker and Nonsmoker adolescents.

The methods for the proposed research are described below.

Selection of Participants

Study participants were 150 AA adolescents between the ages of 12 and 18 who are visiting their primary care physician for medical services at the Children's Pavilion of Virginia Commonwealth University (VCU) Medical Campus. All adolescents visiting the Children's Pavilion for a primary care visit were screened for eligibility in order to maximize rates of recruitment and sample representativeness. However, the majority of patients visiting the clinic were AA (~ 99%), so this study included analysis of AA participants only.
A total of 156 AA adolescents were enrolled in the study. However, two did not complete the entire survey. In addition, four participants completed the survey twice, hence data from their second survey were removed from the analyses, leaving a sample size of 150 for data analysis. For patients who were 18 years of age, informed consent was obtained prior to study participation. For those participants under the age of 18, consent from a parent or guardian was needed, along with participant assent to study participation.

**Inclusion Criteria**

Study inclusion criteria were as follows:

1) Between the ages of 12 and 18;

2) African American;

3) Attending the Children’s Pavilion for primary care services; and

4) Absence of any physical or cognitive impairment that would preclude ability to complete study questionnaire and provision of informed consent.

Specifically, patients must be able to manipulate a computer mouse in order to complete the assessment battery. Additionally, reading, listening and responding to questions in a timely manner is important, so adolescents with a substantive cognitive disability were not eligible for the study.

In addition, participants could complete the survey once, so anyone who had previously completed the survey was ineligible.
Recruitment, Screening, and Informed Consent Procedures

Potential participants were recruited via flyers posted in the Children's Pavilion and by approaching individuals as they waited for their medical appointment. Individuals approached in the clinic were pre-screened by age on daily log printouts provided by clinic staff. Interested volunteers were enrolled into the study after completing VCU Institutional Review Board (IRB) approved procedures. Depending upon their age, participants completed one of two informed consent procedures. For adolescents who were eighteen years of age, informed consent procedures did not require the presence of a parent or guardian and the adolescent independently made a decision whether or not to participate in the study. The person was informed about the study and the research staff member reviewed the consent form with him/her.

For potential participants between the ages of twelve and seventeen, informed consent procedures required parent or guardian approval. Additionally, a signed informed assent was obtained from the adolescent. The informed consent and assent procedure included study details, information regarding the risk/benefit ratio, confidentiality, and standard research participant rights. Questions were encouraged and immediately answered by the research staff.

For all adolescents who consented/assented to be in the study, the research staff member escorted them to a private area where they were introduced to the laptop computer, which contained the software for the standardized assessment. They were familiarized with the headphones, manipulation of the mouse, and so forth. All questions were answered prior to starting the assessment program.
Participant Safety and Rights

The informed consent discussion included information relevant to the rights of the research participant, including statements that participation was voluntary and may be refused or ceased without penalty. Additionally, the risks and benefits of participation were described. In this study, the risks of participation were minimal. Answering questions about smoking may result in anxious moods or negative feelings by the adolescents. However, no distress or anxiety from answering survey items was reported. All data was handled with professional standards of confidentiality, and names were not associated directly with data. Data was stored in locked file cabinet in a locked room.

Materials

For the survey, each participant used a laptop computer, headphones, and wireless mouse to facilitate survey completion. Study procedures are outlined below.

Procedure

Following informed consent procedures, each qualified participant was escorted to a private, confidential area of the clinic for study participation. The computerized survey required approximately 30 minutes to complete. Once participants were seated, they were asked to use a wireless mouse, and directions were given on how to handle volume control. As the survey began, participants were reminded of confidentiality and that their answers could not be linked to their name. The content of the survey is described below. The research staff member remained in an area near the participant testing station until the survey was complete. In this way, they could have intervened if there was a problem with the computer software or if the participant had a question. If the
participant's parent or guardian was present, the research staff member escorted them to an area adjacent to the computer station, where they could not see the computer screen, the questions asked, or their child's (the participant's) answers. Keeping the parent/guardian away from the computer screen removed any chance of parental bias in the participant's responses to survey items, particularly on sensitive items, such as questions about smoking or skipping school. The participant wore headphones so that the parent/guardian did not overhear item content. Once the survey was complete, the participant received $20 cash as compensation for their time and effort.

**Survey Measures**

The current study was part of a larger survey exploring health behaviors of all adolescents visiting their primary care physician at VCU's Children's Pavilion. The full computerized assessment battery of the parent study focused on a variety of domains. Specifically, the survey included questions about demographics, diet and exercise, scholastic performance, tobacco use, mood and self-esteem, etc. For the present study, independent measures included the following: demographics (age, sex, race, scholastic standing), tobacco use, self-esteem, self-efficacy on handling situations where smoking is present, peer smoking, and parental smoking. Smoker was defined as having smoked at least one puff of a cigarette in their lifetime.

The dependent measures contained in the computer-based assessment focused on three domains: the Rosenberg Self-Esteem Scale (Rosenberg, 1965); the Self-efficacy Scale for Adolescent Smoking (Lawrance, 1989); and Peer and Parental/home smoking.
Copies of all independent and dependent measures for the proposed research are included in Appendix C.

*Rosenberg Self-Esteem Scale*

The Rosenberg Self-Esteem Scale (1965) was developed as a brief yet global assessment of an individual's self-esteem. The 10 items are:

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Item Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>On the whole, I am satisfied with myself</td>
</tr>
<tr>
<td>2</td>
<td>At times, I think I am no good at all</td>
</tr>
<tr>
<td>3</td>
<td>I feel that I have a number of good qualities</td>
</tr>
<tr>
<td>4</td>
<td>I am able to do things as well as most people</td>
</tr>
<tr>
<td>5</td>
<td>I feel I do not have much to be proud of</td>
</tr>
<tr>
<td>6</td>
<td>I certainly feel useless at times</td>
</tr>
<tr>
<td>7</td>
<td>I feel that I am a valuable person</td>
</tr>
<tr>
<td>8</td>
<td>I wish I could have more respect for myself</td>
</tr>
<tr>
<td>9</td>
<td>All in all, I am inclined to think that I am a failure</td>
</tr>
<tr>
<td>10</td>
<td>I take a positive attitude toward myself</td>
</tr>
</tbody>
</table>

Participants are presented with a 4-point Likert scale on the computer screen ranging from "Strongly Disagree" to "Strongly Agree" and individual item scores ranging from 0 to 3, respectively. A general summary score is obtained by summing point totals for the ten items, with total scores ranging from 0-30. Higher scores are associated with higher levels of self-esteem, with total scores between 15 and 25 defined as "normal limits" of self-esteem. This scale was developed for adolescents, and studies have shown it is a sensitive measure of global self-esteem (Blond et al., 2008; Sung, Puskar, & Sereika, 2006).

*Self-efficacy Scale for Adolescent Smoking*

The Self-efficacy Scale for Adolescent Smoking (1989) was developed for cigarette smokers to determine predictors for future smoking behaviors. Thirty-four of the
original fifty items have been adapted for assessment of adolescent smokers (Lawrance, 1989). The items are responses to various scenarios that begin with: "How sure are you that you could resist smoking cigarettes...." Scenarios include: "when you are at a friend's house, no adults are home"; "when you are playing video games"; and "when you are at the mall with friends". The complete list of items can be found in Appendix D. Each item is presented separately on the computer screen, as a multiple choice question. It is scored on a 6-point Likert scale, ranging from 1 ("I am very sure I would smoke") to 6 ("I am very sure I would not smoke"). There are three subscales, "Social Opportunities" (items 2, 3, 5, 7, 9, 12, 18, 20, 21, 23, 30), "Emotions" (items 8, 10, 22, 24, 26, 27, 28, 29, 31), and "Friends Influence" (items 1, 6, 11, 13, 14, 15, 25, 32, 34). For each subscale, individual item raw scores are summed. Possible scores are: 11-66 for the Social Opportunities Scale and 9-54 for both the Emotions and the Friends' Influence Scales. The higher the total or subscale score, the higher the likelihood the individual will resist smoking. The present study will examine the three subscales between AA Smokers and AA Nonsmokers. This adapted version of the scale has previously shown to be sensitive in predicting the likelihood of future smoking in adolescents (see Patten et al., 2008).

Peer and Parental/Home Smoking

The computer-based assessment contained four individual items that focus peer and parental/home smoking. Items that address peer smoking included: "How many of your five closest friends have ever tried a cigarette?" and "How many of your five closest friends smoke cigarettes daily?". The two items for parental/home smoking were as follows: "Does either of your parents (or guardians) smoke cigarettes?"; and "Does
anyone who lives with you now smoke cigarettes? If so, who?". These were yes/no responses with the second question allowing the participant to select who smokes in their home (grandmother, aunt, uncle, etc.). For analysis, this enabled the inclusion of adults who they currently live with, yet may not be biological parents. For this study, only adults in the house will be used in analyses. These items helped determine the influence of peer and parental smoking on adolescent smoking.

