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Examining the Association between Parental Smoking and Adolescent Age of Smoking Initiation in Africa

Jessica Lauren Howell

ABSTRACT

JESSICA HOWELL
Examining the Association Between Parental Smoking and Adolescent Age of Smoking Initiation in Africa
(Under the direction of Michael Eriksen, Faculty Member)

Tobacco use is responsible for millions of preventable illnesses and deaths throughout the world. Nevertheless, multitudes of people begin smoking every day, most before reaching the age of 18. Previous research suggests that parental smoking status is a significant predictor of adolescent smoking. Furthermore, parental smoking status may also be associated with a younger age of smoking initiation, which increases a person's risk of nicotine dependence, cancer, and death. This study examines the association between parental smoking and adolescent age of smoking initiation in 14 African countries. Data for this study was obtained from the Global Youth Tobacco Survey from 2003 – present. Parental smoking status was significantly associated with a younger age of adolescent smoking initiation; maternal smoking had a greater influence than paternal smoking. Gender was also significantly associated with age of initiation; girls are smoking at a younger age than boys. In addition, parental smoking was significantly associated with current smoking among adolescents. The tobacco industry is increasingly targeting these countries to market products to women and adolescents, among whom smoking prevalence is currently low. More rigorous examinations of the association between parent and adolescent smoking in developing countries are needed. Immediate and compelling interventions in the areas of education for parents and adolescents on the health consequences of smoking, access to cessation benefits, and policies to reduce the visibility of smoking are critical steps to preventing tobacco-related death and disease.

INDEX WORDS: smoking, age of initiation, adolescent, parent, tobacco, Africa

EXAMINING THE ASSOCIATION BETWEEN PARENTAL SMOKING AND ADOLESCENT AGE OF SMOKING INITIATION IN AFRICA

by

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CHAPTER I

INTRODUCTION

1.1 Background

Tobacco use is widely recognized as the most preventable cause of death in the world. Nevertheless, approximately 1.25 billion people continue to smoke tobacco and nearly 5.4 million people die each year from tobacco-related illnesses (Mackay, Eriksen, & Shafey, 2006; World Health Organization [WHO], 2008). The World Health Organization (WHO) estimates that if current tobacco use trends continue, as many as one billion people could die in the 21st century (WHO, 2008). Cigarette smoking is one type of tobacco use and is a major cause of lung, pharynx and esophageal cancer (American Cancer Society [ACS], 2008). Smoking causes heart disease, emphysema, and stroke; it also causes reproductive problems in women (ACS, 2008). Young smokers have significantly higher odds of developing coronary atherosclerosis, or heart disease (Zieske et al., 2005).

Tobacco use has reached a plateau in many developed countries, allowing for a decline in tobacco-related mortality over the next several decades (Mathers & Loncar, 2006). In contrast, developing nations are increasing tobacco use and approximately 80% of tobacco-related mortality is projected to impact these countries by the year 2030 (WHO, 2008). Furthermore, smoking-attributable mortality among individuals between 30 and 69 years of age is of a greater proportion in developing countries than in higher income countries (Ezzati & Lopez, 2003). The loss of individuals in this age group

translates into a substantial loss to the workforce, further perpetuating poverty and economic hardship in lower-income countries (WHO, 2004).

Prevalence of tobacco use varies widely among developing nations and even more so among men and women. About 50% of men and fewer than 10% of women smoke in developing countries (Mackay et al., 2006). Thus, the tobacco industry has already identified these countries as new markets, targeting women and young people with aggressive marketing strategies and a variety of tactics to repeal advertising restrictions and suppress tax increases (WHO, 2008; Sebrie & Glantz, 2006; Samet, Wipfli, Perez-Padilla, & Yach, 2006). Prevalence of smoking among youth also varies across regions of the world, ranging from 4.3% in Southeast Asia to almost 18% in the European region (Warren, Jones, Eriksen, & Asma, 2006). Throughout the world, more than half of youth are exposed to secondhand smoke in their home (Warren et al., 2006).

Specifically, developing nations in Africa are an attractive market to tobacco companies. While much attention is paid to the immediate threats presented by communicable diseases, specifically HIV/AIDS and malaria, public health officials have only weakly, if at all, addressed the problems associated with tobacco use. In Africa, adult smoking prevalence ranges from approximately 3% in Ethiopia to 20% in Namibia; however other forms of tobacco use, such as rolled tobacco leaves and pipes are more common than cigarettes (Warren et al., 2006; Shafey, Dolwick, & Guindon, 2003). On average, 13% of boys and 5.8% of girls in Africa smoke cigarettes (Warren et al., 2006).

In an effort to prevent individuals from initiating tobacco use, much research has been conducted to determine who is at risk for smoking and how to focus prevention efforts. Research shows that while tobacco use is often perceived as an adult activity,

most people begin smoking prior to age 18 (U.S. Department of Health and Human Services [HHS], 1994). Moreover, people who have not started smoking by age 21 are unlikely to ever start (HHS, 1994). While the decision to begin smoking is usually made prior to adulthood, the resulting morbidity and mortality do not occur for some decades; leading some to conceptualize nicotine dependence as a "pediatric disease" (Kessler et al., 1997).

Many factors appear to be associated with young people becoming smokers. They include parental and peer smoking status, parenting style, genetics, and exposure to advertising, in addition to others. Parental smoking is of particular interest, as it presents a unique opportunity for public health intervention – helping parents quit and preventing adolescents from beginning. A recent report of the US Surgeon General concluded that evidence of the influence of parental smoking was only weakly associated with youth smoking initiation, while peer smoking appeared to have the strongest relationship with trying smoking (HHS, 1994). Since that report, however, numerous studies have challenged that conclusion, not only finding that parental smoking is a strong predictor of youth smoking, but also that peer influence is often inadequately conceptualized and misinterpreted (Arnett, 2007).

Much is yet to be learned about adolescent smoking and the effects of nicotine on young people. Current evidence posits that adolescents are highly susceptible to developing symptoms of tobacco dependence sooner and with less frequent use than adults (DiFranza et al., 2002). Additionally, the younger an adolescent begins smoking, the greater his odds are of developing lung cancer and other health problems (Wiencke et al., 1999; Kenfield, Stampfer, Rosner, & Colditz, 2008). By understanding the individual

and contextual factors that lead adolescents to initiate tobacco use, better public health programs and policies can be designed.

1.2 Purpose of Study

The association between parental smoking and adolescent smoking initiation has been established. Few studies to date, however, have examined whether parental smoking is associated with a younger age of smoking initiation. A finding that parents not only influence their children's smoking, but also the age of trying, would illustrate a greater need to focus on parent smokers and supporting their cessation efforts. Much of what is currently understood about the interaction between parental and adolescent behavior originates in developed countries. More research is needed to understand predictors of adolescent tobacco use in the different social and political environments of developing countries, and how it may differ from the evidence in developed countries. Because smoking prevalence in the African region is relatively low, a broad understanding of these predictors presents a unique opportunity for prevention.

1.3 Research Questions

The purpose of this study is to add to the existing body of literature linking parental smoking and adolescent smoking by answering the following questions:

1. Of those who have tried smoking, are adolescents more likely to try at a younger age if one or both of their parents smoke compared to if neither parent smokes?

2. Of those who have tried smoking, are adolescents more likely to be current smokers if one or both of their parents smoke compared to if neither parent smokes?
3. Among current smokers, does parental gender have an effect on adolescent smoking status?

CHAPTER II

REVIEW OF THE LITERATURE

The purpose of this study is to determine if parental smoking is associated with a younger age of adolescent smoking initiation. To support the rationale for this study, a review of the literature will illustrate the current knowledge of the characteristics of adolescent smoking, the suggested predictors of adolescent smoking, and the health risks associated with an early age of initiation. In addition, this review will provide an overview of the challenges facing African nations in combating the tobacco epidemic. While much of what is currently understood about the characteristics of adolescent smoking is derived from studies in developed countries, we will use it here with the awareness that unknown factors may be more relevant to cultures in the diverse regions of Africa.

2.1 Characteristics of Adolescent Smoking

The majority of people who try smoking do so before they are 18 years old. Globally, nearly one out of four adolescents has tried smoking before the age of 10 (Global Youth Tobacco Survey Collaborative Group, 2002). Adolescents who smoke are more likely to experience respiratory problems, such as slowed growth of lung function and mild airway obstruction; some evidence shows that girls are more susceptible to these problems than boys (Gold et al., 1996). Adolescent smokers are less physically fit than their non-smoking peers and they are at greater risk of developing cardiovascular

disease (HHS, 1994). Finally, experimentation with smoking during adolescence is associated with being a smoker as an adult (Paul, Blizzard, Patton, Dwyer, & Venn, 2008).

