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## Parental, Peer, and Tobacco Marketing Influences on Adolescent Smoking in South Africa

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## ABSTRACT

REYNOLDS MORRISON

Parental, peer, and tobacco marketing influences on adolescent smoking in South Africa.

(Under the direction of Michael Eriksen, FACULTY MEMBER)

Tobacco use is a major preventable cause of morbidity and mortality worldwide. Most smokers initiate smoking in childhood, become addicted, and continue the habit into adulthood. Various factors have been shown to impact smoking behavior. It is important to determine how these factors impact smoking behavior in developing regions of the world, such as in South Africa. This study examines the association between parental smoking status; peer smoking status; exposure to pro-tobacco marketing; and current smoking status among adolescents in South Africa. It also determines which factor is the most significant predictor of current smoking status among the study population and further examines the trends in these factors among survey populations from 1999 – 2008.

Secondary analysis was conducted on data obtained from the Global Youth Tobacco Survey. Logistic regression analyses were conducted to determine the association between the independent variables; parental smoking status, peer smoking status, and exposure to pro-tobacco marketing; and the dependent variable, current smoking status, controlling for other factors.

Adolescents who had at least a parent or a friend who smoked had greater odds of being current smokers as compared to those who had neither a parent nor a friend who smoked. Similarly, exposure to average and high levels of pro-tobacco marketing was associated with greater odds of an adolescent being a current smoker as compared to exposure to low levels of pro-tobacco marketing. Maternal smoking appeared to have a greater impact on adolescent smoking behavior as compared to paternal smoking. Also, peer smoking had the greatest impact on smoking behavior as compared to the other independent factors. Smoking rates among South African adolescents has decreased from 23% in 1999 to about 17% in 2008. Similarly, the proportion of adolescents who had a parent or a friend who smoked, or had been exposed to average and high levels of pro-tobacco marketing has also decreased over the same period.

Programs must be implemented to educate parents on how their smoking behavior is being transmitted to their children, with a special focus on maternal influences. Tobacco use prevention campaigns aimed at the youth should also be implemented, and laws restricting tobacco marketing must be enforced.

INDEX WORDS: smoking, current smoking, adolescent, parent, peer, pro-tobacco marketing, tobacco, South Africa.

PARENTAL, PEER, AND TOBACCO MARKETING INFLUENCES ON ADOLESCENT  
SMOKING IN SOUTH AFRICA

by

REYNOLDS A. MORRISON

B.Sc., UNIVERSITY OF GHANA

A Thesis Submitted to the Graduate Faculty  
of Georgia State University in Partial Fulfillment  
of the  
Requirements for the Degree

MASTER OF PUBLIC HEALTH

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2011

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I thank my family for their immense support throughout my stay in school. To save the best for last, I thank God, who made it possible for me to start and end this amazing journey.

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## LIST OF ABBREVIATIONS

WHO – World Health Organization

USDHHS – United States Department of Health and Human Services

GYTS – Global Youth Tobacco Survey

CDC – Centers for Disease Control and Prevention

COPD – Chronic Obstructive Pulmonary Disease

IHD – Ischemic Heart Disease

TB – Tuberculosis

# CHAPTER I

## INTRODUCTION

### 1.1 Background

Tobacco use is known to be an addictive behavior. It is a major preventable cause of morbidity and mortality worldwide. According to the World Health Organization (WHO), tobacco smoking kills at least one person every 6 seconds and it is also responsible for one in ten adult deaths worldwide (WHO, 2009). It is associated with more than 5 million deaths each year, and by 2030 this will increase to 8 million (WHO, 2011). Unless urgent interventions are put in place, tobacco use will kill more than a billion people by the end of the 21<sup>st</sup> Century (WHO, 2011). Cigarette smoking has negative effects on nearly every organ of the body. Smoking causes coronary heart disease, several types of cancer (e.g. acute myeloid leukemia, cancers of the lung, mouth, etc.), and reproductive impairments (infertility, preterm delivery, sudden infant death syndrome etc.) among many other diseases (U.S. Department of Health and Human Services (USDHHS), 2004).

Cigarette smoking has been referred to as a “pediatric epidemic” (Perry, Eriksen, & Giovino, 1994) whose addictive nature ensures that most smokers who initiate smoking in their childhood will continue the habit into adulthood (USDHHS, 1994). This is buttressed with the finding that in the United States, 80% of adult smokers become habitual smokers before the age of 18 and 90% before the age of 20 (Centers for Disease Control (CDC), 1998). It is unknown how this pertains in Africa, but Howell (2009) showed that most adolescents in Africa who were current smokers initiated smoking between the ages of 12 and 14 years. Individuals who start smoking at younger ages are more likely to become strongly addicted to nicotine (CDC, 1994),

and have an increased risk of developing lung, kidney, and bladder cancer as well as coronary heart disease (CDC, 1998). For instance, people who start smoking at age 15 or younger have a two-fold increase in risk of lung cancer as compared to those who start at age 20 and older (Peto, Darby, Deo et al., 2000).

Tobacco use contributes to severe poverty experienced in many parts of the world, especially in developing countries (WHO, 2004). In low-income families, where the smoker may be the main breadwinner of the family, significant amounts of money that would have been spent on food and shelter is often spent on sustaining the nicotine addiction (WHO, 2004). For instance, more than 10% of expenditure in poor households in Egypt is spent on cigarettes and other forms of tobacco (Nassar, 2003). Moreover the expenditure by governments on tobacco-related diseases and economic costs of lost productivity is far less than the revenue gained from tobacco (Jha & Chaloupka, 1999).

Cigarette smoking prevalence which was high in developed countries has been decreasing in recent years, with an associated decline in tobacco-related mortality that will continue over the next decades (Mathers and Loncar, 2006). Conversely, smoking which was rare in developing countries has increased in prevalence over the past years (Shafey, Eriksen, Ross & Mackay, 2009), such that 80% of tobacco-related deaths is projected to occur in the developing world by 2030 (WHO, 2011). This is bound to have significant negative public health and economic impacts on developing countries which already face substantial challenges with fighting infectious diseases. Developing countries therefore need to implement effective tobacco-use monitoring and prevention systems (Ezzati, Henley, Lopez, et al, 2005). However, they lack the necessary resources to do this (Owusu-Dabo, Lewis, McNeill, Gilmore, & Britton, 2009).

About 50% of men and 9% of women in developing countries smoke as compared to 35% of men and 22% of women in developed countries (Shafey et al., 2009). The Global Youth Tobacco Survey (GYTS) conducted between 1999 and 2005 showed that in Africa, about 13% of boys smoked as compared to 5.8% of girls (Warren, Jones, Eriksen, & Asma, 2006). Due to this low prevalence of smoking among women and young people in developing countries, such regions of the world have been identified as prime targets of tobacco industries (Shafey et al., 2009). The scarcity of accurate information on some parts of the world such as Africa makes it difficult to determine tobacco use prevalence and its predictive factors. A study by Pampel (2008) attempted to provide an estimate of tobacco use prevalence among adults in fourteen countries in Sub-Sahara Africa. His results showed that smoking prevalence ranged from as low as 8% in Nigeria to as high as 27.3% in Madagascar. However the age range of respondents (15 – 54 or 15-59 years for men, and 15-49 years for women) may have biased the estimates of tobacco use (Pampel, 2008). Shafey, Dolwick, & Guidon (2003), found that tobacco use among adults in Africa showed a smoking prevalence ranging from a low of about 3% in Ethiopia to a high of 20% in Namibia, though other forms of tobacco use such as rolled tobacco leaves and pipes were more common than cigarettes. Considering that Shafey et al., (2009) found that the proportion of men who smoke in developing countries is more than five times the proportion of women who smoke, one would have thought that a similar observation will pertain to youth smoking behavior. But this is not the case. Data from the GYTS showed that there was no significant difference in smoking rates between girls and boys (Shafey et al., 2009). This alludes to the possibility of insignificant differences in the proportions of adult male and female smokers in the future with serious implications for the public health systems of African countries.