Data Analysis

All analyses were performed using SPSS 16.0. Comparison of participant demographic characteristics between Smokers and Nonsmokers were completed using independent t-tests for continuous variables, and chi-square analyses for discrete variables. Consistent with variables in the literature thought to be predictive of smoking initiation, variables for peer smoking, adult smokers in the home, current age, self-esteem, and self-efficacy for smoking were selected \textit{a priori} for a stepwise descriptive discriminant analysis. Predictor variables with \( p < .05 \) are reported as significant.
Results

Many studies have identified demographic and psychosocial variables that predict smoking initiation in Caucasian adolescents. Specifically, the more robust predictors include age, number of adults in household who smoke and number of peers who smoke, as well as individual levels of self-esteem and self-efficacy (Bernat et al., 2009; Bricker et al., 2006a; Tyc et al., 2004; Tyas & Pederson, 1998). The present study investigated whether this same constellation of variables would predict smoking initiation in an African American sample of adolescents recruited from an urban pediatric clinic. The tobacco use measures included smoking prevalence (ever smoked a cigarette; yes/no) and age of onset (years of age when the person tried his/her first cigarette). In addition, the study descriptively compared present study findings for the African American sample with those reported in the literature with samples of predominantly Caucasian adolescents and using similar assessment measures. The following section describes study findings.

Participant group assignment and demographic and tobacco use characteristics

The sample consisted of N=150 African American teens between the ages of twelve and eighteen. Participants were categorized as Smokers (N=68; 45.3%) if they reported smoking at least one puff from a cigarette or Nonsmokers (N= 82; 54.7%) if they denied ever trying a cigarette. Demographic characteristics for the two groups and the entire sample are summarized in Table 1. Smokers were significantly older than nonsmokers, t(148) = 2.94, p < .01 and more than half of both samples were female (55.9% of smokers and 57.3% of nonsmokers).
Table 1

*Demographic Characteristics of Participants (N = 150)*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Smokers % or M (SD)</th>
<th>Nonsmokers % or M (SD)</th>
<th>Total Sample % or M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>68</td>
<td>82</td>
<td>150</td>
</tr>
<tr>
<td>Age (years)</td>
<td>15.49 (2.03)*</td>
<td>14.42 (2.32)*</td>
<td>14.90 (2.25)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>44.1</td>
<td>42.7</td>
<td>43.3</td>
</tr>
<tr>
<td>Female</td>
<td>55.9</td>
<td>57.3</td>
<td>56.7</td>
</tr>
</tbody>
</table>

*denotes significant mean differences, p < .01.
Tobacco use characteristics for participants categorized as Smokers are summarized in Table 2. The mean age at which they first tried a cigarette was 12.42 years (SD = 2.20). Male and female adolescents did not differ in their ages at first cigarette 12.91 years (SD = 1.90) for boys and 11.85 years (SD = 2.43) for girls. When lifetime smoking was examined, less than half (41.0%) of the sample reported smoking one or more puffs but denied ever smoking a whole cigarette; over one-fourth (27.9%) reported smoking between 2 and 9 cigarettes (total) in their lifetime; 4.4% reported smoking 10-24 cigarettes; and the remaining quarter (26.5%) reported having smoked 25 or more cigarettes. Of those who smoked 25 or more cigarettes in their life, exactly half of them (13.2% of entire sample) admitted to smoking five or more packs of cigarettes in their lifetime.

Nearly one-fifth of the Smokers (19.1%) reported being daily smokers at some point in their lives. Over one fourth of the sample (27.4%) reported smoking at least one cigarette in the 30 days prior to study participation, and 9.4% reported smoking between ½ pack (10 cigarettes) and 1 ½ packs (30 cigarettes) during this 30 day period. For the entire sample of smokers, time since last cigarette (even a puff) varied from “within the past week” (36.8%) to “within the past 8-30 days” (4.4%); to “more than one month but less than six months ago” (36.8%) and finally “more than one year ago” (38.2%).

Data preparation for discriminant analysis

Variables were selected *a priori* after a thorough review of the peer-reviewed studies focused on predictors of smoking initiation in primarily Caucasian adolescents. For constructs such as self-esteem and self-efficacy, standardized scales used in previous
### Table 2

_Demographic Characteristics of Smoking Participants (N = 68)_

<table>
<thead>
<tr>
<th>Measure</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lifetime smoking</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than one whole cigarette</td>
<td>28</td>
<td>41.0</td>
</tr>
<tr>
<td>2-9 cigarettes</td>
<td>19</td>
<td>27.9</td>
</tr>
<tr>
<td>10-25 cigarettes</td>
<td>3</td>
<td>4.4</td>
</tr>
<tr>
<td>26-50 cigarettes</td>
<td>8</td>
<td>11.8</td>
</tr>
<tr>
<td>51-99 cigarettes</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>100 or more cigarettes</td>
<td>9</td>
<td>13.2</td>
</tr>
<tr>
<td><strong>Daily smoking at some point in life</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>13</td>
<td>19.1</td>
</tr>
<tr>
<td>No</td>
<td>55</td>
<td>80.9</td>
</tr>
<tr>
<td><strong>Smoking during past 30 days</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>39</td>
<td>57.3</td>
</tr>
<tr>
<td>Less than one cigarette</td>
<td>11</td>
<td>16.0</td>
</tr>
<tr>
<td>1-5 cigarettes</td>
<td>14</td>
<td>20.6</td>
</tr>
<tr>
<td>6-10 cigarettes</td>
<td>2</td>
<td>2.9</td>
</tr>
<tr>
<td>11-20 cigarettes</td>
<td>2</td>
<td>2.9</td>
</tr>
</tbody>
</table>
Table 2 (continued)

Demographic Characteristics of AA AES Participants ($N = 68$)

<table>
<thead>
<tr>
<th>Measure</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last time cigarette smoked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Past week</td>
<td>25</td>
<td>36.8</td>
</tr>
<tr>
<td>Past 30 days</td>
<td>3</td>
<td>4.4</td>
</tr>
<tr>
<td>Past 6 months</td>
<td>5</td>
<td>7.4</td>
</tr>
<tr>
<td>Past 1-5 years</td>
<td>26</td>
<td>38.2</td>
</tr>
</tbody>
</table>
research or having good psychometric properties were chosen (see methods).

Specifically, the potential predictor variables included: current age (AGE), the Rosenberg Self-esteem scale (SELF-ESTEEM), number of adult smokers in the adolescent's home (ADULT), the number of close friends who smoke (PEER), and the three subscales of the Self-efficacy for adolescent smoking questionnaire [Social Opportunity (SOCIAL), Emotions (EMOTION), and Friends' Influence (INFLUENCE)]. Prior to loading independent variables into the stepwise descriptive discriminant analysis (DDA) model, correlations between all independent variables were computed and are summarized in Table 3. Correlations ranged from $r = -0.02$ (Age and Self-esteem) to $r = 0.92$ (Social opportunity and Friend's Influence self-efficacy subscales).

High levels of multicollinearity were identified between several independent variables; significant correlations are denoted in Table 3 with asterisks. This required that multiple discriminate analysis models be run so that contributions of different combinations of independent variables in predicting the outcome (Smoker or Non-smoker) could be determined. To illustrate, due to the high level of multicollinearity among the self-efficacy subscales, they were not included in the first model. The remaining outcome variables: AGE, SELF-ESTEEM, ADULT, and PEER were loaded into the first stepwise DDA. For the second DDA, the self-efficacy subscales were added to explore if they significantly increased the model’s ability to predict outcome (SMOKER or NON-SMOKER). Thereafter, two additional models were run to investigate the influence of additional combinations of the independent variables on the
Table 3

*Correlations for Predictors of Smoking Initiation in African American Adolescents*

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td>---</td>
<td>-0.02</td>
<td>-0.14</td>
<td>0.17*</td>
<td>-0.24**</td>
<td>-0.27**</td>
<td>-0.21*</td>
</tr>
<tr>
<td>2. Self-esteem</td>
<td>-0.02</td>
<td>---</td>
<td>-0.06</td>
<td>-0.01</td>
<td>0.21*</td>
<td>0.24**</td>
<td>0.19*</td>
</tr>
<tr>
<td>3. Adult smoking</td>
<td>-0.14</td>
<td>-0.06</td>
<td>---</td>
<td>0.21*</td>
<td>-0.21*</td>
<td>-0.20*</td>
<td>-0.23**</td>
</tr>
<tr>
<td>4. Peer smoking</td>
<td>0.17*</td>
<td>-0.01</td>
<td>0.21*</td>
<td>---</td>
<td>-0.41**</td>
<td>-0.46**</td>
<td>-0.44**</td>
</tr>
<tr>
<td>5. Social opportunity</td>
<td>-0.24**</td>
<td>0.21*</td>
<td>-0.21*</td>
<td>-0.41**</td>
<td>---</td>
<td>0.91**</td>
<td>0.92**</td>
</tr>
<tr>
<td>6. Emotions</td>
<td>-0.27**</td>
<td>0.24**</td>
<td>-0.20*</td>
<td>-0.46**</td>
<td>0.91**</td>
<td>---</td>
<td>0.89**</td>
</tr>
<tr>
<td>7. Friends' influence</td>
<td>-0.21*</td>
<td>0.19*</td>
<td>-0.23**</td>
<td>-0.44**</td>
<td>0.92**</td>
<td>0.89**</td>
<td>---</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01
discriminating function of the DDA. Finally, gender was included in a logistic regression in order to examine potential gender differences. Mean results for each independent variable used in the primary analyses are shown in Table 4.