The last decade has also brought attention to the difference between adult and adolescent tobacco dependence (Wellman, DiFranza, Savageau, & Dussault, 2004). For many years, research supported that one must smoke for several years and at least five cigarettes daily, in order to experience addiction to nicotine (Benowitz & Henningfield, 1994). More recent examinations that focus specifically on the experience of youth, however, suggest that tobacco dependence develops much more rapidly in adolescents than in adults (DiFranza et al., 2002). DiFranza and colleagues (2002) found there to be no minimum dose or duration of tobacco use required before symptoms of dependence may appear. Furthermore, their research found that the appearance of merely one symptom of dependence predicted continued smoking.

As aforementioned, there are many documented factors that influence adolescent smoking initiation. Tobacco industry advertising has been found to significantly influence adolescent smoking behavior by promoting positive images of smoking and the perception that the behavior is pervasive (HHS, 1994; Gilpin, White, Messer, & Pierce, 2007; Audrain-McGovern et al., 2006). More than $13 billion is spent by tobacco companies on advertising and promotion materials each year, much of which is accessible to young people (Federal Trade Commission, 2007). Tobacco industry documents reveal that young women, especially, are targeted with advertising that conveys self confidence, independence, and freedom (Anderson, Glantz, & Ling, 2005). Gilpin and colleagues found that receptivity to tobacco advertising during early

adolescence was predictive of established smoking six years later (Gilpin et al., 2007). Finally, adolescents with "novelty-seeking" characteristics (e.g., sensation-seeking and risk-taking behavior) are more receptive to tobacco advertising and more likely to smoke (Audrain-McGovern et al., 2006).

In addition to advertising, peers are often found to be highly influential in determining an adolescent's smoking initiation and progression (HHS, 1994; Nakajima, 2007). Peer smoking has been shown to influence experimentation with smoking, as well as progression to daily smoking (Bricker, Peterson, Sarason, Anderson, & Rjan, 2006; Bricker et al., 2007). Having friends who exhibit problem behaviors is associated with adolescent smoking; however, the presence of strong parental involvement appears to provide a protective factor in this context (Simons-Morton, 2002). Furthermore, Okoli and colleagues found that exposure to peer smoking influences an adolescent's initial smoking experience and expectations (Okoli, Richardson, & Johnson, 2008). In this study, increased exposure to peer smoking resulted in a greater likelihood of adolescents to report symptoms such as coughing or "buzz" during their initial smoking experience. Experiencing these initial symptoms has been shown as an important predictor of continuing to smoke (DiFranza et al., 2002; DiFranza et al., 2004).

Adolescents are more likely to smoke when cigarettes are readily accessible to them. Access to cheap cigarettes appears to influence adolescent smoking. In the United States, when taxes on cigarettes are high, odds of smoking initiation or regular smoking are lower (Thomson et al., 2004). Similarly, a Canadian study found that a decrease in the price of cigarettes translated into a 10% increase in adolescent smoking initiation (Zhang, Cohen, Ferrence, & Rehm, 2006).

Recent findings from the Global Youth Tobacco Survey illustrate relatively little difference in the rates of smoking of boys compared to girls (Global Youth Tobacco Survey Collaborative Group, 2003). These results are concerning when compared to the rates of smoking among adults: women smoke at approximately 25% the rate of men (WHO, 2008). While adolescent data on the current adult population is not available, it is assumed that this period was characterized by lower rates of female smoking and higher rates of male smoking. The fact that the current smoking rates among adolescent boys and girls do not reflect this expected difference could predict much higher rates of adult smoking in the coming decades. Higher rates of adult smoking will inevitably be followed by much greater numbers of smoking-related deaths than are currently predicted (Global Youth Tobacco Survey Collaborative Group, 2003).

2.2 Conceptual Models and Theories of Adolescent Smoking

Adolescent smoking has been characterized as a series of transitions or trajectories, not necessarily linear, through distinct stages of smoking (Bricker et al., 2006; Tucker, Ellickson, & Klein, 2003; Colder, Balanda, & Mayhew, 2001). The transitions have been described as a level of never trying, trying smoking, monthly smoking, and daily smoking (Bricker et al., 2007). Others have characterized the stages as abstinent, sporadic, occasional, daily, escalating, and intermittent; where escalating refers to an increasing number of cigarettes smoked per day and intermittent refers to those who were making quit-attempts, but were not abstinent (Wellman et al., 2004). The latter model is a more concise description of the movement an adolescent may experience within an ever-changing framework of smoking behaviors. Mayhew and colleagues

(Mayhew, Flay, & Mott, 2000) also identified distinct stages of adolescent smoking in which the nonsmoking stage is subdivided into two stages differentiated by whether the adolescent has no intention to smoke or is contemplating smoking. By dividing the nonsmoking stage, this construct takes into account the behavioral theory of reasoned action, discussed later, which is thought to be a critical time for preventive action.

In addition to transitions or levels of smoking, levels of influence have also been used to explain the factors that may impact an adolescent trying or progressing in his/her smoking behavior (Turner, Mermelstein, & Flay, 2004). The first level of influence includes individual variables, such as genetics and biological factors. The second level consists of the adolescent's immediate social surroundings, which can include his family and peers and the influence exerted by their behavior, attitudes, and beliefs. The final level of influence is comprised of the environmental and cultural surroundings, such as media and public policy that contribute to an adolescent's exposure to smoking. Each level of influence interacts in complex ways with the others, which ultimately affect intentions to smoke or abstain (Turner et al., 2004).

Several reviews have examined the social and behavioral theories that have been used to explain adolescent smoking (Turner et al., 2004; Carvajal, Hanson, Downing, Coyle, & Pederson, 2004; Collins & Ellickson, 2004). Collins and Ellickson (2004) considered four theories in their review of adolescent smoking literature: Theory of Planned Behavior, Social Learning and Social Cognitive theories, Social Control and Social Development theories, and finally, Problem Behavior Theory. As in other reviews, the authors found that by integrating the four theories, they were able to more accurately

explain adolescent smoking behavior and that differing characteristics of the theories were more applicable at different periods of childhood and adolescence.

The central theme in the Theory of Planned Behavior is that the intention or willingness to smoke determines the actual behavior (Ajzen & Fishbein, 1980). Social learning theories, discussed again in Section 2.4, posit that behavior is learned from role models, as well as past experience, with the perception of positive results for the behavior (Collins & Ellickson, 2004). Social control and development theories maintain the hypothesis that bonds to social institutions such as family, school, and church prevent deviant behavior, such as smoking. Several studies support this theory, finding that adolescents with weak bonds are more likely to initiate smoking (Tilson, McBride, Lipkus, & Catalano, 2004; Battistich & Hom, 1997). Finally, Problem Behavior Theory is described as a "constellation" of deviant behaviors that influence each other in a reciprocal manner (Jessor, Donovan, & Widmer, 1980). As such, smoking has been found to predict deviant behaviors (e.g., risk-taking and substance use), while other studies have noted that the aforementioned behaviors are predictive of cigarette smoking (Ellickson, 2001).

2.3 Health Consequences Associated with Age of Smoking Initiation

A younger age of smoking initiation is associated with greater nicotine dependence, a lower level of self-efficacy related to quitting, and a decreased likelihood of cessation in adulthood (Wilkinson, Schabath, Prokhorov, & Spitz, 2007; Lando et al., 1999; Everett et al., 1999). Among U.S. high school students, age of initiation is significantly associated with frequent and daily smoking, where early initiators smoke

more cigarettes per day than later initiators (Everett et al., 1999). Chen and colleagues found that initiating smoking prior to age 13 significantly increased the odds of being a heavy smoker as an adult (Chen & Miller, 1998). Additionally, adolescents who initiate daily smoking at an earlier age are significantly less likely to have quit smoking as adults (Lando et al., 1999; Khuder, Dayal, & Mutgi, 1999).