Some of the factors that appear to be associated with adolescent smoking include parental and peer smoking, exposure to pro-tobacco marketing, easy access to tobacco products, adolescent age group, genetics, among many others. Parental and peer smoking, and pro-tobacco marketing are especially important because several research studies have demonstrated their impact on adolescent smoking behavior. Peer smoking has been considered as being the most significant predictor of adolescent smoking (Abroms, Simons-Morton, Haynie, & Chen (2005); Bauman, & Ennett, 1996; Conrad, Flay, & Hill, 1992). Other studies have however challenged this assertion, stating instead that adolescents select their friends based on their own characteristics and that parental smoking plays a greater role in adolescent smoking (Arnett, 2007). The impact of pro-tobacco marketing on adolescent smoking has also been demonstrated in many studies (Sargent, Beach, Adachi-Mejia, et al., 2005; Wakefield, Flay, Wellman, Sugarman, DiFranza, & Winickoff, 2006.). However, most of these studies were conducted in developed countries and their findings may or may not be applicable to some developing regions of the world such as Africa. There is a need, therefore, to determine the impact of these factors on adolescent smoking behavior within Africa, such as in South Africa.

## **1.2 Purpose of the study**

Most African countries lack accurate standardized data on tobacco use by age, sex, and risk group (Baris, Prindiville, Silva, et al., 2000). Studies have demonstrated the association between parental smoking, peer smoking, and pro-tobacco marketing on adolescent current smoking status. However, these studies were mostly conducted in developed countries. Results obtained will provide more information on the factors that drive adolescent smoking within South Africa and will contribute to the literature on tobacco use behavior within the African context. This will help determine which areas to focus prevention efforts.



### **1.3 Research Questions**

This study seeks to provide information on the comparative impact of identified risk factors for adolescent smoking by answering the questions;

1. What is the association between the number of parents who smoke, parental gender, and adolescent current smoking status.
2. What is the association between the number of closest friends who smoke and current smoking status.
3. What is the association between the level of exposure to pro-tobacco marketing and adolescent current smoking status
4. What is the trend in the prevalence of the independent variables for populations surveyed in 1999, 2002, and 2008?

## **CHAPTER II**

### **LITERATURE REVIEW**

The purpose of this study is to determine the influence of parental, peer and pro-tobacco marketing on adolescent current smoking status. A review of current information on theoretical perspectives on adolescent smoking; the various determinants and characteristics of adolescent smoking; and negative health effects associated with adolescent smoking will provide a basis for this study. Available studies on determinants of adolescent smoking have been mostly conducted in developed countries. The same situation may or may not be true in the African or South African context, but they provide a dependable framework from which predictors of smoking among South African adolescents can be studied. South Africa is one of the few African countries with comprehensive tobacco control policies. This review will therefore show an overview of the current state of tobacco use and control in South Africa.

#### **2.1 Characteristics of Adolescent Smoking**

Whiles there is no scientific classification of adolescence, or a set age boundary, the generally accepted age range is 10-24 years (USDHHS, 2011). Adolescence is a period marked by dramatic increases in smoking prevalence (Johnston, O'Malley, Bachman, & Schulenberg, 2007), and as has been stated earlier, a substantial proportion of adult smokers became regular smokers before ages 18 and 20 (CDC, 1998). There is a significant association between experimentation with smoking during adolescence, and regular smoking status as an adult (Paul Blizzard, Patton, et al., 2008) though not all adolescents who initiate smoking progress to regular smoking (Abroms, Simons – Morton, Haynie, & Chen, 2005; Tucker, Klein, & Elliott, 2004).

Adolescents who smoke are also at an increased risk of becoming addicted to nicotine. DiFranza and colleagues found out that adolescents who report positive feelings such as relaxation, dizziness, and nausea on first cigarette use had a high likelihood of becoming dependent on nicotine since these feelings can only persist with continued cigarette use. Furthermore, there was no significant association between these indicators of nicotine dependence and the gender of the user, or cigarette characteristics (brand, strength, or mentholation) (DiFranza, Savageau, Fletcher, et al., 2004). However, the experience of irritating symptoms, such as coughing, was predictive of possible reduction in nicotine exposure and may have protected against nicotine addiction (DiFranza et al., 2004).

Apart from parental smoking, peer smoking, or tobacco advertisements (which are discussed in section 2.4) various factors have been examined as predictors of adolescent cigarette smoking. Christophi et al. (2009) examined possible determinants of cigarette smoking among youth in Cyprus. Among their findings of significant predictors of adolescent smoking, apart from the three above mentioned factors were: access to pocket money and easy accessibility to cigarettes; age, with the odds of smoking higher among youths up to 12 years old and those older than 17 years; the perception that smoking helps weight loss efforts; and gender, with boys more likely to smoke than girls. They also identified factors that have a protective effect against adolescent cigarette smoking namely: higher educational level of parents; a belief that smoking was harmful; anti-smoking education at school over the last year; and a perception that adolescent smokers are less attractive, and have fewer friends.

## 2.2 Conceptual and Theoretical Perspectives on Adolescent Smoking

Adolescent smoking behavior occurs in discrete phases or stages which may not be sequential (Bricker , Peterson, Sarason, et al., 2007; Tucker, Ellickson & Klein, 2003; Colder, Mheta, Balanda et al., 2001). These phases are described as a level of never trying, trying smoking, monthly smoking, and daily smoking (Bricker et al., 2007). Wellman, DiFranza, Savageau, & Dussault (2004) have also described these stages as abstinent, sporadic, occasional, daily, escalating (increasing number of cigarettes smoked per day) and intermittent (making quit attempts but not abstinent). This suggests that adolescents who initiate smoking may progress to occasional smoking, regular smoking or will cease the habit altogether.

Different levels of influence have been found to impact adolescent smoking behavior . According to Simons-Morton & Farhat (2010), adolescent smoking is influenced by social norms that are determined in terms of social context, social networks, and group membership. The social context is the existing environment under which interpersonal interactions occur between individuals in a group such as in families, neighborhoods, religious organizations etc. (Simons-Morton & Farhat, 2010). The most direct and primary influence comes from family and peer groups and they provide a framework through which an individual gains an understanding of what is normal and acceptable behavior in society (Dawkins, 1989). An individual's social network consists of all the persons and groups that the individual interacts with (Simons-Morton & Farhat, 2010) and this is largely determined by shared social context (Wilcox, 2003). As the individual interacts with other persons in his/her social network, there is an exchange of information which shapes perception of social norms (Simons-Morton & Farhat, 2010), but this is influenced by the nature of the relationship (such as closeness, reciprocity, frequency of contact)

(Valente, Gallaher, & Mouttapa, 2004). These levels of influence overlap and interact to ultimately impact behavior (Simons-Morton & Farhat, 2010), in this case adolescent smoking.

Socialization and selection are two processes thought to occur in adolescent smoking behavior among their peers (Simons-Morton, 2007). Socialization occurs when an individual adopts attitudes and behaviors in conformity to the actual or perceived group expectation. Selection on the other hand is the tendency to join or form friendships with individuals who have similar attitudes and common interests (Simons-Morton, 2007).

Peer socialization in adolescents occurs in two ways; either overt or perceived (Simons-Morton & Farhat, 2010). Overt socialization, also known as peer pressure, is when the adolescent is directly persuaded by friends to adopt their behavior. This has been evidenced in studies showing that adolescents offer cigarettes to, and initiate smoking with their peers (Kirke 2004; Lucas & Lloyd 1999; Robinson, Murray, Alfano et al., 2006). Perceived socialization occurs in a normative process, where the adolescent experiences internal pressure to smoke in the presence of other adolescents who are smoking (Nichter, Nichter, Vuckovic et al., 1997). This latter process is found to be more common. Therefore most adolescents make decisions about smoking more to fit in, gain recognition with their friends and declare their independence (Kobus, 2003; Nichter et al., 1997).