**Model 1**

For the first stepwise DDA model, AGE, SELF-ESTEEM, ADULT, and PEER were entered to examine which variables maximally discriminated between the two dependent groups: Smokers and Nonsmokers. The overall Wilk's $\lambda$ for the model containing PEER, AGE, and ADULT indicated that the model did discriminate between Smokers and Nonsmokers (Wilks' $\lambda = 0.72$; $\chi^2 = 48.73$, $p < .001$; canonical correlation = 0.53). The model accounted for 45% of the variance between groups (eigenvalue = 0.45).

One-way ANOVAs were used to determine which independent variables significantly differed by means between the two groups of the dependent variable (F values are shown in Table 5). Overall, PEER [$F(1,148) = 46.85$, $p < .001$], AGE [$F(1,148) = 8.62$, $p < .01$], and ADULT [$F(1,148) = 6.56$, $p < .01$] differed significantly between Smokers and Nonsmokers; thus considered significant contributors of the DDA model. SELF-ESTEEM did not differ for this model [$F(1,148) = 1.3$, $p > .05$], or for any subsequent DDA models. For the significant contributors, a stepwise analysis was performed and all three independent variables were included. In the first step, PEER ($\lambda = 0.76$) was entered into the analysis, AGE ($\lambda = 0.95$) was added in the second step, and ADULT was added in step 3 ($\lambda = 0.96$). SELF-ESTEEM ($\lambda = 0.99$) was not included in any steps, indicating the variable would not discriminate between the two groups. As shown in Table 6, structure coefficients for the variables were as follows: 0.84 for Friend
Table 4

*Means and standard deviations of all predictor variables as a function of ever smoking status*

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Smokers</th>
<th></th>
<th></th>
<th>Nonsmokers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SEM</td>
<td>M</td>
<td>SEM</td>
<td></td>
</tr>
<tr>
<td>Close friend ever smoking***</td>
<td>2.99</td>
<td>0.53</td>
<td>1.12</td>
<td>0.43</td>
<td></td>
</tr>
<tr>
<td>Current age (years)**</td>
<td>15.49</td>
<td>0.87</td>
<td>14.43</td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>Adult smoker in the home*</td>
<td>0.96</td>
<td>0.42</td>
<td>0.57</td>
<td>0.37</td>
<td></td>
</tr>
<tr>
<td>Rosenberg Self-Esteem Scale</td>
<td>22.75</td>
<td>1.20</td>
<td>23.70</td>
<td>1.26</td>
<td></td>
</tr>
<tr>
<td><strong>Self-efficacy subscales</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social opportunity***</td>
<td>54.10</td>
<td>4.54</td>
<td>64.21</td>
<td>0.86</td>
<td></td>
</tr>
<tr>
<td>Emotions***</td>
<td>42.47</td>
<td>3.45</td>
<td>52.13</td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td>Friends' influence***</td>
<td>42.99</td>
<td>3.36</td>
<td>51.80</td>
<td>0.80</td>
<td></td>
</tr>
</tbody>
</table>

* denotes group mean differences at p < .05; ** p<.01, and ***p < .001
Table 5

*Predictor Variables in Stepwise Discriminant Function Analysis (Model 1)*

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Variables in discriminant function</th>
<th>Wilk's λ</th>
<th>Equivalent F (1, 148)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close friend ever smoking</td>
<td>1</td>
<td>0.76</td>
<td>46.85**</td>
</tr>
<tr>
<td>Age</td>
<td>2</td>
<td>0.95</td>
<td>8.62*</td>
</tr>
<tr>
<td>Adult smoker in the home</td>
<td>3</td>
<td>0.96</td>
<td>6.56*</td>
</tr>
<tr>
<td>Rosenberg Self-Esteem Scale*</td>
<td>4</td>
<td>0.99</td>
<td>1.40</td>
</tr>
</tbody>
</table>

*a not included in stepwise analysis; *p < .01; **p < .001
Table 6

Correlations Between Discriminating Variables and Discriminant Function (Function Structure Matrix) and Standardized Discriminant Function Coefficients (Model 1)

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Correlation with discriminant function</th>
<th>Standardized discriminant function coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close friend ever smoking</td>
<td>0.90</td>
<td>0.83</td>
</tr>
<tr>
<td>Age</td>
<td>0.38</td>
<td>0.40</td>
</tr>
<tr>
<td>Adult smoker in the home</td>
<td>0.34</td>
<td>0.31</td>
</tr>
<tr>
<td>Rosenberg Self-Esteem Scale&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.02</td>
<td>***</td>
</tr>
</tbody>
</table>

<sup>a</sup>variable not included in stepwise analysis
smoking, 0.40 for Current age, 0.40 for Adult smokers in the home, and 0.1 for Rosenberg Self-esteem scale; indicating that PEER was the strongest predictor of the group, followed by AGE and ADULT, respectively. The coefficients indicated that Smokers were more likely to have friends that were also smokers, were more likely to be older than Nonsmokers, and were more likely to have an adult smoker in their home, compared to Nonsmokers. When the model was re-ran as a predictor model using current data, 69.1% of AA AES and 73.2% of AA ANS were correctly classified, with 70.3% of all original grouped cases classified correctly using the three predictor variables (see Table 7).

Model 2

The second DDA model included the three Self-efficacy for adolescent smoking subscales: SOCIAL, EMOTION, and INFLUENCE, in addition to the four variables from the first model (AGE, SELF-ESTEEM, ADULT, and PEER). The overall Wilks' λ for this model indicated that it could discriminate between Smokers and Nonsmokers (Wilks' λ = 0.70; χ² = 52.22, p < .001; canonical correlation = 0.55). This model accounted for 43% of the explained variance between Smokers and Nonsmokers (eigenvalue = 0.427).

For the ANOVAs, all variables with the exception of SELF-ESTEEM significantly differed between Smokers and Nonsmokers (see Table 8). Specifically, PEER, AGE, ADULT (F and p values for PEER, AGE, and ADULT are listed above), SOCIAL [F(1, 148) = 29.98, p < .001], EMOTIONS [F (1,148) = 32.49, p < .001], and INFLUENCE [F(1,148) = 34.24, p < .001] were all found to contribute significantly to
Table 7

*Classification Analysis for Ever Smoking Status (Model 1).*

<table>
<thead>
<tr>
<th>Actual group membership</th>
<th>Predicted group membership</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ever Smoker</td>
<td>Ever Smoker</td>
<td>Never Smoker</td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Ever Smoker</td>
<td>68</td>
<td>47</td>
<td>69.10</td>
</tr>
<tr>
<td>Never Smoker</td>
<td>82</td>
<td>22</td>
<td>26.80</td>
</tr>
</tbody>
</table>

Note: Overall percentage of correctly classified cases = 71.30%
Table 8

Predictor Variables in Stepwise Discriminant Function Analysis (Model 2)

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Variables in discriminant function</th>
<th>Wilk's $\lambda$</th>
<th>Equivalent $F$ (1, 148)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close friend ever smoking</td>
<td>1</td>
<td>0.76</td>
<td>46.85**</td>
</tr>
<tr>
<td>Age$^a$</td>
<td>2</td>
<td>0.95</td>
<td>8.62*</td>
</tr>
<tr>
<td>Adult smoker in the home$^a$</td>
<td>3</td>
<td>0.96</td>
<td>6.56*</td>
</tr>
<tr>
<td>Rosenberg Self-Esteem Scale$^a$</td>
<td>4</td>
<td>0.99</td>
<td>1.40</td>
</tr>
<tr>
<td><strong>Self-efficacy subscales</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social opportunity$^a$</td>
<td>5</td>
<td>0.83</td>
<td>29.98**</td>
</tr>
<tr>
<td>Emotions$^a$</td>
<td>6</td>
<td>0.82</td>
<td>32.49**</td>
</tr>
<tr>
<td>Friends' influence</td>
<td>7</td>
<td>0.81</td>
<td>34.23**</td>
</tr>
</tbody>
</table>

$^a$not included in stepwise analysis; *p < .01; **p < .001
the discriminating factor of the model. Interestingly, and unlike Model 1, only two of the six significantly contributing variables were included in the stepwise analysis. PEER (\( \lambda = 0.76 \)) was entered in the first step, and the INFLUENCE subscale (\( \lambda = 0.81 \)) was entered into the second and final step of stepwise model as significant predictors of Ever smoking and Never smoking. As shown in Table 9, structure coefficients for the variables included in the stepwise analysis were 0.86 for PEER and -0.074 for INFLUENCE, indicating that PEER once again was the strongest predictor variable of the group; and that Smokers were more likely to have friends who have tried smoking and were more likely to try smoking when around their peers. Run as a predictor model, 72.1% of the Smokers and 80.5% of the Nonsmokers in this study were correctly classified, with an overall correct classification of 76.7% (See Table 10).