Greater morbidity and mortality is experienced by those initiating smoking early compared to those delaying smoking. Kenfield et al. (2008) found that women who initiated on or before age 17 had 22% greater mortality from all causes than those who delayed starting to age 26 or after. Younger initiators are also more likely as adults to miss work due to illness and to be admitted to a hospital for health problems (Lando et al., 1999). An increased risk of lung cancer mortality is also associated with a younger age of initiation, even after controlling for number of cigarettes consumed per day or number of years smoked (Knocke, Shanks, Vaughn, Thun, & Burns, 2004).

Lung cancer risk is almost double for younger initiators than those who begin after age 19 (Hegmann et al., 1993). For women specifically, an early age of smoking initiation is associated with a greater risk of developing small cell lung carcinoma, which is considered to be a very aggressive type of lung cancer with a poor prognosis (Stefani et al., 2005; ACS, 2008). Wiencke and colleagues (1999) found that earlier initiation was associated with increased DNA adduct levels, which are considered biomarkers for cancer, in former smokers. The authors hypothesized that young smokers are either more susceptible to this DNA adduct formation or that smoking during adolescence may promote the formation through physiological changes.

2.4 Influence of Parental Smoking

Social cognitive or social learning theory is often used when explaining adolescent smoking (White, Hopper, Wearing, & Hill, 2003). This theoretical model developed by Albert Bandura maintains that adolescents learn behavior by observing others; adolescents then model or adopt the behavior (Bandura, 1986). Accordingly, parents serve as role models for their children; adolescents observe their smoking behavior, and perceive positive consequence of smoking, ultimately trying it themselves (Bandura, 1986). If adolescents perceive smoking to be socially normative, they may use the behavior to seem older or more adult-like (Tucker et al., 2003; Milton, Dugdill, Porcellato, & Springett, 2008). In a British qualitative study conducted by Milton and colleagues, 11 year old adolescents expressed that smoking represented adult status (Milton et al., 2008). This finding is supported by social learning theory, in that an adolescent's parents are likely his most immediate adult role models. The authors also suggest that smoking initiation is tied to the complex transition from the feelings of dependence associated with childhood to the responsibility of adulthood; and therefore, smoking behavior serves as a projection to others that this transition has occurred. Notably, the transition from childhood to adulthood likely differs widely among cultures and regions throughout the world. Consequently, this hypothesis may only be relevant in cultures that do not have specific rites of passage symbolizing this transition.

In addition to parents as a source of modeling, children may also perceive smoking to be socially acceptable if they are exposed to the behavior in their community. A recent prospective study examined the transition from experimenting with smoking to established-smoking among American youth living in towns with differing restaurant

smoking laws (Siegel, Albers, Cheng, Hamilton, & Biener, 2008). In the towns with strong regulations, children were significantly less likely to make the transition from trying to established-smoking than those lacking strong regulations. Researchers hypothesized that the young people perceived a lower prevalence of smoking and a lower social acceptability of smoking when their exposure in public places was reduced.

Both prospective and cross-sectional studies link parental smoking with the smoking of their children (Bricker et al., 2006; Fleming, Kim, Harachi, & Catalano, 2002; Peterson et al., 2006). Fleming et al. (2002) found parental smoking to be significantly associated with adolescent smoking with an odds ratio twice that of children whose parents did not smoke. Bricker et al. (2006) found similar results by surveying children in 3rd grade and again in 12th grade; children whose parents smoked at time one were almost twice as likely to be smokers at time two than children whose parents did not smoke. This association between parental smoking status and adolescent smoking initiation was relevant for non-biological parents, such as step-parents, a finding that is supported by behavior modeling and the social learning theory (Fidler, West, van Jaarsveld, Jarvis, & Wardle, 2007). More specifically, parental smoking status has been found to predict the transition from never smoking to trying smoking, as well as from trying smoking to daily smoking (Otten, Engels, Van de Ven, & Bricker, 2007). There also appears to be a "dose-response" effect, as moving from neither parents smoking, to one, to both parents smoking increases the odds that an adolescent will smoke (Peterson et al., 2006; Otten et al., 2007; Jackson & Henriksen, 1997).

It is important to note that some studies show an association between parental smoking and both adolescent and subsequent adult smoking, while others may support

one and not the other. For instance, Paul et al. (2008) found that parental smoking during childhood was a significant predictor of current adult smoking, but not of experimentation during childhood. This finding is supported by the aforementioned hypothesis that both individual and contextual factors influence adolescent smoking transitions. It is also supported by the notion that the effects of parental modeling may be a delayed phenomenon. Furthermore, the influence exerted by these factors can differ depending on the age of the adolescent or the smoking stages within which they are transitioning (Bricker et al., 2006).

Much of the current research examining the influence of parental smoking status on adolescent smoking behavior analyzes the impact of one or both parents compared to neither parent smoking. Few specify or test the gender of the parent smoking with presence of adolescent smoking. Paterson et al. (2006) found that parental smoking was significantly associated with adolescent smoking, but that neither parent exerted more influence than the other. The risk of smoking has also been found to be significantly higher for girls when a mother smoked, but not when the father smoked (Vink, Willemsen & Boomsma, 2003). A more recent study found a significant interaction between male smoking and maternal smoking status (Paul et al., 2008). The relative risk of becoming a smoker as an adult was higher among males whose mothers smoked; this risk was higher than when fathers only or both parents smoked.

Few studies have examined how parental smoking influenced an adolescent's age of smoking initiation. Two U.S. studies found parental smoking to be significantly associated with a younger age of smoking initiation, in addition to current adult smoking (Wilkinson et al., 2007; Edelen, Tucker & Ellickson, 2007). Wilkinson and colleagues

(2007) found that when one or both parents smoked, adolescents were significantly more likely to have initiated smoking prior to age 15 compared with individuals with neither parent smoking. Edelen et al. (2007) found that the presence of smoking by an important adult figure lowered the age of smoking initiation, especially for girls.

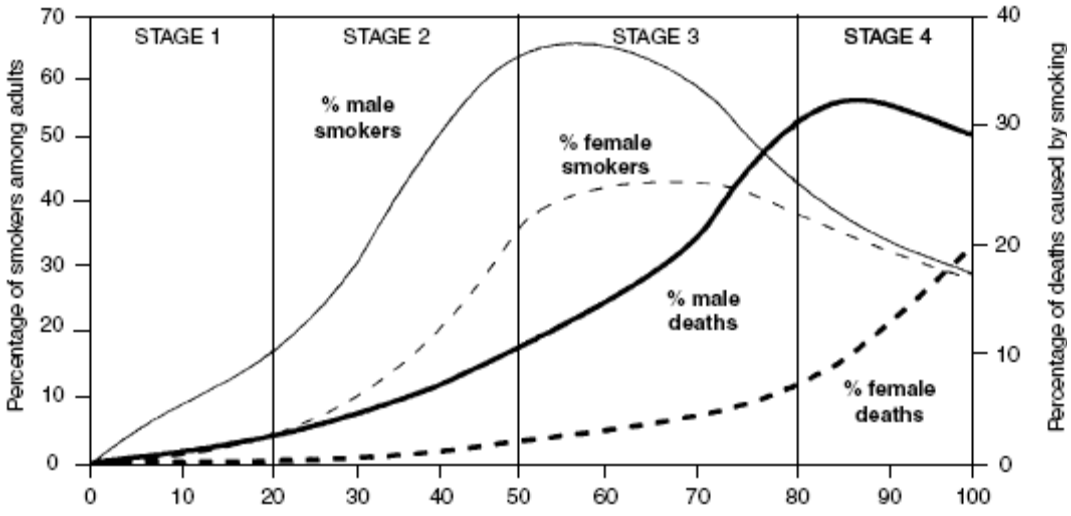
A relatively new area of study examining parental and adolescent smoking involves the influence of genetics. A small number of twin studies have produced inconclusive results to determine whether genes play a significant role in determining smoking behavior. It appears that rather than influencing the likelihood of smoking, genetics may exert an influence on nicotine dependence, while it is the social environment that prompts adolescent smoking initiation (White et al., 2003).

2.5 Tobacco in Africa

Cigarette smoking prevalence in the African region is low compared to other regions of the world – fewer than 20% of adults smoke in most African countries (Mackay, 2006). Even though current prevalence of smoking is relatively low, both adult and adolescent rates show signs of increasing over the next several decades (Shafey et al., 2003). Based on a four-stage model of the tobacco epidemic developed by Lopez and colleagues (1994), Africa is in the beginning stages of a preventable onslaught of tobacco-related death and disease (Figure 1). Transition from one stage to the subsequent stage is characterized by changes in the prevalence of tobacco use, overall consumption, and finally of tobacco-related mortality. The first stage of the epidemic is usually a period of ten to twenty years during which prevalence is low and smoking gains social acceptance. This period is also marked by a greater focus on infectious diseases, such as

combating HIV, tuberculosis, and malaria, resulting in less attention on chronic disease prevention.