Peer selection occurs when in response to the initiation of smoking by members of a peer group, adolescents make one of three decisions; they may choose to dissociate themselves from the group (deselection), conform to the new group standard (socialization), or stay in the group despite the difference between their norms and the group's (Andrews et al., 2002). Selection may be abstract and internal, such as when a person befriends other people on the basis of shared

interests or what the others represent than on any common observable behaviors (Simons-Morton & Farhat, 2010). For example, shared interests in music or other reputation can serve as the basis for which adolescents form friendships (Ter Bogt Engels, & Dubas, 2006). Selection can also involve association with individuals or groups on the basis of actual similarities in interests and behavior (Urberg, Chen, & Shyu, 1998). For instance, adolescents who are interested in smoking may befriend others with similar interests (Emmett, Bauman, & Koch, 1994), though besides smoking, they may have other similarities in interests and behaviors (Simons-Morton & Farhat, 2010).

Various theories have been used to explain characteristics of smoking among adolescents. The theory of planned behavior predicts that behavior (an adolescent's decision to smoke or refrain from smoking) is determined by behavioral intentions (the adolescent's willingness or desire to smoke) (Ajzen & Fishbein, 1980). As such, adolescent smoking behavior is determined by factors such as the adolescent's perception of his or her ability to act given available personal resources and situational restraints; the attitudes of his/her family and peers towards smoking, and beliefs about the positive and negative effects of smoking (Collins & Ellickson, 2004). The social cognitive theory (Bandura, 1986) emphasizes that an individual's observations and experiences within a society guides his behavior as to what he considers to be the social norms in that society. This has implications for the impact of parental smoking on adolescent smoking as parents may be modeling the behavior to their children. Problem behavior theory (Jessor, Donovan, & Widmer, 1980; Donovan & Jessor, 1985) states that adolescent deviant behaviors tend to cluster together and influence each other in a reciprocal manner such that they form a single behavioral syndrome, and may be the expression of an underlying personality dimension (Donovan & Jessor, 1985). As such, smoking is predictive of several behavioral problems such as

sexual risk behaviors, aggression, alcohol use, and marijuana use. Social identity theory (Terry, Hogg, & White, 2000) posits that in order for adolescents to be considered as members of their peer group, they experiment with various identities and adopt the norms specific to that group. Also, social exchange theory (Kelley & Thibaut, 1985) states that there is an exchange of values and norms between the individuals in a friendship or group, leading to conformity of behavior between friends or group members. Therefore adolescents may associate with friends who smoke, or influence their friends with their smoking behavior (Baumann & Ennett, 1996). According to the primary socialization theory (Oetting and Donnermeyer, 1998), the absence of strong social bonds in an adolescent's family or school also makes him/her more susceptible to peer group influence. Finally social network theory (Scott, 2000; Valente, 1995) suggests that information shared among members of a society determines the social norms that will pertain to that group. This is the basis of two-stage marketing strategies where opinion leaders whose attitudes and behavior influence others, are used to portray certain products or behaviors in a positive light (Rogers, 2003).

While the various theories identify similar factors that impact tobacco use, they have significant differences that make it difficult to determine the best approach to adolescent tobacco use prevention (Collins & Ellickson, 2004). Collins & Ellickson (2004) showed that the use of an integrated model of theories was more likely to explain the broad spectrums of adolescent smoking behavior. They reviewed four theories related to adolescent smoking (Theory of Planned Behavior, Social Learning Theory, Social Attachment Theory and Problem Behavior Theory) and found that a better prediction of adolescent smoking behavior was obtained as opposed to using each theory individually.

### **2.3 Adverse Health Effects Associated with Adolescent Smoking**

Individuals who start smoking at younger ages are more likely to become strongly addicted to nicotine (CDC, 1994). They will also find it more difficult to quit and are most likely to continue the habit into adulthood (CDC, 1994). Young smokers also have an increased risk of developing lung, kidney, bladder cancer and coronary heart disease (CDC, 1998). For instance, people who start smoking at age 15 or younger have a two-fold increase in risk of lung cancer as compared to those who start at age 20 and older (Peto et al., 2000). Tobacco use is also associated with an increased likelihood of other drugs use, and involvement in other risky behaviors . Studies in South Africa (Pahl, Brook, Morojele, & Brook, 2010) and the United States (Busen, Modeland, & Kouzekanani, 2001; Unger, Sussman, & Dent, 2003; Valois, Oeltman, Waller, & Hussey, 1999) came to similar findings that tobacco use among adolescents was associated with several problem behaviors including sexual risk behaviors, aggression, alcohol use, and marijuana use.

Adolescents who start smoking at early ages have an increased risk of sickness and death due to tobacco-related disease than those who delay smoking. For instance, women who start smoking on or before age 17 have a 22% greater mortality from all diseases than those who start at age 26 or later (Kenfield et al, 2008). People who start smoking at young ages are also more likely to die from lung cancer, even after controlling for number of cigarettes smoked per day, or number of years of being a smoker (Knocke, Shanks, Vaughn, Thun, & Burns, 2004).



## **2.4. Parental, Peer and Tobacco marketing influences on adolescent smoking**

### **2.4.1. Parental Smoking**

Social cognitive theory (Bandura, 1986) provides an explanation for the impact of parental smoking on adolescent smoking behavior. It emphasizes that adolescents observe the smoking behavior of their parents, consider it to be normal, and initiate the smoking behavior (Bandura, 1986; White, Hopper, Wearing, & Hill, 2003). Adolescents may also see smoking as an adult activity, and they may initiate this behavior to indicate their maturity into adulthood (Tucker et al., 2003; Milton, Dugdill, Porcellato, & Springett, 2008).

Various studies link parents' smoking with smoking behavior of their children. Gilman, Rende, Boergers, et al., (2009) conducted a study of the influence of parental smoking histories on adolescent smoking initiation. The results showed that adolescents who had parents who were regular smokers had a higher likelihood of initiating smoking (OR=2.81) as compared to adolescents whose parents had never smoked. They also did not find any significant differences in the likelihood to initiate smoking between adolescents whose parents never smoked and adolescents whose parents had quit smoking. This has implications for tobacco control efforts as parents who quit smoking can have as much impact on their children's smoking as compared to parents who had never smoked. Adolescents who had both parents smoking had a nearly threefold risk (OR=2.75), and those with a single parent smoking 1.45 higher odds, to initiate smoking as compared to those whose parents didn't smoke, suggesting a dose-response relationship. Mother's or father's smoking also independently raised the risk of initiation of smoking, but there was no significant difference between the two (Gilman et al, 2009). Fleming and colleagues also conducted a longitudinal study of first and second graders who were

followed for four years and the effect of identified predictive variables on smoking initiation assessed when the participants were in sixth and seventh grade (Fleming, Kim, Harachi, & Catalano, 2002). Their results showed that by the sixth or seventh grade, children of parents who smoked were almost twice as likely to smoke (OR=1.84) as compared to children of non-smoking parents.

Parental views on smoking can also have a likely impact on adolescent smoking intentions and behavior. However, the verdict on this is mixed. Haraken et al (2010) found out that strong parental antismoking views may directly reduce smoking intentions of adolescents, and will also weaken adolescent tendencies to see smokers (in the media, and real life) in a positive light. On the other hand, Sargent and Hannevinkel (2008) suggested that the media was the dominant influence, and that seeing smoking in movies had the effect of undermining parental anti-smoking practices. McCool, Cameron, & Robinson (2011) studied the effect of smoking images in the media on adolescents' smoking intentions in light of their parents' antismoking expectations. Their results showed that adolescents whose parents had clear and unambiguous rules against smoking had a less favorable view of smokers in the media, whilst in households where conflicting views about smoking were expressed, adolescents were more likely to have relatively positive views about smoking, which in turn will promote smoking intentions. Young people therefore internalize parental views about tobacco use and this will go on to shape their behavior (Jackson, 2002).