**Models 3 and 4**

Because the addition of the self-efficacy subscales in Model 2 resulted in the removal of variables that were considered significant contributors to the discriminating function between the dependent variables groups in Model 1, third and fourth stepwise DDA models were used to investigate how these contributions may change if self-efficacy subscales were removed from the analyses one by one. For example, INFLUENCE would be removed to explore potential model changes with SOCIAL and EMOTION remaining as independent variables.

Model 3 (Tables 11, 12, and 13) included AGE, SELF-ESTEEM, ADULT, PEER, SOCIAL, and EMOTION. The Wilks' \( \lambda \) for the model was significant, indicating that Model 3 could discriminate between Smokers and Nonsmokers (Wilks' \( \lambda = .71; \chi^2 = \)).
Table 9

*Correlations Between Discriminating Variables and Discriminant Function (Function Structure Matrix) and Standardized Discriminant Function Coefficients (Model 2).*

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Function 1 Correlation</th>
<th>Function 1 Standardized Discriminant Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close friend ever smoking</td>
<td>0.86</td>
<td>0.71</td>
</tr>
<tr>
<td>Adult smoker in the home&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.17</td>
<td>***</td>
</tr>
<tr>
<td>Rosenberg Self-Esteem Scale&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-0.06</td>
<td>***</td>
</tr>
<tr>
<td>Age&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.11</td>
<td>***</td>
</tr>
<tr>
<td><strong>Self-efficacy subscales</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social opportunity&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-0.66</td>
<td>***</td>
</tr>
<tr>
<td>Emotions&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-0.69</td>
<td>***</td>
</tr>
<tr>
<td>Friends' influence</td>
<td>-0.74</td>
<td>-0.53</td>
</tr>
</tbody>
</table>

<sup>a</sup>variable not included in stepwise analysis
Table 10

*Classification Analysis for Ever Smoking Status (Model 2).*

<table>
<thead>
<tr>
<th>Actual group membership</th>
<th>Predicted group membership</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ever Smoker</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>68</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>Never Smoker</td>
<td>n</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>82</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Never Smoker</td>
<td>n</td>
<td>66</td>
</tr>
</tbody>
</table>

Note: Overall percentage of correctly classified cases = 76.70%
Table 11

*Predictor Variables in Stepwise Discriminant Function Analysis (Model 3)*

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Variables in discriminant function</th>
<th>Wilk's $\lambda$</th>
<th>Equivalent $F$ (1, 148)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close friend ever smoking</td>
<td>1</td>
<td>0.76</td>
<td>46.85**</td>
</tr>
<tr>
<td>Age$^a$</td>
<td>2</td>
<td>0.95</td>
<td>8.62*</td>
</tr>
<tr>
<td>Adult smoker in the home$^a$</td>
<td>3</td>
<td>0.96</td>
<td>6.56*</td>
</tr>
<tr>
<td>Rosenberg Self-Esteem Scale$^a$</td>
<td>4</td>
<td>0.99</td>
<td>1.40</td>
</tr>
</tbody>
</table>

**Self-efficacy subscales**

| Social opportunity                               | 5                                  | 0.83             | 29.98**                 |
| Emotions$^a$                                      | 6                                  | 0.82             | 32.49**                 |

$^a$not included in stepwise analysis; *$p < .01$; **$p < .001$
### Table 12

*Correlations Between Discriminating Variables and Discriminant Function (Function Structure Matrix) and Standardized Discriminant Function Coefficients (Model 3).*

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Correlation with discriminant function</th>
<th>Standardized discriminant function coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Function 1</td>
<td>Function 1</td>
</tr>
<tr>
<td>Close friend ever smoking</td>
<td>0.87</td>
<td>0.74</td>
</tr>
<tr>
<td>Adult smoker in the home&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.16</td>
<td>***</td>
</tr>
<tr>
<td>Rosenberg Self-Esteem Scale&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-0.63</td>
<td>***</td>
</tr>
<tr>
<td>Age&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.13</td>
<td>***</td>
</tr>
<tr>
<td><strong>Self-efficacy subscales</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social opportunity&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-0.70</td>
<td>-0.51</td>
</tr>
<tr>
<td>Emotions&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-0.69</td>
<td>***</td>
</tr>
</tbody>
</table>

<sup>a</sup>variable not included in stepwise analysis
Table 13

*Classification Analysis for Ever Smoking Status (Model 3).*

<table>
<thead>
<tr>
<th>Actual group membership</th>
<th>Predicted group membership</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ever Smoker</td>
<td>Never Smoker</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>n</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Ever Smoker</td>
<td>68</td>
<td>49</td>
<td>72.10</td>
<td>19</td>
<td>27.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never Smoker</td>
<td>82</td>
<td>15</td>
<td>18.30</td>
<td>67</td>
<td>81.70</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Overall percentage of correctly classified cases = 77.30%
51.15, p < .001; canonical correlation = .54). As with Model 2, AGE, ADULT, PEER, SOCIAL, and EMOTION were determined significant contributors to the discriminating model. For the stepwise analysis, PEER was entered into the first step (structure coefficient = .87). Interestingly, now that INFLUENCE was removed from the model, SOCIAL was entered into the second and final step of the analysis (structure coefficient = -.70). Again, PEER was considered the strongest predictor of the group of variables, but SOCIAL was now considered the only other predictor to account for variance explained, indicating that Smokers were more likely to have peer ever smokers, and were more susceptible to smoking in social situations. This model accounted for 42% of the explained variance and correctly classified 72.1% of Smokers and 81.7% of AA Nonsmokers (77.3% total).

Model 4 removed SOCIAL, leaving EMOTION as the only self-efficacy subscale to remain in the stepwise DDA, in addition to the four variables of Model 1: PEER, AGE, ADULT, and SELF-ESTEEM. The Wilks' λ for this model was significant (Table 14), indicating that Model 4 could also discriminate between Smokers and Nonsmokers (Wilks' λ = .71; \( \chi^2 = 50.41, p < .001; \) canonical correlation = .54). As with all prior models, AGE, ADULT, PEER, and EMOTION were found to be significant contributors to the discriminant function of the model. For the stepwise analysis, PEER was entered into the first step (structure coefficient = 0.88, Table 15). Now that SOCIAL was removed from the model, EMOTION was entered into the second and final step of the analysis (structure coefficient = -0.733). Again, PEER was considered the strongest predictor of the group of variables, but EMOTION was now considered the only other
Table 14

*Predictor Variables in Stepwise Discriminant Function Analysis (Model 4)*

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Variables in discriminant function</th>
<th>Wilk's λ</th>
<th>Equivalent F (1, 148)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close friend ever smoking</td>
<td>1</td>
<td>0.76</td>
<td>46.85**</td>
</tr>
<tr>
<td>Age&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2</td>
<td>0.95</td>
<td>8.62*</td>
</tr>
<tr>
<td>Adult smoker in the home&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3</td>
<td>0.96</td>
<td>6.56*</td>
</tr>
<tr>
<td>Rosenberg Self-Esteem Scale&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4</td>
<td>0.99</td>
<td>1.40</td>
</tr>
<tr>
<td><strong>Self-efficacy subscales</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotions</td>
<td>5</td>
<td>0.82</td>
<td>32.49**</td>
</tr>
</tbody>
</table>

<sup>a</sup> not included in stepwise analysis; *p < .01; **p < .001
### Table 15

*Correlations Between Discriminating Variables and Discriminant Function (Function Structure Matrix) and Standardized Discriminant Function Coefficients (Model 4).*

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Correlation with discriminant function</th>
<th>Standardized discriminant function coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close friend ever smoking</td>
<td>0.88</td>
<td>0.72</td>
</tr>
<tr>
<td>Adult smoker in the home(^a)</td>
<td>0.15</td>
<td>***</td>
</tr>
<tr>
<td>Rosenberg Self-Esteem Scale(^a)</td>
<td>-0.08</td>
<td>***</td>
</tr>
<tr>
<td>Age(^a)</td>
<td>0.15</td>
<td>***</td>
</tr>
<tr>
<td><strong>Self-efficacy subscales</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotions</td>
<td>-0.73</td>
<td>-0.50</td>
</tr>
</tbody>
</table>

\(^a\)variable not included in stepwise analysis
predictor to account for variance explained, suggesting that Smokers were more likely to have friends who have tried smoking and were less likely to be able to avoid smoking in stressful, or emotional, situations. Model 4 accounted for 41% of the explained variance between Smokers and Nonsmokers. Finally, this model correctly classified 72.1% of the Smokers and 79.3% of the Nonsmokers, with an overall classification percentage of 76.0% (shown in Table 16; additionally, a matrix of all 4 models' structure coefficients and classification percentages can be found in Tables 17 and 18, respectively).
Table 16

*Classification Analysis for Ever Smoking Status (Model 4).*

<table>
<thead>
<tr>
<th>Actual group membership</th>
<th>Predicted group membership</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ever Smoker</td>
<td>Never Smoker</td>
<td></td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Ever Smoker</td>
<td>68</td>
<td>49</td>
<td>72.10</td>
</tr>
<tr>
<td>Never Smoker</td>
<td>82</td>
<td>17</td>
<td>20.70</td>
</tr>
</tbody>
</table>

Note: Overall percentage of correctly classified cases = 76.00%
Table 17

Structure coefficients for discriminant analyses (Models 1 through 4).