Figure 1 The Tobacco Epidemic, Lopez et al.



Over subsequent stages of the tobacco epidemic, male smoking prevalence increases, followed by an increased female prevalence (Lopez et al., 1994). As smoking-attributable mortality begins to rise, male smoking decreases, with women following in a pattern that lags slightly behind. The resonating theme of Lopez's model is the thirty to forty year lag between the peak of smoking prevalence and the consequential peak in smoking-attributable mortality. This model also highlights the difficulty of making a convincing argument for curbing tobacco use, as the detrimental effects do not occur until future decades. As African nations are in the beginning stages of the epidemic, it is difficult to make the case for effective tobacco control policies.

Because smoking prevalence in Africa is low, the nations in this region of the world are susceptible to the tobacco industry's aims to create a new market for their

product (Shafey et al., 2003). Not only do tobacco companies aggressively market their products, but they also invest their money in local establishments or government programs. For example, DIMON Incorporated (now, Alliance One International) financially supports Tanzanian tobacco growers to continue growing the crop, while Philip Morris invests in children's health and other social responsibility projects in Malawi (Nsimba & Sussman, 2006; Samet et al., 2006). Because of this investment in public programs, many people are afraid to speak out against the tobacco industry and many politicians are favorable to promoting smoking (Muula, 2001; Sebrie & Glantz, 2006).

Countries such as Malawi, Tanzania, and Zimbabwe that grow tobacco face an even more problematic challenge. It is difficult to make an argument for health and against tobacco when the crop supports the viability of the nation. For instance, Malawi derives more than 61% of its share of total exports from tobacco, leaving some to argue that tobacco growing is in the country's best social and economic interest (Malawi National Statistics Office, 2006; Davies, 2003). Government and health officials alike are involved in tobacco growing and have a stake in the success of the crop (Muula, 2001; Davies, 2003). Nevertheless, the country remains in poverty, in part because of the tobacco industry's manipulation of the market. For instance, in Malawi, two major tobacco leaf-buying companies purchase 91% of the available crop. The two companies conspire with each other to set the auction price well below the value (Otañez, Mamudu, & Glantz, 2007). This practice drastically depresses the prices and efforts by the government to intervene have failed. Additionally, a significant smuggling network

further depresses prices, contributing to the prolonged poverty experienced by many of these nations (Otañez et al., 2007).

While manipulative tobacco industry practices negatively impact the population, tobacco control policies are also severely lacking. Only a handful of countries have comprehensive anti-tobacco legislation, while the majority of the African region is covered by little to no tobacco control policies (Shafey et al., 2003). Smoking is rarely prohibited in public places; in some regions, teachers of primary and secondary school are allowed to smoke in the classroom (Nsimba & Sussman, 2006). In many regions, young people have ample access to cigarettes sold in single sticks, as tobacco companies enjoy unregulated sales and direct advertising to minors (Shafey et al., 2003).

To begin to address many of these issues, WHO is leading a recent major tobacco control initiative called the Framework Convention on Tobacco Control (FCTC) (WHO, 2008). The FCTC is an international treaty that outlines specific goals related to reducing the impact of tobacco company advertising and practices, protecting citizens from secondhand smoke, and increasing taxes on tobacco products among others. Currently, 160 countries have ratified the treaty, including many countries in the African region. Zimbabwe, Malawi, and Eritrea are among the very few that have neither signed nor ratified the treaty (Framework Convention Alliance, 2008). (The U.S. has signed, but not yet ratified the treaty.) By joining the FCTC, these countries are publicly dedicating their efforts to issue effective tobacco control policies with the intent of reducing tobacco use and related disease.

2.6 Summary

Numerous studies have substantiated the association between parental smoking status and adolescent smoking behavior; far fewer have investigated the link between parental smoking and a younger of age of smoking initiation. A younger age of smoking initiation is linked to a greater risk of dependence, disease, and death; therefore preventing (or delaying) the onset of smoking is of significant public health importance. This study focuses solely on the African region, first because less is known about the influence of parental smoking on adolescents, and second because prevalence of smoking is relatively low. By gaining a better understanding of the predictors of adolescent smoking, this study hopes to inform public health interventions to prevent an increase in cigarettes smoking in developing regions of the world.

CHAPTER III

METHODS AND PROCEDURES

3.1 Data Source

The data used in this study were obtained from the Global Youth Tobacco Survey (GYTS), a publicly available database. The GYTS was developed in 1998 by the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC). It is funded by the Canadian Public Health Association, National Cancer Institute, United Nations Children Emergency Fund, and World Health Organization—Tobacco Free Initiative (WHO, 2008; Centers for Disease Control and Prevention [CDC], 2008). The GYTS is a school-based surveillance system designed to allow countries throughout the world to track youth tobacco use in a common, standardized format. Standard methodology guides the sampling and selection procedures, preparation of questionnaires, and ensures consistency of data collection, management, and analysis. The survey seeks to collect information in seven major areas: knowledge and attitudes toward cigarette smoking, prevalence of all tobacco use, the influence of media and advertising on the use of cigarettes, accessibility of cigarettes, tobacco-related curriculum in schools, exposure to secondhand smoke, and smoking cessation (WHO, 2008).

The majority of students surveyed are between 13 and 15 years old and enrolled in either public or private schools. Through a multi-stage sampling design, schools are selected in the first stage proportional to their enrollment size; then, in the second stage,

classrooms within each school are randomly selected, with all students in the class eligible to participate (Global Youth Tobacco Survey Collaborative Group, 2002). The questionnaire used is anonymous and self-administered. Each questionnaire has a set of approximately 56 core questions; each country is permitted to add optional questions, if relevant.

After collecting the data, the research coordinator from each country or region submits its survey forms to CDC to process, edit, and apply adjustments (described below). The CDC generates a data file, which is returned to the country for verification. After one year, the data file is made available in Microsoft Access® format through the CDC website (CDC, 2008). A codebook, which details the questions and responses, is also available.

To adjust for sample selection, non-response, and post-stratification, the CDC applies a weighting factor is applied to the GYTS data using the following formula:

W = W1 * W2 * f1 * f2 * f3 * f4

where
W1 = the inverse of the probability of selection for each school
W2 = the inverse of the probability of selection of each classroom within each selected school
f1 = a school level, non-response adjustment calculated by school enrolment size category (small, medium, large); school non-response is calculated within each tertile
f2 = a class level, non-response adjustment factor calculated for each school
f3 = a student level, non-response adjustment factor calculated by class
f4 = a post-stratification adjustment factor calculated by sex and grade.
(Global Youth Tobacco Survey Collaborative Group, 2002)

Data files were downloaded from the CDC website in Access database format and were converted to Statistical Package for the Social Sciences (SPSS)® version 16.0 data

files for analysis. To differentiate between country samples, each set of surveys was assigned a country number and region number where applicable. The individual country data files were then merged into one general data file for analysis.

3.2 Study Population

Population delimitations were established so that only surveys from WHO designated African countries were selected for analysis (WHO/Regional Office for Africa, 2008). Surveys were available for 40 African countries or regions. Each survey was studied to ensure the uniformity of the questions being considered in the analysis; twenty countries met this standard for uniformity. This selection was further restricted to the surveys that had been conducted within the last five years (2003 – present). Fourteen countries met these criteria (Table 1). Benin, Burkina Faso, Mauritius, Tanzania, and Zimbabwe had more than one regional sample, which were compiled into one country sample. Five of the countries are located in western Africa, five are located in southern Africa, one is an island nation in the Indian Ocean, and one country is located in each Central Africa, East Africa, and Northeast Africa (Figure 2).