#### **2.4.2 Peer Smoking**

Peer selection & socialization, and theories such as Social Exchange Theory and Social Identity Theory can be used to explain the influence of peers on adolescent smoking. Research

has also shown that adolescents have a misperception of a higher prevalence of smoking among their peers than what actually pertains (Bauman and Ennett, 1996; Iannotti, Bush, & Weinfurt, 1996). Reasons for this could be that adolescents who smoke may assume that other members of their group also smoke (Miller, Monin, & Prentice, 2000), or they may have a false impression that their attitudes and behaviors are the norm in the group (Berkowitz, 2004). Adolescent peer groups therefore tend to share common behaviors such as smoking; a characteristic known as peer group clustering, or homogeneity (Andrews et al., 2002; Alexander, Piazza, Mekos, & Valente, 2001).

Adolescents form friendships based on smoking status such that smokers befriend smokers and non-smokers befriend other non-smokers (Urberg et al. 1991; Ennett et al. 1994; Michell, 1997). Non-smokers who befriend smokers are at greater risk of transitioning to tobacco use than youth without smoking friends (Engels et al. 1997; Flay, Hu, & Richardson, 1998; O'Loughlin et al., 1998). Also, encouragement and approval from friends can lead to adolescents increasing their levels of smoking (Duncan et al. 1995; Flay et al. 1998). In a study by Okoli, Richardson & Johnson (2008), the extent of adolescents' exposure to smoking by their peers was associated with their level of expectations and reporting of positive experiences or symptoms on smoking initiation; the greater the adolescent's exposure to peer smoking, the more likely they were to report positive symptoms such as feeling dizzy, relaxed, good, and high on initial smoking experience. This is in light of other studies that show that individuals who report such feelings at their initial smoking attempt are more susceptible to future smoking (DiFranza et al., 2004; O'Connor, Kozlowski, Vandenberg et al., 2005).

The comparative impact of peers and parents on adolescent smoking has been studied by various researchers with conflicting results. Some of the studies found out that peers play a

greater role in adolescent smoking than parents (Rose, Chassin, Presson, & Sherman, 1999; Bahr, Hoffman & Yang, 2005; Avenevoli & Merikangas, 2003; Webster et al. 1994; Hu, Flay, Hedeker, et al., 1995). On the other hand, other studies also suggested that parents play an equal or a greater role in adolescent smoking behavior than peers (Bauman et al. 2001; Chassin, Presson, & Sherman, 1995; Eiser & Van der Pligt, 1984; Villanti et al., 2011)

Rose et al., (1999) conducted a prospective study of the impact of parent and peer influences on smoking onset among adolescents. Their results showed that while having parents who smoked was a significant predictor of smoking onset in adolescence, having close friends who smoked had a greater impact. Bahr et al., (2005) examined the influence of peer drug use, and familial characteristics – which included parental drug attitudes and adult drug use – on adolescent drug behavior. They found that within the familial characteristics, parental attitudes towards smoking and sibling smoking were the most significant. However, the number of friends who smoke was the strongest predictor and appeared to mediate the impact of familial characteristics. Avenevoli & Merikangas (2003) also conducted a comprehensive review of available studies and concluded that peer smoking influences adolescent smoking more strongly than the smoking behavior of siblings or parents.

Chassin et al., (1995) conducted a cohort-sequential study in which they examined parent and peer influences on initiation of smoking and transition to regular smoking among adolescents. The findings from the cross-sectional data indicated that the magnitude of peer influences increased while parental influence decreased as adolescents grow older. However on examining the data longitudinally, it appeared that both peer and parental influences remained significant but constant with increasing age. Similarly, Bauman et al., (2001) analyzed data from a longitudinal study of U.S. adolescents in middle and high school. Their findings indicated that

while parents and friend smoking were associated with adolescent smoking, the influence did not vary with increasing adolescent age. Villanti et al., (2011) presented a different view when, in their cross-sectional study of adolescents in the United States, they found that while parental smoking exerts a constant influence on adolescent smoking behavior, peer smoking influence decreases during the transition from early adolescence (10-13 years) to middle adolescence (14-17 years).

### **2.4.3 Exposure to pro-tobacco marketing**

Exposure to pro-tobacco marketing and advertising also has important influences on adolescent smoking behavior. Youth exposed to tobacco advertising and smoking in movies, magazines and other media report increased positive attitudes about smoking, intention to smoke, and smoking initiation (Wellman, et al., 2006; Sargent et al., 2005; Wakefield et al., 2003). Wellman et al., (2006) conducted a meta-analysis of studies that reported an association between exposure to pro-tobacco marketing and tobacco use outcomes in individuals younger than 18 years. They found that compared to unexposed youth, exposed youth had approximately 50% greater odds of having positive attitudes toward tobacco use or expressing an intention to use it in the future. Also, individuals exposed to pro-tobacco marketing had more than twice the odds of initiating tobacco use. In their study of determinants of smoking behavior among youth in Cyprus, Christophi et al. (2009) showed that exposure to the various indicators of pro-cigarette marketing were significantly associated with an increased risk of current smoking status; An adolescent who owned an item with a cigarette logo on it had nearly four times the odds (OR=3.77) of being a current smoker as compared to those who didn't own any item and exposure to pro-cigarette advertising was also associated with increased odds of being a current smoker (OR=1.56) as compared to no exposure. On the other hand, exposure to anti-smoking

advertising was protective, with reduced odds of being a current smoker (OR=0.84). Other studies have also shown that anti-tobacco campaigns lead to a reduction in smoking among adolescents (Farrelly, Heaton, Davis, et al., 2002; Farrelly, Niederdeppe, & Yarsevich, 2003; Wakefield et al., 2003).

There is a dose-response relationship between exposure to cigarette advertising and cigarette smoking. Hannewinkel et al., (2010) conducted a study to assess the influence of cigarette advertising on teens in Germany, which has partial tobacco advertising restrictions. They found that adolescents who had been exposed to higher levels of smoking were significantly more likely to have tried smoking, to smoke currently and also to be susceptible to smoking. Also, DiFranza, Wellman, Sargent et al., (2006) conducted a systematic review of available studies on the relationship between tobacco advertising and adolescent smoking and concluded that a greater exposure to cigarette advertising implied a higher risk of cigarette smoking among teens. Villanti et al., (2011) in their study also found out that tobacco advertising was significantly associated with current smoking across adolescence but the impact was strongest during early adolescence.

Adolescent receptivity to pro-tobacco marketing is predictive of tobacco use behaviors. According to McGuire (1985), receptivity is a “measure of the extent to which the adolescent has been exposed to the tobacco advertisement, has paid attention to it, and the cognitive response to it”. Sargent, Gibson and Heatherton (2009) demonstrated that higher receptivity to tobacco products advertising implied a greater likelihood to engage in smoking. In their study, they attempted to determine the impact of receptivity to pro-tobacco marketing and exposure to smoking in movies on two outcomes; smoking onset and progression to regular smoking. Both independent variables were associated with initiation of smoking at baseline. Among individuals

who had initiated smoking, receptivity to pro-tobacco marketing was common and strongly associated with higher levels of regular smoking, while exposure to movie smoking was not. They therefore suggested that exposure to smoking in movies will lead to initiation of smoking, which then makes the adolescent more attentive and responsive to pro-tobacco marketing.