<table>
<thead>
<tr>
<th>Measure</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer smoking</td>
<td>0.90*</td>
<td>0.86*</td>
<td>0.87*</td>
<td>0.88*</td>
</tr>
<tr>
<td>Self-efficacy subscales (3):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friends' Influence</td>
<td>n/a</td>
<td>-0.74*</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Social Opportunity</td>
<td>n/a</td>
<td>-0.66</td>
<td>-0.70*</td>
<td>n/a</td>
</tr>
<tr>
<td>Emotions</td>
<td>n/a</td>
<td>-0.69</td>
<td>-0.69</td>
<td>-0.73*</td>
</tr>
<tr>
<td>Current age</td>
<td>0.38*</td>
<td>0.11</td>
<td>0.13</td>
<td>0.15</td>
</tr>
<tr>
<td>Adult smokers in the home</td>
<td>0.34*</td>
<td>0.17</td>
<td>0.16</td>
<td>0.15</td>
</tr>
<tr>
<td>Rosenberg Self-esteem scale</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.06</td>
<td>-0.08</td>
</tr>
</tbody>
</table>

*significant predictor for model

n/a= variable not included in model
Table 18

Summary of Classification Analysis for Models 1 through 4

<table>
<thead>
<tr>
<th>Model</th>
<th>AA AES % Correct</th>
<th>AA ANS % Correct</th>
<th>Total % Correct</th>
<th>Eigenvalue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>69.1</td>
<td>73.2</td>
<td>70.3</td>
<td>0.45</td>
</tr>
<tr>
<td>2</td>
<td>72.1</td>
<td>80.5</td>
<td>76.7</td>
<td>0.43</td>
</tr>
<tr>
<td>3</td>
<td>72.1</td>
<td>81.7</td>
<td>77.3</td>
<td>0.42</td>
</tr>
<tr>
<td>4</td>
<td>72.1</td>
<td>79.3</td>
<td>76.0</td>
<td>0.41</td>
</tr>
</tbody>
</table>
Discussion

Overview

The best way to avoid tobacco-related death and disease is to not smoke. However, despite widespread awareness of the health risks (CDC, 2008, 2005; US DHHS, 1990, 1988), approximately 21% of the U.S. adult population smokes (CDC, 1999). The frequent relapse associated with smoking cessation, and the overwhelming evidence that smoking cigarettes increases users’ risk of cancer and other diseases (CDC, 1993, 2002; USDHHS, 1986, 1964), have produced a public health crisis with renewed prevention and intervention efforts focused on reducing prevalence rates of cigarette smoking. Adolescence is a particularly important time to intervene, as approximately 80% of current adult smokers initiated smoking prior to the age of 18 (US DHHS, 1994). Studies have consistently shown that an earlier age of onset for smoking is associated with greater dependence severity, more substantive health sequelae, and less successful outcomes following quit attempts. As a result, many prevention programs seek to delay onset of cigarette smoking. Smoking is not uniformly distributed across the U.S. population, however, and several demographic and psychosocial variables have been found to distinguish between smokers and nonsmokers. For example, AA and Caucasian groups differ in their rates of smoking initiation, subsequent levels of nicotine dependence, and tobacco cessation efforts. Additionally, AA bear a disproportionate weight of the tobacco-related health effects associated with smoking. Previous studies posit that certain variables (personal characteristics, social/peer influences) may differentially influence smoking in AA as compared to Caucasian individuals. Hence,
more studies with African American adolescent are needed to explore and understand potential differences that may influence smoking initiation.

The present study employed a computer-directed assessment to examine tobacco use in an urban sample of AA adolescents visiting their primary care provider. The assessment included demographic and psychosocial variables previously found to predict the likelihood of an adolescent trying a cigarette in predominantly Caucasian adolescent samples. Demographic and psychosocial differences were found between Smoker and Nonsmoker study participants. Overall, the variables and constructs selected for this study as potential predictors of smoking initiation in AA adolescents appear to be similar to predictors of smoking in Caucasian adolescents. The significance of study findings and implications for future research as well as for clinical practice will be discussed.

In addition to primary study findings, a secondary aim of this project was to examine the feasibility of using a computer-directed program to collect data on smoking and other health behaviors in a clinical setting with an adolescent population. Overall, participant response was quite favorable, affirming the potential to effectively use such software for patient health assessments, in particular when assessment domains include potentially “sensitive:” topics such as teen smoking. The savings in practitioner time and training could be considerable. The discussion that follows, will therefore also highlight the potential clinical and economic utility of using computer-directed methods to collect patient data and potentially to also educate or intervene on health risk behaviors that could compromise a person’s health status.

Findings for predictor variables (independent variables)
First and foremost, it is important to note that the data for the present study focused solely on African American adolescents attending an urban primary care clinic. It was a convenience sample and is representative of overall demographic characteristics for the target clinic. Because the majority of adolescents attending the clinic are African American (i.e., >90%), this made it impractical to collect a sufficient number of Caucasian study participants for meaningful direct comparisons. This is clearly a study limitation (see Study contributions and limitations section below). Because a direct comparison to Caucasian youth from the same clinic was impractical, instead the present study examined the extent to which current study findings agreed or disagreed with published literature on smoking initiation among Caucasian youth. While statistical comparisons cannot be made, a comparison of absolute values and patterning as well as magnitude of various predictors will be presented with the goal of guiding future research. The studies selected for comparison purposes were chosen on the basis that one is state-wide demographic data from the Commonwealth of Virginia (Virginia Youth Tobacco Survey; VYTS); while the other studies selected use the same, if not similar, measures to the ones used in the current study. Table 18 shows general findings from the VYTS (Virginia Tobacco Settlement Foundation), as well as existing studies in the literature where the participants were predominately Caucasian.
Table 19

*Qualitative comparison for study findings to state-wide data and studies in literature*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Current Study</th>
<th>VYTS</th>
<th>Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close friend ever smoking</td>
<td>*</td>
<td>n/a</td>
<td>†2,5</td>
</tr>
<tr>
<td>Age (current)</td>
<td>*</td>
<td>n/a</td>
<td>†5,6</td>
</tr>
<tr>
<td>Adult smoker in the home</td>
<td>*</td>
<td>n/a</td>
<td>†2-6</td>
</tr>
<tr>
<td>Rosenberg Self-Esteem Scale</td>
<td>n.s.</td>
<td>n/a</td>
<td>†6</td>
</tr>
<tr>
<td>Self-efficacy subscales</td>
<td>*</td>
<td>n/a</td>
<td>†6'</td>
</tr>
<tr>
<td>Ever smoked (%)</td>
<td>45.3</td>
<td>AA- 33.3</td>
<td>33-571,7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CA- 29.1</td>
<td></td>
</tr>
</tbody>
</table>

*significantly discriminates between AES and ANS of current study
†significantly discriminates between ever and never smokers
AA=African American; CA= Caucasian

1Bernat et al., 2009
2Bricker et al., 2006a
3Kodl & Mermelstein, 2004
4Peterson et al., 2006
5Tyc et al., 2004
6Carvajal et al., 2000
7CDC, 2009

6'Survey measure not the measure used in current study, but survey items are similar
For this study, peer smoking, self-efficacy for smoking, current age, number of adults smokers in the home, and self-esteem were explored to determine if they could predict the likelihood of an adolescent initiating smoking. Overall, peer smoking appeared to be the strongest influence on the initiation of cigarette smoking in this sample of AA adolescents. That is, having close friends that have tried smoking, or are smokers, was the strongest predictor of the group of variables for predicting the likelihood a teen was a Smoker or Nonsmoker. The strength, or size, of a predictors' contribution is determined in a stepwise DDA via structure coefficients, which are simple correlations between the discriminant function and the scores of the individual variable. Thus, a predictor variable's contribution to the model increases as the coefficient value approaches 1.0. Indeed, in DDA Models 1 through 4, having close friends who have at least tried smoking was entered at the first step, with structure coefficients of 0.90, 0.86, 0.87, and 0.88.