Table 1 Selected countries, year of data collection, and mean and median age

Country	*Year*	*N*	*Mean Age*	*Median Age*
Benin	2003	4239	14.6	15
Botswana	2005	1907	15.2	15
Burkina Faso	2006	4323	14.6	15
Congo	2006	3083	13.5	13
Eritrea	2006	9325	13.5	13
Ghana	2006	9647	14.1	14
Malawi	2005	5121	13.4	13
Mauritania	2006	3714	13.6	13
Mauritius	2003	2786	14.1	14
Namibia	2004	6021	14.4	14
Niger	2006	1960	14.9	15
Swaziland	2005	17592	15.2	15
Tanzania (United Republic of)	2003	6149	14	14
Zimbabwe	2003	5581	14.6	15

Figure 2 Map of Africa and selected countries

Google Maps, 2008

According to the United Nations Human Development Index (HDI), the 14 countries selected vary in their level of social and economic development (Table 2). The HDI combines measures of life expectancy, education, and income into a single statistic to enable social and economic comparisons between different regions and countries throughout the world (United Nations Development Programme, 2008). There are minimum and maximum benchmarks for each measure of the HDI, and countries are ranked on where they fall between benchmarks. Only one of the selected countries, Mauritius, achieved a high ranking on the HDI. Compared to medium and low HDI rankings, high HDI is reflected in lower poverty rates, lower probability of not surviving

to age 40, higher literacy rates, and a lower rate of underweight children, among other factors. Botswana, Namibia, Ghana, Mauritania, Congo, Swaziland, and Zimbabwe achieved a medium ranking. Finally, Eritrea, the United Republic of Tanzania, Benin, Malawi, Niger, and Burkina Faso ranked low on the HDI.

Table 2 United Nations Human Development Index, Selected countries

		Human Poverty Index (rank)	Human Poverty Index (value %)	Probability at birth of not surviving to age 40 (% of cohort)	Adult illiteracy rate (% age 15 and older)	Population not using an improved water source (%)	Children underweight for age (% under age 5)	Population living below $1 a day
HDI Rank								
	High							
65	Mauritius	27	11.4	5.1	15.7	0	15	..
	Medium							
124	Botswana	63	31.4	44	18.8	5	13	28
125	Namibia	58	26.5	35.9	15	13	24	34.9
135	Ghana	65	32.3	23.8	42.1	25	22	44.8
137	Mauritania	87	39.2	14.6	48.8	47	32	25.9
139	Congo	57	26.2	30.1	15.3	42	15	..
141	Swaziland	73	35.4	48	20.4	38	10	47.7
151	Zimbabwe	91	40.3	57.4	10.6	19	17	56.1
	Low							
157	Eritrea	76	36	24.1	..	40	40	..
159	Tanzania	67	32.5	36.2	30.6	38	22	57.8
163	Benin	100	47.6	27.9	65.3	33	23	30.9
164	Malawi	79	36.7	44.4	35.9	27	22	20.8
174	Niger	104	54.7	28.7	71.3	54	40	60.6
176	Burkina Faso	106	55.8	26.5	76.4	39	38	27.2

3.3 Study Measures

The primary dependent variable was age of smoking initiation, which was determined by responses to the question, "How old were you when you first tried a cigarette?" Responses to this question were in the following categorical format: 1 = I have never smoked cigarettes, 2 = 7 years old or younger, 3 = 8 or 9 years old, 4 = 10 or 11 years old, 5 = 12 or 13 years old, 6 = 14 or 15 years old, and 7 = 16 or older. For the primary analysis, only cases with a response of 2 or higher were included; this represents those who indicated ever smoking.

A secondary analysis using current smoking status as a dependent variable was also conducted. Smoking status was determined using responses to the question, "During the past 30 days (one month), on how many days did you smoke cigarettes?" Response options were offered as follows: 1 = 0 days, 2 = 1 or 2 days, 3 = 3 to 5 days, 4 = 6 to 9 days, 5 = 10 to 19 days, 6 = 20 to 29 days, 7 = All 30 days. As with other studies, current cigarette smoking was defined as having smoked one or more cigarettes in the past 30 days. Current smoking status was collapsed and recoded into a new variable, where 1 = not a current smoker and 2 through 7 = a current smoker. Current smoking status was also analyzed in more detail by recoding it into a 4-category variable, where 1 = smoking 0 of the last 30 days, 2 = smoking 1 to 5 for the last days, 3 = smoking 6 to 19 of the last 30 days, and 4 = smoking 20 or more of the last 30 days.

The independent variable was parental smoking status, which was determined by responses to the question, "Do your parents smoke?" Students were given the following options: 1 = None, 2 = Both, 3 = Father only, 4 = Mother only, and 5 = I don't know.

Respondents' current age and gender were also collected and used in the analysis to further examine the association between parental smoking and adolescent smoking.

3.4 Statistical Analysis

Frequency tables were produced to determine prevalence of trying smoking, current smoking, and parent smoking among the entire sample. Frequencies were also used to ascertain age and gender representation. Descriptive statistics were produced to determine variables such as the average age of smoking initiation.

To answer study question one, are adolescents more likely to try at a younger age if one or both of their parents smoke compared to if neither parent smokes, a correlation calculation was generated. For this calculation, parental smoking status was recoded so that 1 = neither parent, 2 = I don't know, 3 = mother or father smoking, and 4 = both parents smoking. Using a chi-square analysis, the results were separated and examined by gender to determine the difference between boys' and girls' age of smoking initiation.

An ordinal regression analysis was also performed to further examine the association between age of initiation and parental smoking status, as well as age of initiation and gender. First, each level of parental smoking status was compared to a reference category of both parents smoking. Subsequent regression analyses were run using neither, I don't know, father only, and mother only as the reference category. For gender, girls were set as the reference category to determine the effect of gender on age of initiation.

To answer study question two, are adolescents more likely to be current smokers if one or both of their parents smoke compared to if neither parent smokes, a chi-square

analysis was performed. Results were then separated and examined by gender. To further investigate current adolescent smoking, a chi-square analysis was performed to the effect of parental gender on the likelihood of being a current smoker.

CHAPTER IV

RESULTS

4.1 Frequencies and Descriptive Statistics

Frequency tables and descriptive characteristics for the sample are presented in Table 3 and 4. In total, 83,350 respondents completed the survey; approximately 48% were boys and 49% were girls (3% were missing responses). Most of the respondents were between 13 and 16 years of age. Approximately 18% of the total number of respondents had ever tried smoking; and 7.8% were current smokers. Of those who had tried smoking, age 12 to 13 was the most frequent range of smoking initiation. Three and a half percent of adolescents responded that both parents smoked, 13.5% responded that father only smoked, and 1.4% responded that mother only smoked. Approximately 6% of students answered “I don’t know.”

Table 3 Respondent age and gender

Variable	*n*	*%*
Respondent Age		
11 years old or younger	6114	7.3
12 years old	8205	9.8
13 years old	12288	14.7
14 years old	15816	19
15 years old	15339	18.4
16 years old	12466	15
17 years old or older	11220	13.5
Missing	1902	2.3
Respondent Gender		
Male	40447	48.5
Female	40767	48.9
Missing	2136	2.6

Table 4 Respondent smoking characteristics

Variable	*n*	*%*
Tried or experimented with smoking		
Yes	14772	17.7
No	63430	76.1
Missing	5148	6.2
Age of trying a cigarette		
I have never tried	66974	80.4
7 years old or younger	1698	2.0
8 or 9 years old	1301	1.6
10 or 11 years old	1883	2.3
12 or 13 years old	2624	3.1
14 or 15 years old	2482	3.0
16 years or older	1263	1.5
Missing	5125	6.1
Smoking during the past 30 days		
0 days	69825	83.8
1 or 2 days	2870	3.4
3 to 5 days	1151	1.4
6 to 9 days	659	0.8
10 to 19 days	498	0.6
20 to 29 days	352	0.4
All 30 days	1040	1.2
Missing	6955	8.3
Parents or guardians smoke		
None	62099	74.5
Both	2876	3.5
Father only	11284	13.5
Mother only	1163	1.4
I don't know	5094	6.1
Missing	834	1.0

Ghana, Malawi, and Mauritania had the highest percentage of young initiators. In Ghana, 36.7% of adolescents reported trying smoking at age seven or younger; in Malawi, 25.6% of adolescents reported trying smoking in the youngest category; and 26.5% of Mauritanian adolescents tried smoking at age seven or younger. Table 5 includes response percentages from each country. Overall, 15% of adolescents tried

smoking at age seven or younger, 11.6 tried at eight or nine, 16.7% tried at 10 or 11, 23.3% tried at 12 or 13, 22.1% tried at 14 or 15, and 11.2% tried at 16 or older. The highest percentage of current smokers initiated in the 12.5 and 14.5 age categories, accounting for approximately 47% of current smokers. A small percentage (12.7%) of current smokers initiated smoking in the age 7 or younger category (Table 6).