## **2.5 Tobacco Use and Control in South Africa**

South Africa is situated on the Southernmost tip of Africa, and is divided into nine provinces; Western Cape, Eastern Cape, Northern Cape, KwaZulu-Natal, Free State, Gauteng, Mpumalanga, Limpopo and North-West . It is estimated that of its approximately 49 million inhabitants, 79.4% is Black African , 9.2% is White , 8.8% is Colored and 2.6% is Indian/Asian (Statistics South Africa, 2010). Adolescents between the ages of 10 – 19 years make up 20% of the population (United Nations Children’s Fund, 2011). South Africa has 11 official languages namely IsiZulu, IsiXhosa, Afrikaans, Sepedi, English, Setswana, Sesotho, Xitsonga, Ndebele, Tshivenda, and siSwati (Central Intelligence Agency, 2011). It is considered a middle-income developing country with an abundant supply of natural resources; and well-developed financial, legal, communications, energy, and transport sectors (Central Intelligence Agency, 2011). However, it has one of the highest rates of income inequality in the world (World Bank, 2006). Blacks make up the majority of the population living in poverty, and rural residents make up nearly 72% of the country’s poor (Wilkins, 1998).

South Africa has one of the highest smoking prevalence rates in Africa but, unlike many other lower- and middle-income countries, this has been decreasing in recent years. Between 1993 and 2000, cigarette smoking prevalence in South Africa decreased from 32% to 27% of the adult population (van Walbeek, 2002). However, smoking rates vary markedly among different

sections of South African society. Daily smoking prevalence is highest among Coloreds (Male 57%, Females 40%), followed by Asians (Male 47.7%, Female 7.6%), Whites (Male 33.4%, Female 23.2%), and Africans (Male 33.9%, Female 4.2%) (Steyn, Bradshaw, Norman et al., 2002). The heaviest smokers are South African whites. In 1998, whites reported smoking an average of 18 cigarettes per day as compared to 11 for Asians, 9 for coloreds and 7 for Africans (Steyn et al, 2002). On average, women smoked about 2 cigarettes less than men (Steyn et al, 2002). One reason for the disparity in tobacco use rates between men and women are social norms that serve as 'protective' factors against smoking by women (Saloojee, 2006). For instance, tobacco use is perceived as taboo for black women and those who use it do so in secret or only with people they trust (Saloojee, 2006). A survey of a group of Xhosa women in Cape Town, South Africa showed that 25% were smokers, 27% Snuff users, 2% used both products, and less than 46% did not use tobacco (Marks, Steyn, & Ratheb, 2001). Nearly 75% of the women said their society disapproved of smoking by women, a view that was even supported by majority of the smokers. Interestingly, 80% of the reasons offered for why men should not smoke were focused mainly on the negative health effects of smoking, while 72% of reasons why women should not smoke were that it was disgraceful, shameful and a taboo (Marks, et al., 2001).

Nationally representative information on tobacco use among adolescents became available for the first time in 1999 when South Africa participated in the GYTS. The survey was repeated in 2002, and 2008. Within this period, there has been a decline in the prevalence of smoking among the respondents. In 1999, about 17.6% (Boys = 52.2%, Girls = 37.7%) of adolescents aged 13 -15 years reported being current smokers (smoked cigarettes at least one day



in the 30 days preceding the survey) (CDC, 2011). This decreased to 14.8% (Boy = 43.8%, Girl = 30.9%) in 2002 (CDC, 2011), and 13.6% (Boy = 17.9%, Girl = 10.6%) in 2008 (CDC, 2011).

It has been estimated that tobacco-attributable mortality in South Africa was about 8% of adult deaths (21000 deaths) in 1998 (Sitas et al., 2004). But this was expected to increase in the coming years since the proportion of the most vulnerable population (older people who became lifetime smokers at young ages) was still increasing (Saloojee, 2006). The leading causes of death from smoking in South Africa are chronic obstructive pulmonary disease (COPD), tuberculosis (TB), lung cancer, and ischemic heart disease (IHD). 28% of people who die from smoking related diseases die from COPD; 19% from TB; 13% from lung cancer; 12% from IHD; 10% from cancer of the lip, mouth, pharynx and esophagus; 9% from strokes and vascular disease; and 9% from other conditions (Sitas et al., 2004). This is different from what pertains in high-income countries where cardiovascular diseases and lung cancer are the main causes of smoking-related death (Saloojee, 2006).

South Africa is one of the few countries in Africa with comprehensive tobacco control policies. According to one study, as far back as the 1970's tobacco use was banned in cinemas as well as on domestic flights (Swart & Reddy, 1998). By 1993 the first Tobacco Products Control Act (Government Gazette, 1993) was passed and was implemented in 1995. Under this law, tobacco sales to minors under age 16 was prohibited, and smoking in public places and tobacco advertising were regulated (Swart & Panday, 2003). In 1995, health warnings were introduced for all tobacco packaging and tobacco advertising on billboards (Swart & Panday, 2003). By 1999, loopholes in the 1993 act necessitated the passage of the Tobacco Products Control Amendment Act (Government Gazette, 1999), which was implemented in 2001. Under this amendment, advertising and promotion of tobacco products, including sponsorship and free

distribution of tobacco products; smoking in public places, including the workplace and public transport; and the maximum permissible levels of tar and nicotine were all regulated (Swart & Panday, 2003). However, the law has had limited success in terms of implementation, enforcement and compliance. For instance, a study of public places in Gauteng, Limpopo, and Northern Cape provinces found varying levels of compliance with the law (Steyn, Engelbrecht, Ngwena, van Rensburg, 2002). Only about 33% of the pubs, restaurants, and shebeens in the three provinces were smoke-free; another 26% had separate smoking sections; and 44% (most of which were small informal establishments in rural areas) still allowed smoking anywhere (Steyn et al, 2002). Encouragingly, 90% of workplaces had a policy regulating smoking and public support for the law was widespread with more than 80% of smokers and non-smokers agreeing that restaurants and bars should have separate smoking and non-smoking sections (Steyn et al, 2002). A study of data from the GYTS for South Africa shows the law had little impact on access to cigarettes by minors. In 1999, 54.8% of young smokers (13 – 15 years) who participated in the survey bought cigarettes in a store, and of these 77.2% were not refused purchase because of their age (CDC, 2011.b). By 2008, 52.2% of young smokers were still able to buy cigarettes in stores, and of these 56.8% were not refused purchase on account of their age (CDC, 2011.b). The 2008 GYTS also showed that a sizeable proportion of young respondents were still being exposed to cigarette advertising on billboards (76.4%) and in newspapers or magazines (80.7%), while about 15.2% were offered free cigarettes by a tobacco company representative (CDC, 2011.b).

Further amendments to the law were carried out in 2008 (Government Gazette, 2009) to provide more protection for non-smokers and prevent smoking by children. The amendment prohibited the sale of tobacco to and by persons under age 18 years and banned tobacco industry

sponsorship of projects such as scholarships and charities. Promotions of tobacco products such as free samples and gifts or cash rebates were also banned. More stringent regulations on public smoking were also added especially in locations like schools and cars where children would be present. It will be informative to observe how these changes will affect future results from surveys like the GYTS.

## CHAPTER III

### METHODS AND PROCEDURES

#### 3.1 Data Source

The data used for this study were obtained from the Global Youth Tobacco Survey (GYTS), a publicly available database. The GYTS is a global collaborative surveillance effort between governments and non-governmental organizations under the leadership of the World Health Organization-Tobacco Free Initiative (WHO-TFI) and the US Centers for Disease Control and Prevention-Office on Smoking and Health (CDC-OSH) (The Global Youth Tobacco Survey Collaborative Group, 2002). The GYTS was developed to enable countries to design, implement, and evaluate tobacco control and prevention programs (The Global Youth Tobacco Survey Collaborative Group, 2002). Standard methodology is used for constructing the sample frame, selecting schools and classes, preparing uniform questionnaires, and following consistent field procedures (The Global Youth Tobacco Survey Collaborative Group, 2002). The survey obtains information on prevalence of cigarette and other tobacco use, perceptions and attitudes concerning tobacco use, as well as information on access, availability, and price; environmental tobacco smoke exposure (ETS); school curriculum; media and advertising; and cessation (The Global Youth Tobacco Survey Collaborative Group, 2002).