After peer smoking, the three subscales of the Self-efficacy for smoking measure were considered the next strongest variables in discriminating between Smokers and Nonsmokers. The three subscales were Social opportunities, Emotions, and Friends' Influence. These subscales are highly inter-correlated (r ≥ .90), so Models 2, 3, and 4 were run to determine which subscales were stronger contributors in relation to each other. Model 2 found that the Friends' Influence scale was the strongest predictor of the three subscales (structure coefficient = 0.74). This is not surprising, as this subscale asks questions that include smoking tendencies around friends and was significantly correlated with Peer smoking (r = .44). When the Friends' Influence scale was removed for Model 3,
Social Opportunity moved into the second step of the DDA (structure coefficient = 0.70) and when the Emotion subscale was the only subscale represented in Model 4, it was selected as the second strongest predictor to Peer smoking (structure coefficient = 0.73).

Current age and adult smokers in the home were found to discriminate between Smokers and Nonsmokers, only when the self-efficacy subscales were not involved in the models (i.e., Model 1). Additionally, Peer smoking was a stronger predictor than either variable. In Model 1, current age (structure coefficient = 0.38) was entered into the second step and number of adult smokers (structure coefficient = 0.34) was entered into the third step of the DDA. Thus, current age was considered slightly stronger contributor to the discriminant function than having adult smokers in the home. That is, regardless if there were adult smokers in the adolescent's home, the older the adolescent, the more likely they have tried smoking. This could be due to that older adolescents are around peers more often than younger adolescents; thus, they are more likely to be influenced by the pressure to smoke by peers.

Most of the variables included in this study were found to discriminate between Smokers and Nonsmokers. The one exception would be the Rosenberg Self-esteem scale, which was not found to contribute to variance explained between Smokers and Nonsmokers in any of the DDA models. This is likely due to the similar mean scale scores between groups (Smoker = 22.8, SD = 4.6; Nonsmoker = 23.7, SD = 5.1), which are considered on the high end of "normal" levels of self-esteem (the scale runs 0-30 with 15-25 considered "normal").
Taken together, it would appear that peer smoking/influences, lower self-efficacy for avoiding smoking, current age, and having adult smokers in the home increase the likelihood of an adolescent initiating smoking. Conversely, scores on the Rosenberg Self-esteem Scale did not differ between groups, and therefore did not register as a significant predictor of ever smoking and never smoking for this study population. As shown in Table 18, findings for these variables are qualitatively similar to other studies in the literature with predominately-Caucasian participants, which could suggest there may be more similarities than differences in predictive factors for adolescents across race. However, without a quantitative comparison group, any statement for the similarity or difference across race is merely speculation.

**The use of a computerized screening for smoking in adolescents**

Findings from this study support the use of a computerized screening for smoking in an urban clinic sample of AA adolescents. Overall, adolescents were comfortable with using the computer, rates of disclosure about smoking did not appear to be affected by the presence of parents/guardians or physicians, and the survey was generally well accepted.

Despite the potential confound of having adults present in the area while the adolescent completed the questionnaire (discussed in more detail under *Study contributions and limitations*), disclosure may not have been entirely hindered. The prevalence of ever smoking in the current study population was 45.3%. This is actually higher than the 33.3% found reported for AA adolescents in the VYTS (Table 18), yet lower than the national data report of around 57.0% (CDC, 2006). These data suggest that disclosure rates were not overwhelmingly affected by the presence of adults and that the
participants probably openly answered questions about smoking. Previous studies have shown that individuals are more likely to disclose personal information to a computer, rather than to a live person in an interview setting (Newman et al., 2002).

The current study is the first to use this particular computerized screening assessment software for smoking in an adolescent population. The survey software and animated narrator, Peedy the Parrot, were for the most part, acceptable to this population. Previously used in brief motivational intervention with pregnant and postpartum women who use drugs (Ondersma, Svikis, & Schuster, 2007; Ondersma, Chase, Svikis, & Schuster, 2005), Peedy is an animated narrator that guides participants through the survey while explaining survey sections, reading questions, and keeping the participant engaged with appropriate humor (Ondersma, Chase, Svikis, & Schuster, 2005). To get an initial sense of what adolescents think of the software, the survey ended with a brief section asking participants how they liked the survey and working with Peedy. When asked if they enjoyed completing the survey, one hundred four of the one hundred fifty participants (63%) responded that they enjoyed completing the survey "very much"; twenty-six (17.3%) reported "somewhat" enjoying the survey; fifteen (10%) responded they liked the survey "a little bit"; and five (3.3%) reported they did not like the survey at all. As for acceptability of Peedy the Parrot as a narrator, responses were similar. For example, ninety-two of the one hundred participants (61.3%) reported enjoying working with Peedy "Very much". Of the remaining participants, 21 (14%) reported "somewhat" liking to work with Peedy, twenty-four (16%) reported only liking to work with Peedy "a little bit"; and thirteen (8.7%) did not like working with Peedy at all.
Overall, it would appear that disclosure of smoking experience within this population was likely not overly influenced by the presence of adults in a clinic/medical setting; and prevalence rates of ever smoking in the study fall between what is reported in state and national rates of ever smoking for AA adolescents. As for the survey software and Peedy, adolescents were receptive to the survey and most enjoyed Peedy the Parrot as a narrator. However, a more in-depth study on the acceptability of Peedy as a narrator for teen smoking surveys is needed, as the questions from this survey are limited, and acceptability of the software was not a primary aim of this study. Additionally, it would be interesting to investigate the use of this software compared to a paper-based version of the survey to determine if disclosure rates of ever-smoking would be different, as well as explore potential differences in overall satisfaction with taking the survey.

*Study contributions and limitations*

The study reported here demonstrates how computerized assessments can be used in a medical setting with adolescents in order to determine prevalence rates of smoking behaviors, as well as assess psychosocial factors that may play a role in smoking initiation. Self-reported ever smoking for this study was in-line with state and national rates, suggesting that participants felt comfortable with disclosing their smoking experiences. Using the computerized assessment rather than a paper-based or interview style has its advantages. First, using a computer with headphones ensures privacy for the participant, encouraging full disclosure of health behaviors including substance use (in this case, cigarette smoking). Second, computerized assessments can be completed while waiting to see the doctor, or after an appointment, thereby minimizing the time and effort
of clinic staff. Finally, computerized assessments are cost-effective in that upkeep of software is inexpensive and minimal staff training is needed.

Of course, there are some important limitations with this study, including the reliance on potentially biased self-report data, the lack of a quantitative comparison group, and the possibility of Type I and Type II error. With adult participants, relying on self-reported behaviors leaves room for participants to either embellish and/or omit honest disclosure in response to survey items. In this study, having adolescent participants may have resulted in an increase in expectation and experimenter bias, where the youth responded to questions as they thought their parent/guardian, doctor, or study staff would want them to respond. Thus, the implementation of this tool in a medical setting where parents/guardians, physicians, and other adult authority figures are present may confound survey responses and, in turn, study findings. To minimize the possible occurrence of a confound, specific steps were taken to ensure that the parent/guardian could not see or hear the specific questions being asked of the adolescent; and responses were also guarded by having the study staff engage the adult while the survey was taken, so the adult could not watch the adolescent. Additionally, the adolescent may have been concerned that their doctor would be told of their survey responses. The possibility of any bias in responses was countered by repeatedly assuring the participant that no one they know will see their responses, or even be able to connect their name with any survey responses.

Another potential limitation concern is the lack of a quantitative comparative group restricts the statements that can be made from the data in this study and its
findings. As discussed earlier (and shown in Table 18), findings from data analyses suggest that predictor variables for the AA adolescents in this study are similar to what has been found in the literature. However, it is unclear if these data would differ from other race groups in this sociodemographic area. Specifically, it is unknown how differences within the AA adolescent population compare to the Caucasian adolescent population in the area. For this study, enrolling equal sample sizes of AA and Caucasian was difficult, as the majority of patients visiting the clinic were lower-SES AA. Future studies should try to include representative samples across race. Additionally, administering the survey in a medical setting may have resulted in the inclusion of adolescents more at-risk for trying cigarettes, as compared to a school-based study. For example, adolescents who skip school, or have dropped out completely do so for various reasons (i.e, personality disorders, lack of adult supervision) and would likely miss surveys administered in school. So, while these groups may be more at-risk for trying smoking, they are less likely to be represented in school-based study findings. The same population may attend regular doctor visits; thus, clinic-based surveys may be more likely to include adolescents with higher risk-taking behaviors. However, for this survey, the majority of visits were for check-ups or school physicals, so it is difficult to determine if study results would have differed if administered in a school setting.

Finally, Type I and Type II errors may have influenced the findings reported. The probability of a Type I error, false significant effects, was controlled by the alpha level. The alpha level for this study was 0.05, reflecting a 5% chance that a Type I error would occur on any given measure. Thus, the probability of Type I error was limited
statistically. Type II error, which is the failure to detect a significant effect when one is present, is not controlled and is influenced by sample size, effect size, and Type I error rate. For this study, the sample size is adequate, yet a larger sample size could provide more confidence in limiting Type II error. Additionally, the use of a discriminant analysis was a statistically more powerful option than a logistic regression, thus further reducing the chance of committing Type II error.