Table 5 Country-specific responses, age of smoking initiation

Country	7 or younger	8 or 9	10 or 11	12 or 13	14 or 15	16 or older
	n (%)	*n (%)*	*n (%)*	*n (%)*	*n (%)*	*n (%)*
Benin	64 (8.1)	69 (8.8)	164 (20.8)	187 (23.7)	180 (22.8)	124 (15.7)
Botswana	30 (15.1)	22 (11.1)	19 (9.5)	45 (22.6)	49 (24.6)	34 (17.1)
Burkina Faso	85 (9.9)	71 (8.3)	130 (15.2)	234 (27.3)	239 (27.9)	98 (11.4)
Congo	71 (13.7)	66 (12.8)	110 (21.3)	143 (27.7)	92 (17,8)	35 (6.8)
Eritrea	47 (15.5)	24 (7.9)	48 (15.8)	54 (17.8)	92 (30.4)	38 (12.5)
Ghana	234 (36.7)	104 (16.3)	78 (12.2)	89 (13.9)	58 (9.1)	75 (11.8)
Malawi	62 (25.6)	50 (20.7)	34 (14.0)	54 (22.3)	31 (12.8)	11 (4.5)
Mauritania	196 (26.5)	123 (16.6)	155 (20.9)	128 (17.3)	100 (13.5)	39 (5.3)
Mauritius	80 (8.3)	113 (11.7)	212 (22.0)	318 (33.0)	224 (23.2)	18 (1.9)
Namibia	268 (16)	158 (9.4)	300 (17.9)	449 (26.8)	360 (21.5)	141 (8.4)
Niger	17 (5.9)	22 (7.7)	46 (16.0)	73 (25.4)	91 (31.7)	38 (13.2)
Swaziland	366 (12.5)	329 (11.3)	407 (13.9)	614 (21.0)	720 (24.6)	486 (16.6)
Tanzania	74 (19.8)	60 (16.0)	57 (15.2)	80 (21.4)	70 (18.7)	33 (8.8)
Zimbabwe	104 (14.0)	90 (12.1)	123 (16.6)	156 (21)	176 (23.7)	93 (12.5)
TOTAL	1698 (15.1)	1301 (11.6)	1883 (16.7)	2624 (23.3)	2482 (22.1)	1263 (11.2)

Table 6 Current smoking status by respondent age of initiation

Variable	*n*	*%*
Respondent age		
7 or younger	719	12.7
8 to 9	600	10.6
10 to 11	913	16.1
12 to 13	1314	23.2
14 to 15	1364	24.1
16 or older	746	13.2

4.2 Age of Initiation and Parental Smoking

The correlation calculation shows that parental smoking lowers the age of adolescent smoking initiation (Table 7). As the number of smoking parents increases from neither, to father or mother only, to both parents smoking, the age of adolescent smoking initiation decreases.

Table 7 Correlation calculation, parental smoking and age of initiation

Variable		Parental Smoking
Age of Initiation	Pearson Correlation	-0.077
	Sig. (2-tailed)	0.000
	N	11088

**Correlation is significant at the 0.01 level (2-tailed).

A chi-square analysis showed that the association between gender and age of initiation was statistically significant ($p<.001$) based on an adjusted F test (Rao-Scott = 6.7) (Table 8). In the sample, a greater proportion of girls tried smoking at an earlier age than boys; 22.3% of girls tried smoking at age 7 or younger, while only l5.5% of boys

tried as young (Table 9). For each age category of 10 years and above, boys smoke in greater proportions than girls.

Table 8 Gender and age of initiation, test of independence

		Adjusted F	Sig.
Gender & Age of Initiation	Pearson	6.707	0.000
	Likelihood Ratio	6.588	0.000

**Significance is based on the adjusted F.

Table 9 Gender and age of smoking initiation

Variable	Age of Initiation					
Gender	7	8.5	10.5	12.5	14.5	16
Male	15.50%	11.70%	17.80%	23.10%	21.00%	11.00%
Female	22.30%	14.20%	14.90%	21.60%	17.80%	9.20%

Results of the analysis show that for boys and girls, respectively, there is an association between parental smoking and age of initiation (Table 10 and 11). Among males who responded that both parents smoked or mother only smoked, approximately 22% tried smoking by age seven in each respective category. Among females who responded that both parents or mother only smoked, approximately 25.4% and 18.7% tried smoking by age seven, respectively. For females, only the response category of "I don't know" had a greater proportion of smokers by age seven (26.0%).

Table 10 Crosstabulation of age of initiation by gender and parental smoking status

	7	8.5	10.5	12.5	14.5	16
Variable	*n (%)*	*n (%)*	*n (%)*	*n (%)*	*n (%)*	*n (%)*
None						
male	549 (12.0)	482 (10.6)	784 (17.2)	1069 (23.4)	1097 (24.0)	585 (12.8)
female	309 (15.4)	242 (12.1)	321 (16.0)	483 (24.1)	464 (23.2)	185 (9.2)
Both						
male	86 (22.4)	56 (14.6)	68 (17.7)	90 (23.4)	56 (14.6)	28 (7.3)
female	82 (25.4)	43 (13.3)	45 (13.9)	79 (24.5)	54 (16.7)	20 (6.2)
Father only						
male	183 (11.5)	184 (11.6)	301 (18.9)	392 (24.6)	331 (20.8)	202 (12.7)
female	155 (17.8)	101 (11.6)	128 (14.7)	213 (24.4)	198 (22.7)	77 (8.8)
Mother only						
male	41 (22.5)	24 (13.2)	24 (13.2)	39 (21.4)	35 (19.2)	19 (10.4)
female	37 (18.7)	27 (13.6)	35 (17.7)	45 (22.7)	40 (20.2)	14 (7.1)
I don't know						
male	68 (16.0)	47 (11.1)	70 (16.5)	83 (19.5)	95 (22.4)	62 (14.6)
female	58 (26.0)	33 (14.8)	32 (14.3)	29 (13.0)	46 (20.6)	25 (11.2)

Table 11 Chi-square analysis, age of initiation and parental smoking by gender

Gender		Value	df	Asymp. Sig. (2-sided)
Male				
	Pearson Chi-square	91.806	20	0.000
	Likelihood Ration	87.624	20	0.000
	Linear-by-Linear	8.626	1	0.003
	N of Valid Cases	7150		
Female				
	Pearson Chi-square	51.830	20	0.000
	Likelihood Ration	52.298	20	0.000
	Linear-by-Linear	9.538	1	0.002
	N of Valid Cases	3620		

Results of the ordinal regression show that presence of parental smoking is significantly associated with a younger age of smoking initiation (Table 12). Estimates

were positive for the responses of neither parent smoking, I don't know, father only, and mother only smoking when compared to the reference category, both parents smoking. The positive estimates indicate that smoking age is higher among these categories than when both parents smoke. The neither, I don't know, and father only categories were significantly different from the reference category ($p<.001$). The mother smoking category was also significantly different from both smoking, but at a lower level ($p<.05$). Mother smoking had the smallest estimate compared to both parents smoking, suggesting that the presence of a mother smoking may not be as different from both parents smoking in terms of predicting a younger age of smoking initiation. The regression analysis also found there to be an effect for gender on age of smoking initiation. Compared to girls, boys initiate smoking at an older age. The difference was statistically significant ($p<.001$).

Table 12 Ordinal regression analysis, factors influencing age of smoking initiation

Variable	*Estimate (SE)*	*p-value*	*95% Confidence Interval*
Parental smoking status			
Neither	0.586 (0.70)	<0.001	0.449 - 0.724
I don't know	0.393 (0.096)	<0.001	0.205 - 0.581
Father smoking	0.514 (0.075)	<0.001	0.367 - 0.662
Mother smoking	0.239 (0.112)	0.033	0.019 - 0.459
Both	Ref	ref	ref
Respondent gender			
Male	0.208 (0.036)	<0.001	0.137 - 0.279
Female	ref	ref	ref

Using neither parent smoking as the reference category, a second ordinal regression shows that age of initiation is lower for the both smoking, mother only, father only, and I don't know categories when compared to neither parent smoking (Table 13). Father smoking compared to neither smoking, however, failed to reach significance.