The GYTS focuses on students in private and public schools aged between 13 and 15 years old. A multi-stage sampling design is used to obtain the survey population in each country. First, a database of schools with identified grades and number of students in each grade to be surveyed is used to create a sampling frame from which schools are selected proportional to their enrollment size; Classes within the participating schools are then selected through systematic

equal probability sampling, with all students in each class eligible to participate. To obtain a precision level of  $\pm 5\%$ , a minimum of 1500 completed student interviews is needed (The Global Youth Tobacco Survey Collaborative Group, 2002). The GYTS questionnaire, which is anonymous and self-administered, consists of a set of “core” questions that are used by all countries, and an optional set of questions that can be used by a country based on its needs and priorities. Before the survey is conducted, each country follows local procedures for obtaining parental consent and institutional review (The Global Youth Tobacco Survey Collaborative Group, 2002).

To account for sample selection, non-response, and post-stratification of the sample population, the survey data is weighted by taking into account the specific sampling frame and weight associated with each one of the questionnaires. The formula used is shown below;

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

Which implies that the weight (W) is the product of the inverse of the probability of selecting the school (W1), the inverse of the probability of selecting a classroom within the school (W2), the school-level non-response adjustment factor calculated by school size category (small, medium, large) (f1), the class adjustment factor calculated by school (f2), the student-level non-response adjustment factor calculated by class (f3), and a post-stratification adjustment factor calculated by sex and grade (f4).

(The Global Youth Tobacco Survey Collaborative Group, 2002).

The data obtained is finally processed by the CDC and made available on its website in Microsoft Access<sup>®</sup> format after one year (CDC, 2011b). To conduct this study, the data files

were downloaded from the CDC website and then converted to Statistical Analysis Software® (SAS) version 9.2 files for analysis.

### **3.2 Study Population**

South African students in Grades 8 through 10 participated in the 2008 wave of the survey. A two-stage cluster sample design was used whereby schools were selected proportional to their enrollment size, and then classes were randomly selected in which all students in the selected classes were eligible to participate (Centers for Disease Control, 2011.a). 94.6% of eligible schools participated with a class response rate of 100%. The student response rate was 82.4% and the overall response rate was 77.9% (CDC, 2011b.).

Study populations in the 1999 and 2002 waves of the GYTS were also included to examine the trends in the selected characteristics.

### **3.3 Study Measures**

The dependent variable that was identified to determine adolescent smoking behavior was current smoking status. As indicated in previous research (Villanti et al., 2011; Christophi et al., 2009), current smoking status was determined by responses to the question; “During the past 30 days (one month), on how many days did you smoke cigarettes?” The options were 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. Current smokers were defined as individuals who have ever smoked on 1 or more of the preceding 30days. Current smoking status was then recoded such that 1 = non-current smoker, and 2 through 7 = current smoker.

The independent variables were parental smoking status, peer smoking status, and exposure to pro-tobacco marketing. Parental smoking status was determined by responses to the question, “Do your parents/guardians smoke?” Respondents were given the following options: 1= None, 2=Both, 3= Father only, 4=Mother only and 5=I don’t know. Participants who responded “I don’t know” were not included in the analysis.

Peer smoking status was determined by responses to the question, “Do any of your closest friends smoke?” The options were 1= None of them; 2= Some of them 3=Most of them; 4=All of them.

Wellman et al., (2006) defined pro-tobacco marketing as any activity related to tobacco advertising, promotions, and providing samples as well as pro-tobacco depictions in films, televisions, and videos. An examination of the survey questionnaire provided the following questions as items that can be used to measure exposure to pro-tobacco marketing;

- “When you watch TV, videos, or movies, how often do you see actors smoking?” Responses were categorized as 1=I never watch TV, videos, or movies; 2= A lot; 3=Sometimes; 4= Never.
- “Do you have something (t-shirt, pen, backpack, cap, etc.) with a cigarette brand logo on it?” Responses were 1= Yes 2= No.
- “During the past 30 days (one month), when you watched sports events or other programs on TV how often did you see cigarette brand names?” Response categories were 1=I never watch TV; 2=A lot; 3=Sometimes; 4= Never.
- “During the past 30 days (one month), how many advertisements for cigarettes have you seen on billboards?” Response categories were 1=A lot; 2=A few; 3=None.

- “During the past 30 days (one month), how many advertisements or promotions for cigarettes have you seen in newspapers or magazines?” Response categories were 1=A lot; 2 =A few; 3=None.
- “During the past 30 days (one month), how often did you hear cigarette brand names mentioned when you listened to the radio?” Categories were 1=I never listen to the radio; 2=A lot; 3=Sometimes; 4=Never
- “Have you ever gone to a function (such as a concert or music event) sponsored by a cigarette brand?” Responses were 1= Yes; 2=No.
- “When you go to sports events, fairs, concerts, or community events, how often do you see advertisements for cigarettes?” Categories were 1= I never attend sports events, fairs, concerts, or community events; 2=A lot; 3=Sometimes; 4=Never.
- “Has a cigarette representative (someone working for a cigarette company) ever offered you a free cigarette?” Categories were 1= Yes; 2= No. The responses were further categorized so that 1=1=Yes; 2=0=No.

The responses were recoded and scored. The scores ranged between 0 and 16. Wellman et al., (2006) classified exposure as either ‘Low engagement’ or ‘High engagement’. Operating on the premise that a respondent may have indicated an exposure to some categories of pro-tobacco marketing as determined by the survey questions, the scores were categorized into three groups. Scores 5 and below were categorized as ‘low exposure’, scores between 6 and 10 were categorized as ‘average exposure’, and scores greater than 10 were classified as ‘high exposure’.

Christophi et al. (2009) also indicated that some of the factors associated with cigarette smoking among youth include age, gender, grade level, and exposure to anti-tobacco marketing.



These variables were therefore selected as control variables to further examine the association between the dependent and independent variables.

Exposure to anti-tobacco marketing was determined by responses to the questions;

- During the past 30 days (one month), how many anti-smoking media messages (e.g. television, radio, billboards, posters, newspapers, magazines, movies, drama) have you seen? Responses were 1= A lot; 2=A few; 3=None.
- When you go to sports events, fairs, concerts, community events, or social gatherings, how often do you see anti-smoking messages? Responses were 1= I never go to sports events, fairs, concerts, community events, or social gatherings; 2=A lot; 3= Sometimes; 4= Never.
- During this school year, were you taught in any of your classes about the dangers of smoking? Responses were 1= Yes; 2= No; 3= Not Sure.
- During this school year, were you taught in any of your classes that most people your age do not smoke cigarettes? Responses were 1= Yes; 2= No; 3= Not Sure.
- During this school year, did you discuss in any of your classes the reasons why people your age smoke? Responses were 1=Yes; 2=No; 3=Not Sure.
- During this school year, were you taught in any of your classes about the effects of smoking, like it makes your teeth yellow, causes wrinkles, or makes you smell bad? Responses were 1=Yes; 2= No; 3= Not Sure.
- During the past year, have you heard from youth groups discouraging young people your age from smoking? Responses were 1=Yes; 2= No.
- During the past year, did any health professionals (e.g., doctors, nurses) explain to you why smoking is dangerous to your health? Responses were 1= Yes; 2=No.

- During the past year, did any religious organization discourage young people your age from smoking? Responses were 1= Yes; 2=No.

The responses were recoded and scored. The scores ranged between 0 and 12. Scores 3 and below were categorized as ‘low exposure’, scores between 4 and 6 were categorized as ‘average exposure’, and scores greater than 7 were classified as ‘high exposure’.

### **3.4 Statistical Analyses**

All the analyses were weighted to account for the complex sampling method used in the GYTS. Frequency counts were computed for the demographic variables of the respondents (sex, age, grade level). Similarly, frequencies were computed for the distribution of the respondents by current and non-current smoking status in the three main independent variables (parental smoking status, peer smoking status, and exposure to pro-tobacco marketing).