**Overall conclusion**

In summary, identifying demographic and psychosocial variables that may predict the likelihood of smoking initiation in adolescence is important in trying to limit the number of new and established smokers in the United States. Minority groups, including AA adolescents, should be studied for differences in these variables, as AA adults bear a disproportionate weight of the tobacco-related health effects associated with smoking. The results from the current study support the notion that demographic and psychosocial variables differ between Smokers and Nonsmokers; and that the use of a computerized assessment for tobacco use has advantages and should be considered for use in clinic settings. Study findings can aid in the development of specialized prevention and cessation campaigns for minority populations; as well as inform physicians, schools, and families of factors that could influence adolescents to try smoking. Finally, future studies investigating predictors of adolescent smoking initiation should include comparable sample sizes across race; and perhaps include a larger group of predictor variables for evaluation. For computerized assessments, future studies should include comparisons of computerized and paper-based surveys for adolescent smoking assessment in a clinic.
setting; and acceptability studies for use of Peedy and the accompanying software in an adolescent population.
References


Appendix A

Informed Consent for participants 18 years of age
RESEARCH SUBJECT INFORMATION AND CONSENT FORM

TITLE: Computerized Health Behavior Screening in Adolescents: The Healthy Youth Project

VCU IRB NO.: HM11500

SPONSOR: Virginia Tobacco Settlement Foundation (VTSF)

This consent form may contain words that you do not understand. Please ask the study staff to explain any words that you do not clearly understand. You may take home an unsigned copy of this consent form to think about or discuss with family or friends before making your decision.

PURPOSE OF THE STUDY
The purpose of this research study is to look at health behaviors in adolescents.

DESCRIPTION OF THE STUDY AND YOUR INVOLVEMENT
If you decide to be in this research study, you will be asked to sign this consent form after you have had all your questions answered and understand what will happen to you during the course of the study.

In this study, you will be asked to complete a computerized survey. You will be asked a series of health-related questions. This will include questions about your exercise, diet, tobacco use, and other health-related questions. Participation in this part of the study will take approximately 25-30 minutes of your time, depending on the survey you are assigned to complete.

If you choose to participate in the study, you will be assigned a code number. All of the interview answers will be labeled by the code number only, and not with your name, or any other information that might identify you. Only members of the research team will see your answers and information is considered confidential. Answers will not be shared with anyone outside of our research team.

RISKS AND DISCOMFORTS
Few risks are expected by taking part in this study. Although we will make every effort to protect your identity, there is a minimal risk of loss of confidentiality. Also, sometimes talking about some topics can cause people to become anxious or upset. You do not have to answer any questions you do not want to, and you may stop participation at any time.

BENEFITS TO YOUR CHILD AND OTHERS
You may not get any direct benefit from this study, but the information we learn from people in this study may help us to better understand health behaviors of adolescents.

COSTS
There are no costs for participating in this study other than the time you will spend in the study (approximately 25-30 minutes total).
PAYMENT FOR PARTICIPATION
You will receive $20.00 for completing the computer-based survey.

ALTERNATIVES
You can choose not to participate in the study. A decision not to participate in this study will not affect your care at VCUHS in any way.

CONFIDENTIALITY
We will not tell anyone the answers you give us; however, information from the study, the consent form signed by you may be looked at or copied for research or legal purposes by the sponsor of the research, or by Virginia Commonwealth University. Personal information about your child might be shared with or copied by authorized officials of the Federal Food and Drug Administration, or the Department of Health and Human Services (if applicable). What we find from this study may be presented at meetings or published in papers, but your name will not ever be used in these presentations or papers.

The information you give us will be stored in a locked cabinet.

VOLUNTARY PARTICIPATION AND WITHDRAWAL
You do not have to participate in this study. If you participate, you may stop at any time without any penalty. You may also choose not to answer particular questions that are asked in the study. A decision to not participate or withdraw from the study will in no way affect your care at VCUHS.

QUESTIONS
In the future, you may have questions about your participation in this study. If you have any questions, complaints, or concerns about the research, contact:

Dr. Lori Keyser-Marcus
1001 E Broad Street, Old City Hall
PO Box 980343
Richmond VA 23298-0343
Telephone (804) 827-1727

If you have any questions about your rights as a participant in this study, you may contact:

Office for Research
Virginia Commonwealth University
800 East Leigh Street, Suite 113
P.O. Box 980568
Richmond, VA  23298  
Telephone:  804-827-2157

You may also contact this number for general questions, concerns or complaints about the research. Please call this number if you cannot reach the research team or wish to talk to someone else. Additional information about participation in research studies can be found at http://www.research.vcu.edu/irb/volunteers.htm.

CONSENT

I have been given the chance to read this consent form. I understand the information about this study. Questions that I wanted to ask about the study have been answered. My signature says that I am willing to participate in this study. I will receive a copy of the consent form once I have agreed to participate.

____________________________________________________________________

Participant name printed  Participant signature  Date

____________________________________________________________________

Name of Person Conducting Informed Consent  Discussion / Witness  
(Printed)

____________________________________________________________________

Signature of Person Conducting Informed Consent  Date  Discussion / Witness

____________________________________________________________________

Investigator Signature (if different from above)  Date
Appendix B
Parental Informed Consent for Participants 12-17 Years of Age
RESEARCH SUBJECT INFORMATION AND PARENTAL CONSENT FORM

TITLE: Computerized Health Behavior Screening in Adolescents: The Healthy Youth Project

VCU IRB NO.: HM11500

SPONSOR: Virginia Tobacco Settlement Foundation (VTSF)

This consent form may contain words that you do not understand. Please ask the study staff to explain any words that you do not clearly understand. You may take home an unsigned copy of this consent form to think about or discuss with family or friends before making your decision.

PURPOSE OF THE STUDY
The purpose of this research study is to look at health behaviors in adolescents.

DESCRIPTION OF THE STUDY AND YOUR INVOLVEMENT
If you decide to allow your child to be in this research study, you will be asked to sign this consent form after you have had all your questions answered and understand what will happen to your child during the course of the study.

In this study, your child will be asked to complete a computerized survey. Your child will be asked a series of health-related questions. This will include questions about his or her amount of exercise, diet, tobacco use, and other health-related questions. Participation in the study will take approximately 25-30 minutes of your child’s time.

If you choose to allow your child to participate in the study, he/she will be assigned a code number. All of their interview answers will be labeled by the code number only, and not with his or her name, or any other information that might identify them. Only members of the research team will see your child’s answers and information is considered confidential. Answers will not be shared with anyone outside of our research team.

RISKS AND DISCOMFORTS
Few risks are expected by taking part in this study. Although we will make every effort to protect your child’s identity, there is a minimal risk of loss of confidentiality. Also, sometimes talking about some topics can cause people to become anxious or upset. Your child does not have to answer any questions they do not want to, and either you or they may stop participation at any time.

BENEFITS TO YOUR CHILD AND OTHERS
You and your child may not get any direct benefit from this study, but the information we learn from people in this study may help us to better understand health behaviors of adolescents.

COSTS
There are no costs for participating in this study other than the time your child will spend in the study (approximately 25-30 minutes total).
PAYMENT FOR PARTICIPATION
Your child will receive $20.00 for completing the computer-based survey.

ALTERNATIVES
You can choose not to allow your child to participate in the study. A decision not to participate in this study will not affect your child’s care at VCUHS in any way.

CONFIDENTIALITY
We will not tell anyone the answers your child give us; however, information from the study, the consent form signed by you, and the assent section signed by your child may be looked at or copied for research or legal purposes by the sponsor of the research, or by Virginia Commonwealth University. Personal information about your child might be shared with or copied by authorized officials of the Federal Food and Drug Administration, or the Department of Health and Human Services (if applicable). What we find from this study may be presented at meetings or published in papers, but your child’s name will not ever be used in these presentations or papers.

The information you and your child give us will be stored in a locked cabinet.

VOLUNTARY PARTICIPATION AND WITHDRAWAL
You do not have to allow your child to participate in this study. If you allow your child to participate, your child may stop at any time without any penalty. Your child may also choose not to answer particular questions that are asked in the study. A decision to not participate or withdraw from the study will in no way affect the care of you or your child at VCUHS.

QUESTIONS
In the future, you may have questions about your child’s participation in this study. If you have any questions, complaints, or concerns about the research, contact:

Dr. Lori Keyser-Marcus
1001 E Broad Street, Old City Hall
PO Box 980343
Richmond VA 23298-0343
Telephone (804) 827-1727

If you have any questions about your child’s rights as a participant in this study, you may contact:

Office for Research
CONSENT

I have been given the chance to read this consent form. I understand the information about this study. Questions that I wanted to ask about the study have been answered. My signature says that I am willing to allow my child to participate in this study. I will receive a copy of the consent form once I have agreed to participate.