Table 13 Ordinal regression analysis – neither parent smoking as reference category

Variable	*Estimate (SE)*	*p-value*	*95% Confidence Interval*
Parental smoking status			
Both	-0.586 (0.070)	<0.001	-0.724 - -0.449
Mother smoking	-0.348 (0.093)	<0.001	-0.530 - -0.165
Father smoking	-0.072 (.042)	0.085	-0.154 - 0.010
I don't know	-0.193 (.073)	0.008	-0.336 - -0.051
Neither	Ref	ref	ref

Finally, using mother only smoking as the reference category, reveals that adolescents begin smoking at an earlier age when only their mother smokes compared to when they responded that their father only smokes, neither parent smokes, or they did not know (Table 14). The difference between mother only smoking and father only smoking was significant, as was the difference between mother smoking and neither parent smoking. Only the both parents smoking category resulted in a younger age of initiation than when mother only smoked.

Table 14 Ordinal regression analysis – mother only smoking as reference category

Variable	*Estimate (SE)*	*p-value*	*95% Confidence Interval*
Parental smoking status			
Both	-0.239 (0.112)	0.033	-0.459 - -0.019
Neither	0.348 (0.093)	<0.001	0.165 - 0.530
Father smoking	0.276 (0.097)	0.005	0.085 - 0.466
I don't know	0.154 (0.114)	0.176	-0.069 - 0.378
Mother smoking	Ref	ref	ref

4.3 Current Smoking Status and Parental Smoking

Using the collapsed measure of current smoking, defined as smoking at least once in the last 30 days, 26.5% of current smokers responded that both parents smoke, 31.9% responded that mother only smokes. Respondents whose father only smoked and "I don't know" responses contributed 15.6% and 13.5%, respectively, of the current smokers. Finally, only 6% of current smokers originated from non-smoking parents (Table 15). Current smoking was significantly associated with parental smoking status (Table 16).

Table 15 Parental smoking status and adolescent smoking status

Variable	Smoking *n (%)*	Not smoking *n (%)*
Parental smoking status		
None	3503 (6)	55176 (94.0)
Both	539 (26.5)	1564 (74.4)
Father only	1561 (15.6)	8440 (84.4)
Mother only	282 (31.9)	601 (68.1)
I don't know	561 (13.5)	3593 (86.5)

Table 16 Chi-square analysis, association between parental smoking status and adolescent smoking status

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2683.131(a)	4	0.000
Likelihood Ratio	2114.287	4	0.000
Linear-by-Linear Association	1430.994	1	0.000
N of Valid Cases	75820		

Current smoking status was then divided into four categories, demonstrating those who smoked on zero days, 1 to 5 days, 6 to 19 days, and 20 to 30 days. Using this configuration, results show that within the "both parents" category or "mother only" category, most of the adolescents are smoking fewer than 5 days out of the last 30 days (Table 17).

Table 17 Parental smoking status and adolescent smoking status, expanded

	Current Smoking			
Variable	0 days	1 to 5 days	6 to 19 days	20 to 30 days
Parent smoking status	*n (%)*	*n (%)*	*n (%)*	*n (%)*
None	55176 (94.0)	2260 (3.9)	586 (1.0)	657 (1.1)
Both	1564 (74.4)	292 (13.9)	119 (5.7)	128 (6.10)
Father only	8440 (84.4)	948 (9.5)	257 (2.6)	356 (3.6)
Mother only	601 (68.1)	149 (16.9)	72 (8.2)	61 (6.9)
I don't know	3593 (86.5)	306 (7.4)	96 (2.3)	159 (3.8)
Total	69374 (91.5)	3955 (5.2)	1130 (1.5)	1361 (1.8)

When the results were separated by gender, boys were more likely to be current smokers than girls. In both parent smoking households, 27.3% of boys were current

smokers, while 23.3% of girls were. In mother only smoking households, 36.5% of boys were current smokers, while 27.1% of girls were. In father only smoking households, 20.2% of boys were current smokers and 10.6% of girls were current smokers (Table 18). Parental smoking was significantly associated with current smoking for boys and for girls, $p<.001$, $\chi^2= 1120$ and $p<.001$, $\chi^2= 1665$, respectively (Table 19).

Table 18 Parental smoking status and adolescent smoking status, by gender

	Not smoking *n(%)*	Currently smoking *n(%)*
None		
male	25789 (91.3)	2462 (8.7)
female	28378 (96.8)	929 (3.2)
Both		
male	770 (72.7)	289 (27.3)
female	738 (76.7)	224 (23.3)
Father only		
male	3807 (79.8)	962 (20.2)
female	4460 (89.4)	530 (10.6)
Mother only		
male	249 (63.5)	143 (36.5)
female	337 (72.9)	125 (27.1)
I don't know		
male	1775 (83.5)	351 (16.5)
female	1712 (91.1)	169 (9.0)

Table 19 Chi-square analysis between gender and current smoking status

		Value	df	Asymp. Sig. (2-sided)
1 Male	Pearson Chi-Square	1120.299(a)	4	0.000
	Likelihood Ratio	937.453	4	0.000
	Linear-by-Linear Association	622.477	1	0.000
	N of Valid Cases	36597		
2 Female	Pearson Chi-Square	1665.409(b)	4	0.000
	Likelihood Ratio	1154.675	4	0.000
	Linear-by-Linear Association	748.865	1	0.000
	N of Valid Cases	37602		

CHAPTER V

DISCUSSION AND CONCLUSION

5.1 Discussion

Tobacco use is the leading cause of preventable death throughout the world, killing more than 5 million people each year. Despite this fact, people continue to initiate cigarette smoking, most often as children or adolescents. Nicotine is an addictive drug and the health effects from smoking are detrimental, especially to young people whose bodies are developing during adolescence. Much tobacco-related research throughout the developed world focuses on why adolescents start smoking and how to prevent them from doing so. According to current knowledge, it is accepted that parental smoking status, either through behavior modeling, genetics, or a combination of both factors, influences the smoking behavior of their children. Less is understood about the impact that parental smoking may have on the age of children's smoking initiation.

This study sought to address the association between parental smoking status and age of initiation among adolescents in Africa. As aforementioned, there is a rich body of literature addressing tobacco use among youth in developed countries, but much less exploring the predictors and influences of youth in developing countries, such as those in Africa. Focusing on adolescent tobacco use in developing countries is essential if the global community is going to avoid a public health disaster. Nicotine dependence and secondhand smoke may be poorly understood or accepted in developing countries, therefore tobacco control policies are often weak or nonexistent. A combination of

ineffective tobacco control policies and powerful, manipulative tobacco industry practices leave children in an increasingly vulnerable position. Expanding knowledge of the impact of parental smoking on adolescent smoking could be the first step in delaying an increase in smoking prevalence, morbidity, and mortality.

In answering this study's first question, results of the analysis show that adolescents are more likely to try smoking at a younger age if one or both of their parents smoke compared to if neither parent smokes. The association between all categories of parental smoking and adolescent age of smoking initiation were statistically significant. This finding is similar to that of Wilkinson et al. and Edelen et al. who found that, in the U.S., parental smoking is significantly related to initiating smoking at a younger age. More in depth analysis is required to understand why parents appear to have such influence; whether it is through behavior modeling or by providing a means for their children to access cigarettes.

Interestingly, maternal smoking emerged as having a significant impact on not only the age of trying smoking, but also on the likelihood of being a current smoker. Maternal smoking had a greater impact on lowering the age of initiation than paternal smoking, and the greatest proportion of current smokers responded that only their mother smoked. Compared to females, a greater proportion of males smoked when their mothers only smoked. Furthermore, compared to both parents smoking and father only smoking, a greater proportion of males smoked when only their mothers smoked. This association between maternal smoking and male smoking was also found by Paul et al. Current smoking among females was also higher in proportion when their mothers smoked compared to when only fathers smoked; a trend that was also observed by Vink et al.

The studies mentioned above, conducted in the U.S., hypothesized that maternal-child relationships were more intimate and characterized by deeper levels of communication. Because of this closeness, they concluded that adolescents were more likely to view maternal smoking behavior as normative and acceptable. This hypothesis may not translate to the mother-child relationships in African countries. The trend observed in this study may be a reflection of adolescents who live only with their mother. Subsequently, the mother's smoking behavior is the only parental behavior to observe or emulate. Similarly, because adult female smoking prevalence is low, fewer than 5% of adolescents in this study said their mother only or both parents smoked, these results may represent adolescents' desire to emulate their mothers smoking behavior because it is so different form what is normally observed.