To determine the relationship between current smoking status and the three independent variables, logistic regression analysis was used. For each independent variable and smoking status, three models were built for the analysis –the Crude regression model between current smoking status and the independent variable; Model I adjusted for age, gender, and grade level, Model II adjusted for exposure to anti-tobacco marketing in addition to age, gender, and grade level, and finally Model III, the Full model which contained all the three independent variables in addition to age, gender, grade level, and exposure to anti-smoking marketing variables. Odds ratios (OR) at 95% confidence intervals were reported and a p-value of <0.05 was considered to be statistically significant.

## CHAPTER IV

### RESULTS

#### 4.1 Frequencies and Descriptive Statistics

A total of 8602 respondents participated in the survey, of which 49.4% were males and 50.6% females. Most of the respondents in the study were between the ages of 14 to 18 years. About 17% of the respondents who participated in the study were current smokers (Table 1). Table 2 shows the current smoking distribution by gender, age and grade level. Twenty-three percent of males and about 11% of females were current smokers. Current smoking prevalence was higher among 12 year olds (29%) and those 18 years or older (21%) as compared to the other age groups. About 35% of the respondents had parents who smoked and about 40% had close friends who smoked. About 47% and 7% of the survey population had been exposed to average and high levels of pro-tobacco marketing respectively (Table 3).

Table 4 shows the distribution of the independent variables among current and non-current smoking adolescents. Of those adolescents who were current smokers, about half had at least a parent who was a smoker, about 76% had close friends who smoked, and nearly 58% and 11% had been exposed respectively to average and high levels of pro-tobacco marketing. Comparatively, for the non-current smoking adolescents, only about 30% had a parent who smoked, about 30% had close friends who smoked, and about 44% and 6% had been exposed to average and high levels of pro-tobacco marketing.

**Table 1:** Frequencies for selected demographic characteristics of study population (n=8602)

| <b>Variable</b>                  | <b>n</b> | <b>Percentage (%)</b> |
|----------------------------------|----------|-----------------------|
| <b>Age</b>                       |          |                       |
| Up to 11 years                   | 84       | 1.1                   |
| 12 years                         | 35       | 0.5                   |
| 13 years                         | 239      | 2.7                   |
| 14 years                         | 1681     | 18.9                  |
| 15 years                         | 2054     | 24.4                  |
| 16 years                         | 1915     | 22.7                  |
| 17 years                         | 1275     | 15.5                  |
| 18 years or older                | 1264     | 14.3                  |
| <b>Gender</b>                    |          |                       |
| Male                             | 4078     | 49.4                  |
| Female                           | 4422     | 50.6                  |
| <b>Grade</b>                     |          |                       |
| Eight                            | 2872     | 31.8                  |
| Nine                             | 2611     | 31.1                  |
| Ten                              | 31119    | 37.2                  |
| <b>Respondent smoking status</b> |          |                       |
| Non-current smokers              | 6302     | 83.5                  |
| Current smokers                  | 1344     | 16.5                  |

**Table 2:** Gender, Age, and Grade level stratified by current smoking status

| <b>Characteristic</b> | <b>Percentage of current smokers (%)</b> |
|-----------------------|--|
| <b>Gender</b>         |  |
| Male                  | 22.8                                     |
| Female                | 10.5                                     |
| <b>Age</b>            |  |
| Up to 11 years        | 15.6                                     |
| 12 years              | 29.0                                     |
| 13 years              | 8.2                                      |
| 14 years              | 13.6                                     |
| 15 years              | 14.2                                     |
| 16 years              | 18.1                                     |
| 17 years              | 17.9                                     |
| 18 years or older     | 21.0                                     |
| <b>Grade</b>          |  |
| Eight                 | 13.0                                     |
| Nine                  | 17.3                                     |
| Ten                   | 18.5                                     |

**Table 3:** Frequency distribution of independent variables among study population

| Characteristic                           | n    | Percentage (%) |
|--|------|----------------|
| <b>Parental smoking status</b>           |      |                |
| None smoke                               | 4902 | 65.3           |
| Both parents smoke                       | 780  | 8.3            |
| Only father smokes                       | 1659 | 20.8           |
| Only mother smokes                       | 537  | 5.6            |
| <b>Peer smoking status</b>               |      |                |
| None of them smoke                       | 5057 | 61.0           |
| Some of them smoke                       | 2345 | 27.4           |
| Most of them smoke                       | 665  | 7.2            |
| All of them smoke                        | 389  | 4.5            |
| <b>Exposure to pro-tobacco marketing</b> |      |                |
| Low exposure                             | 3289 | 46.3           |
| Average exposure                         | 3392 | 46.8           |
| High exposure                            | 526  | 6.8            |

**Table 4:** Distribution of the independent variables among current and non-current smokers

| Characteristic                           | n   | Current Smokers           |                 | Non-Current Smokers |                           |                 |
|--|-----|---------------------------|-----------------|---------------------|---------------------------|-----------------|
|  |     | Weighted Percent (95% CI) |                 | n                   | Weighted Percent (95% CI) |                 |
| <b>Parental smoking status</b>           |     |                           |                 |                     |                           |                 |
| None smoke                               | 587 | 49.72                     | (46.15 – 53.29) | 3864                | 69.50                     | (68.05 – 70.94) |
| Both smoke                               | 199 | 14.31                     | (12.07 – 16.54) | 442                 | 5.97                      | (5.29 – 6.64)   |
| Only father smokes                       | 313 | 26.72                     | (23.45 – 29.99) | 1193                | 20.13                     | (18.83 – 21.43) |
| Only mother smokes                       | 127 | 9.25                      | (7.21 – 11.28)  | 337                 | 4.41                      | (3.79 – 5.03)   |
| <b>Peer smoking status</b>               |     |                           |                 |                     |                           |                 |
| None of them smoke                       | 297 | 23.14                     | (20.13 – 26.16) | 4359                | 70.59                     | (69.19 – 71.99) |
| Some of them smoke                       | 567 | 43.55                     | (40.16 – 46.95) | 1492                | 23.38                     | (22.07 – 24.69) |
| Most of them smoke                       | 288 | 21.21                     | (18.42 – 24.00) | 256                 | 3.75                      | (3.19 – 4.31)   |
| All of them smoke                        | 163 | 12.09                     | (9.82 – 14.37)  | 135                 | 2.29                      | (1.79 – 2.78)   |
| <b>Exposure to pro-tobacco marketing</b> |     |                           |                 |                     |                           |                 |
| Low exposure                             | 332 | 31.33                     | (27.78 – 34.88) | 2707                | 50.07                     | (48.45 – 51.69) |
| Average exposure                         | 629 | 58.10                     | (54.38 – 61.82) | 2406                | 43.89                     | (42.26 – 45.51) |
| High exposure                            | 125 | 10.57                     | (8.38 – 12.76)  | 351                 | 6.04                      | (5.27 – 6.82)   |

## 4.2 Parental smoking and current smoking status

The association between the different subsets of parental smoking and current smoking status was statistically significant across all the logistic regression models (Table 5). In the crude model, adolescents were more likely to be current smokers if both parents smoked (OR= 3.33; 95% CI=3.29 – 3.36), only fathers smoked (OR=1.85; CI =1.84 – 1.87), or if only mothers smoked (OR = 2.87; CI= 2.83– 2.91) as compared to if none of their parents smoked. After adjusting for the effect of all the independent and control variables (Model III) adolescents were still more likely to be current smokers if they had parents who smoked as compared to if none of their parents smoked. The odds of being a smoker increased from ‘only father smokes’, to ‘only mother smokes’, and then to ‘both smoke’.

Parental smoking was also significantly associated with male and female adolescent smoking (Table 6). In the crude model, male adolescents were more likely to be current smokers if both parents smoked (OR= 3.34; 95% CI=3.29 – 3.93), only fathers smoked (OR=2.08; 95% CI = 2.06 – 2.10), or if only mothers smoked (OR = 2.22; CI= 2.18 – 2.26) as compared to if none of their parents smoke. Female adolescents were also more likely to be current smokers if both parents smoked (OR= 3.56; 95% CI=3.49 – 3.62), only fathers smoked (OR=1.49; 95% CI = 1.47 – 1.51), or if only mothers smoked (OR =4.23; CI= 4.15 – 4.31) as compared to if none of their parents smoke. After adjusting for the effect of all the independent and control variables (Model III) male and female adolescents were still more likely to be current smokers if they had parents who smoked as compared to if none of their parents smoked.