Parent/Guardian name printed   Parent/Guardian signature   Date

Name of Person Conducting Informed Consent Discussion / Witness (Printed)

Signature of Person Conducting Informed Consent Discussion / Witness   Date

Investigator Signature (if different from above)   Date
Appendix C
Informed Assent for participants 12-17 years of age
YOUTH ASSENT FORM

TITLE: Computerized Health Behavior Screening in Adolescents:
   The Healthy Youth Project

VCU IRB NO.: HM 11500

This form may contain words that you do not know. Please ask someone to explain any words
that you do not know. You may take home a copy of this form to think about and talk to your
parents about before you decide if you want to be in this study.

WHAT IS THIS STUDY ABOUT?
The purpose of this research study is to look at health behaviors in young people.

WHAT WILL HAPPEN TO ME IF I CHOOSE TO BE IN THIS STUDY?
In this study, you will be asked to complete one of two versions of a survey on a computer. The
survey will ask you questions about your health behaviors (like the foods you eat, how much
exercise you get, and if you smoke cigarettes). It will take you about 25 minutes to a half an hour
to finish the survey.

If you decide to be in the study, you will be assigned a code number. All of your answers to the
computer survey will be labeled with the code number only, and not your name, or any other
information that might identify you. Only members of our research team will see your answers.
They will not be shared with anyone outside of our research team.

If you decide to be in this research study, you will be asked to sign this form. Do not sign the
form until you have all your questions answered, and understand what will happen to you.

WHAT MIGHT HAPPEN IF I AM IN THIS STUDY?
Sometimes answering questions about some of these topics makes people upset. You do not have
to answer any questions that you don't want to. You can stop the survey at any time. If you do
become upset, the people running the study will help you.

WHAT DO I GET IF I AM IN THIS STUDY?
You will get $20.00 for doing the survey on the computer today.

WILL YOU TELL ANYONE WHAT I SAY?
We will not tell anyone the answers you give us. We will not share your answers with your
teachers or parents or friends. If you tell us that someone is hurting you, or that you might hurt
yourself or someone else, the law requires us to let people in authority know so they can help you.

If we talk about this study in speeches or writings, we will never use your name.

DO I HAVE TO BE IN THIS STUDY?
You do not have to be in this study. If you choose to be in the study, you may stop at any time. No one will blame you or criticize if you drop out of the study. If you decide not to be in this study, or decide to stop being in the study before you finish the surveys, it will not change the care you are getting from your doctor here at VCUHS.

**QUESTIONS**

If you have questions about being in this study, you can talk to the following persons or you can have your parent or another adult call:

Dr. Lori Keyser-Marcus  
1001 E Broad Street, Old City Hall  
PO Box 980343  
Richmond VA 23298-0343  
Telephone (804) 827-1727

Do not sign this form if you have any questions. Be sure someone answers your questions.

**ASSENT**

I have read this form. I understand the information about this study. I am willing to be in this study.

Youth name printed                        Youth signature                        Date

Name of Person Conducting Informed Assent  
Discussion / Witness, printed

Signature of Person Conducting Informed Assent  
Discussion / Witness                        Date
Appendix D
Dependent Measures Used in Study
The Rosenberg Self-Esteem Scale (Rosenberg, 1965)

Instructions: Below is a list of statements dealing with your general feelings about yourself. If you strongly agree, circle **SA**. If you agree with the statement, circle **A**. If you disagree, circle **D**. If you strongly disagree, circle **SD**.

1. On the whole, I am satisfied with myself. **SA** **A** **D** **SD**
2. At times, I think I am no good at all. **SA** **A** **D** **SD**
3. I feel that I have a number of good qualities. **SA** **A** **D** **SD**
4. I am able to do things as well as most other people. **SA** **A** **D** **SD**
5. I feel I do not have much to be proud of. **SA** **A** **D** **SD**
6. I certainly feel useless at times. **SA** **A** **D** **SD**
7. I feel that I’m a person of worth, at least on an equal plane with others. **SA** **A** **D** **SD**
8. I wish I could have more respect for myself. **SA** **A** **D** **SD**
9. All in all, I am inclined to feel that I am a failure. **SA** **A** **D** **SD**
10. I take a positive attitude toward myself. **SA** **A** **D** **SD**
The Self-efficacy Scale for Adolescent Smoking (Lawrance, 1989)

**Smoking Survey**
The following items ask you to describe your ability to handle smoking situations. Your answers will be kept secret. Not even your teacher or parents will see them. You do not need to write your name on the paper. Please try to answer as honestly as you can.
The following pages contain a list of situations in which young people may find themselves smoking cigarettes. Sometimes it is easier to resist smoking than at other times. In the column at the right, place the number from 1 to 6 using the scale below to show how much you could resist smoking in each case.

<table>
<thead>
<tr>
<th></th>
<th>1 I am very sure I would smoke</th>
<th>2 I most likely would smoke</th>
<th>3 I probably would smoke</th>
<th>4 I probably would NOT smoke</th>
<th>5 I most likely would NOT smoke</th>
<th>6 I am very sure I would NOT smoke</th>
</tr>
</thead>
</table>

**Example**

HOW SURE ARE YOU THAT YOU COULD RESIST SMOKING CIGARETTEs:
When your best friend is smoking………………………………………………………..2
If you think that you would most likely smoke too, then you would put a number 2 in the right hand space or the number (1 through 6) of the best answer for you.

<table>
<thead>
<tr>
<th></th>
<th>1 I am very sure I would smoke</th>
<th>2 I most likely would smoke</th>
<th>3 I probably would smoke</th>
<th>4 I probably would NOT smoke</th>
<th>5 I most likely would NOT smoke</th>
<th>6 I am very sure I would NOT smoke</th>
</tr>
</thead>
</table>

1. When you are at a friend’s house, no adults are home………………..  
2. When you are playing video games……………………………………….  
3. When you are at the mall with friends………………………………...  
4. When you are roller skating……………………………………………  
5. When you are watching TV………………………………………………  
6. When you see others smoking……………………………………………  

HOW SURE ARE YOU THAT YOU COULD RESIST SMOKING CIGARETTEs:
7. When you are doing homework………………………………………….  
8. When you are uptight…………………………………………………….  
9. When you are riding your bike………………………………………….  
10. When you are angry……………………………………………………….  
11. When you are at a party………………………………………………….  

115
12. When you are at school during recess or after school.

HOW SURE ARE YOU THAT YOU COULD RESIST SMOKING CIGARETTES:
13. When someone offers you a cigarette.
14. When you want to look cool.
15. When you want to feel more grown up.
16. When you are bored.
17. When you want to look better.
18. When you want to take a break from studying.

HOW SURE ARE YOU THAT YOU COULD RESIST SMOKING CIGARETTES:
19. When you feel ashamed.
20. When you are waiting to go into the movies.
21. When you are waiting for someone.
22. When you feel restless.
23. When you are playing in your neighborhood.
24. When you feel frustrated.

HOW SURE ARE YOU THAT YOU COULD RESIST SMOKING CIGARETTES:
25. When you want to feel more accepted by friends.
26. When you are worried.
27. When you feel upset.
28. When you feel down.
29. When you feel nervous.
30. When you are on the way home from school.

HOW SURE ARE YOU THAT YOU COULD RESIST SMOKING CIGARETTES:
31. When you feel sad.
32. When your best friend is smoking.
33. When you are listening to rock music.
34. When your friends are smoking.
35. When you are by yourself.
36. When your brother or sister is smoking........................... _________

THANK YOU for your help.
Peer and Parental smoking.

**PEER SMOKING**
1. How many of your five closest friends have ever tried a cigarette? _____
   - a. 0
   - b. 1
   - c. 2
   - d. 3
   - e. 4
   - f. 5
2. How many of your five closest friends smoke cigarettes daily? _____
   - a. 0
   - b. 1
   - c. 2
   - d. 3
   - e. 4
   - f. 5
3. How do you agree with the following statement: “Most of my friends think that I should smoke cigarettes”?
   - □ Strongly disagree
   - □ Slightly disagree
   - □ Neither agree nor disagree
   - □ Slightly agree
   - □ Strongly agree

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**PARENTAL SOCIAL INFLUENCES**
1. Does either of your parents (or guardians) smoke cigarettes?
   - □ Yes, both parents (or guardians)
   - □ Yes, mother (or female guardian) only
   - □ Yes, father (or male guardian) only
   - □ No, neither parent
2. What would your mother or father expect you to do?
   - □ Definitely not smoke
   - □ Maybe smoke
   - □ Definitely smoke
   - □ I don’t know
3. Have you ever felt pressure **not** to smoke from your mother or father?
   - □ Never
   - □ Hardly ever/rarely
   - □ Sometimes
   - □ Often/most of the time
   - □ All of the time
4. Do you think you will be a daily smoker at the time you finish high school?
   □ Yes
   □ No
VITA

Jennifer Gray Kienzle was born in Kansas City, Missouri, on June 6, 1977. She is a graduate of Thomas Dale High School in Chester, VA, and has a B.S. in Psychology from James Madison University, which she received in 2000. She entered the Biopsychology Program at Virginia Commonwealth University in August of 2005, and received her M.S. in Biopsychology in 2007.