Gender was also significantly associated with age of smoking initiation; girls were more likely to try smoking at a younger age than boys. This finding is disturbing considering the tobacco industry's targeted advertising aimed at encouraging young females in developing countries to smoke. For females, it has also been noted that a younger age of initiation is associated with the development of small cell lung carcinoma, a particularly aggressive form of the disease. In light of the current evidence showing little disparity between smoking rates of girls and boys, it is discouraging to see that girls are also trying cigarettes at a younger age. This evidence may signal that tobacco use for females in developing regions is becoming more socially normative, thus, gaining acceptance among younger people.

Regarding the relationship between parental smoking and current smoking, results of the analysis indicate that current adolescent smokers are more likely to have two

parents that smoke or a mother only that smokes compared to when neither parent smoked. These findings confirm similar results found in the U.S. by Fleming et al., Farkas et al., and Peterson et al. These authors found that parental smoking significantly predicted current adolescent smoking, and that the odds of being a smoker increased with the number of parents that smoked.

Even though current smoking prevalence was relatively low, research shows that parental smoking and adolescent experimentation are significantly associated with subsequent adult smoking status. Therefore, we might expect the rate of current smoking to increase among this cohort based on the rate of parental smoking. Additionally, DiFranza and colleagues have demonstrated that adolescents may become nicotine dependent more quickly than adults. Adolescents in this sample who are smoking only sporadically may eventually find themselves unable to quit.

Current smoking in Africa may also be driven by access, both economic and availability of cigarettes. As was observed in other regions of the world, adolescents are sensitive to the price of cigarettes. As transnational tobacco companies target developing markets in Africa, the lack of tobacco control policies may present adolescents with greater access to cheap cigarettes in the coming years.

5.2 Study Limitations

A study of this nature presents several limitations. First, cross-sectional analysis only permits conclusions to be drawn about associations between parental smoking and adolescent smoking. Unlike a prospective study design, the analysis is not rigorous enough to state that parental smoking causes a younger age of adolescent smoking.

Similarly, because trend data is in the process of being collected or made publicly available, we cannot make projections as to continued use of cigarettes. It is unclear whether those who tried at age seven are likely to be smoking as adults or if they only tried a cigarette one time. Following a specific cohort would enable researchers to understand the smoking patterns of these youngest initiators.

The survey relies on self-reported cigarette use by the adolescent and self-reported cigarette use of the adolescent's parent (or parents). Some studies have shown that children of smokers are highly reliable in positively identifying their parents' smoking status (Marks, Swan, C. Pomerleau, & O. Pomerleau, 2003). The respondents' answers are subject to recall bias when determining the age of trying smoking, as well as response bias when identifying themselves or their parents as smokers. This study also assumes that the sample is representative of the region or country surveyed, however, in some cases, schools from a particular city were surveyed and may not represent the country as a whole.

Given that exposure to advertising and peer smoking status are accepted predictors of adolescent smoking initiation, this study could have been stronger had it controlled for these factors. Unfortunately, the questions employed by the GYTS about advertising are framed within the past thirty days, which may or may not have any relevance to the time period within which an adolescent tried smoking. Similarly, questions regarding peer smoking reflect current friend groups and not necessarily a respondent's friends at the time he or she initially tried smoking.

The survey questions also present limitations in regard to parental smoking. For instance, we assume that the respondents live with their parents or guardians, as no

question verifies this. And there is a lack of clarification for the response "I don't know" to the question "Do your parents smoke?" Further information is not elicited from the respondent to clarify why he or she does not know (e.g., child does not live with parents, child's parents are dead, or child knows his parents, but truly does not know if they smoke). Given the unknown nature of this category, it is difficult to make assumptions about the rates of smoking for this group of individuals. The survey also lacks demographic and socioeconomic information about the respondents; this information may reveal more detail about adolescent and parental smoking behavior or moderate their association.

Prevalence of smoking in many African countries is low; both among adults and children, which further limits the strength of this study. Given the small cell counts for the "mother only smokes" category, some caution must be taken when interpreting the results associated with this category. Finally, the GYTS only surveys adolescents attending school and does not capture those not enrolled in school. Likewise, the survey also does not capture students absent from school on the day of the survey. Rates of smoking among absent adolescents or adolescents not enrolled in school (and the rates of their parents) may differ fundamentally from those reflected in the GYTS. Therefore, these results may not be generalizeable to adolescents not enrolled in or regularly attending school.

5.3 Recommendations

More research is needed to determine if parental smoking status is indeed a predictor of early adolescent smoking initiation. Rigorous analyses, such as prospective

examinations, that take into account the predictive factors of peer smoking, exposure to advertising, and access to cigarettes are essential to strengthen the hypothesis that parental smoking is significant. In addition to these factors that have been found to significantly influence adolescent smoking in developed countries, there may be other appropriate factors to be measured in developing countries, such as poverty or civil conflict. While this study focused on the age of first trying smoking, a more in-depth analysis is required to determine the factors related to progression from trying smoking to regular smoking.

Continuing to use the GYTS to track adolescent smoking and tobacco use is critical to determining the best methods and regions for intervention. As this study emphasized, smoking prevalence is relatively low in developing African countries, but adolescents are experimenting with cigarettes, some at a very young age. It is important to stress that regardless of being identified as a current smoker during the time of the survey, adolescents that experiment with cigarettes are more likely to be smokers as adults than their counterparts that do not try smoking. Continuing to pursue the factors that promote both trying and progressing smoking behavior is essential to curb this trend.

Results from this study reinforce the need to improve tobacco control policies in developing countries and counter the efforts of tobacco companies to promote their products in these emerging markets. Case studies of countries that have implemented tobacco policies sometimes reveal that the policies are largely ignored (Sussman, Pokhrel, Black, Kohrman, et al., 2007). If implemented appropriately, however, age verification at the point of purchase could be a powerful deterrent, as well as bans on point of purchase advertising and promotional items (Sussman et al., 2007; Prokhorov,

Winickoff, Ahluwalia, Ossip-Klein, et al., 2006). Restricting the sale of single stick cigarettes and increasing the tax on cigarettes is another cost-effective means of reducing consumption of smoking among adults and youth (Ranson, Jha, Chaloupka, & Nguyen, 2002; Chaloupka & Wechsler, 1997).

Although the rates of cigarette smoking are relatively low, any evidence of children under seven years old trying smoking warrants action on the part of policymakers and the public health community worldwide. Publicizing this alarming trend throughout Africa and abroad presents a unique opportunity to recruit advocates. Many people would be appalled to learn that children are smoking at such a young age, and even worse, are being encouraged by current transnational tobacco company tactics. Similarly, tactics used to recruit both young and adult females in developing countries must be exposed to generate advocates and activates for the cause. In addition to international attention, gender-specific anti-tobacco programs are needed to counter tobacco corporation advertising and messaging (Global Youth Tobacco Survey Collaborating Group, 2003).

Efforts should also be made to educate parents on how their smoking influences their children, while also providing access to smoking cessation services. Not only do parents increase the likelihood that their children will smoke, but they also put their children at risk of developing health problems by exposing them to secondhand smoke. Moreover, when parents spend money on tobacco products, a possible result is a negative impact on the family's financial ability to provide basic needs of nutrition and education (Prokhorov et al., 2006). Thus, health care providers can also play a role in reducing overall tobacco consumption in their region. Providers have an opportunity to screen

adolescent patients and their parents for tobacco use and dependence, convey their support for abstinence, and provide the means for accessing cessation services (Prokhorov et al., 2006).

5.4 CONCLUSION

Parental smoking status significantly influences adolescent smoking, both during adolescence and when adolescents reach adulthood; this conclusion has been reached largely through research conducted in developed countries. This study also found an association between parental smoking status and adolescent smoking status in 14 African countries. It appears that parental smoking influences adolescent experimentation with cigarettes, as well as the likelihood that an adolescent will be a current smoker. Implementing tobacco polices that prevent the tobacco industry from advertising their products and targeting adolescents is one method of addressing this problem at an early stage of the tobacco epidemic. Understandably, some regions without a strong public health infrastructure will need financial support from developed countries to ensure that bans are truly comprehensive and enforced. Additionally, public health organizations should provide education and promote cessation among adults, especially parents. If further studies find a similar link between maternal smoking and youth smoking, mothers should be targeted with gender-specific anti-smoking and cessation programs.

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