**Table 5:** Crude and adjusted odds ratios and 95% confidence intervals for association between parental smoking and current smoking status

|                    | <b>Crude</b>          | <b><sup>a</sup>Model I</b> | <b><sup>b</sup>Model II</b> | <b><sup>c</sup>Model III</b> |
|--------------------|-----------------------|----------------------------|-----------------------------|------------------------------|
| None Smoke         | Ref.                  | Ref.                       | Ref.                        | Ref.                         |
| Both smoke         | 3.33<br>(3.29 – 3.36) | 3.67<br>(3.63 – 3.72)      | 3.98<br>(3.92 – 4.02)       | 2.87<br>(2.83 – 2.91)        |
| Only father smokes | 1.85<br>(1.84 – 1.87) | 1.84<br>(1.83 – 1.86)      | 1.77<br>(1.76 – 1.79)       | 1.48<br>(1.47 – 1.50)        |
| Only mother smokes | 2.87<br>(2.83– 2.91)  | 3.05<br>(3.01 – 3.09)      | 3.22<br>(3.17 – 3.27)       | 2.41<br>(2.37 – 2.45)        |

<sup>a</sup> ORs adjusted for age, gender, and grade level; <sup>b</sup> ORs additionally adjusted for exposure to pro-tobacco marketing; <sup>c</sup> ORs adjusted for the effect of all independent and control variables (Full model).

**Table 6:** Crude and adjusted odds ratios and 95% confidence intervals for association between parental smoking and current smoking status stratified by gender

|                    | <b>Crude</b>          | <b><sup>d</sup>Model I</b> | <b><sup>e</sup>Model II</b> | <b><sup>f</sup>Model III</b> |
|--------------------|-----------------------|----------------------------|-----------------------------|------------------------------|
| <b>MALE</b>        |                       |                            |                             |                              |
| None Smoke         | Ref.                  | Ref.                       | Ref.                        | Ref.                         |
| Both smoke         | 3.34<br>(3.29 – 3.39) | 3.75<br>(3.70 – 3.81)      | 4.13<br>(4.05 – 4.20)       | 3.13<br>(3.07 – 3.20)        |
| Only father smokes | 2.08<br>(2.06 – 2.10) | 2.08<br>(2.06 – 2.10)      | 1.95<br>(1.93 – 1.97)       | 1.51<br>(1.49 – 1.53)        |
| Only mother smokes | 2.22<br>(2.18 – 2.26) | 2.21<br>(2.17 – 2.25)      | 2.73<br>(2.67 – 2.79)       | 2.08<br>(2.03 – 2.14)        |
| <b>FEMALE</b>      |                       |                            |                             |                              |
| None Smoke         | Ref.                  | Ref.                       | Ref.                        | Ref.                         |
| Both smoke         | 3.56<br>(3.49 – 3.62) | 3.69<br>(3.62 – 3.75)      | 3.89<br>(3.81 – 3.96)       | 2.66<br>(2.60 – 2.73)        |
| Only father smokes | 1.49<br>(1.47 – 1.51) | 1.50<br>(1.48 – 1.53)      | 1.48<br>(1.45 – 1.50)       | 1.26<br>(1.24 – 1.28)        |
| Only mother smokes | 4.23<br>(4.15 – 4.31) | 4.38<br>(4.30 – 4.47)      | 3.81<br>(3.73 – 3.89)       | 3.46<br>(3.38 – 3.55)        |

<sup>d</sup> ORs adjusted for age and grade level; <sup>e</sup> ORs additionally adjusted for exposure to anti-tobacco marketing; <sup>f</sup> ORs adjusted for the effect of all independent and control variables (Full model).

### 4.3 Peer smoking and current smoking status

Across all three models, having friends who smoked was associated with increased odds of being a current smoker as compared to having friends who do not smoke (Table 7). In the crude model, adolescents were more likely to be current smokers if some of their friends smoked (OR=5.62; 95 % CI = 5.57 -5.67), most of them smoke (OR=15.92; 95 % CI = 15.74 -16.11), or all of them smoke (OR=15.66; 95 % CI = 15.44 – 15.88). After adjusting for the effect of all independent and control variables, adolescents who had friends who smoked were still more likely to be current smokers as compared to those whose friends did not smoke (Model III). The odds of being a current smoker increased as the number of friends who smoked also increased from ‘some of them’ to ‘most of them’. Peer smoking was also significantly associated with male and female adolescent smoking. Males and females were both likely to be current smokers if they had friends who smoked as compared to those that had none of their friends being smokers (Table 8).

**Table 7:** Crude and adjusted odds ratios and 95% confidence intervals for association between peer smoking and current smoking status

|                    | <b>Crude</b>              | <b><sup>a</sup>Model I</b> | <b><sup>b</sup>Model II</b> | <b><sup>c</sup>Model III</b> |
|--------------------|---------------------------|----------------------------|-----------------------------|------------------------------|
| None of them smoke | Ref.                      | Ref.                       | Ref.                        | Ref.                         |
| Some of them smoke | 5.62<br>(5.57 – 5.67)     | 4.98<br>(4.94 – 5.02)      | 4.60<br>(4.56 – 4.65)       | 5.25<br>(5.20 – 5.31)        |
| Most of them smoke | 15.92<br>(15.74 – 16.11 ) | 14.21<br>(14.04 – 14.38)   | 13.93<br>(13.75 – 14.11)    | 15.03<br>(14.81 – 15.26)     |
| All of them smoke  | 15.66<br>(15.44 – 15.88)  | 14.53<br>(14.32 – 14.74)   | 15.51<br>(15.26 – 15.78)    | 15.31<br>(15.02 – 15.60)     |

<sup>a</sup> ORs adjusted for age, gender, and grade level; <sup>b</sup> ORs additionally adjusted for exposure to pro-tobacco marketing; <sup>c</sup> ORs adjusted for the effect of all independent and control variables (Full model).



**Table 8:** Crude and adjusted odds ratios and 95% confidence intervals for association between peer smoking and current smoking status stratified by gender

|                    | Crude                    | <sup>d</sup> Model I     | <sup>e</sup> Model II    | <sup>f</sup> Model III   |
|--------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <b>MALE</b>        |                          |                          |                          |                          |
| None Smoke         | Ref.                     | Ref.                     | Ref.                     | Ref.                     |
| Both smoke         | 4.09<br>(4.04 – 4.13)    | 3.91<br>(3.87 – 3.95)    | 3.58<br>(3.53 – 3.62)    | 3.83<br>(3.78 – 3.88)    |
| Only father smokes | 12.09<br>(11.92 – 12.27) | 11.77<br>(11.60 – 11.95) | 11.48<br>(8.05– 14.60)   | 12.56<br>(12.33 – 12.81) |
| Only mother smokes | 13.07<br>(12.84 – 13.32) | 12.64<br>(12.41 – 12.88) | 13.71<br>(13.41 – 14.01) | 13.46<br>(13.12 – 13.80) |
| <b>FEMALE</b>      |                          |                          |                          |                          |
| None Smoke         | Ref.                     | Ref.                     | Ref.                     | Ref.                     |
| Both smoke         | 7.09<br>(7.00 – 7.19)    | 7.05<br>(6.95 – 7.15)    | 6.43<br>(6.33 – 6.53)    | 6.02<br>(5.92 – 6.13)    |
| Only father smokes | 18.15<br>(17.80 – 18.51) | 18.78<br>(18.42 – 19.16) | 18.25<br>(17.87 – 18.65) | 14.12<br>(13.78 – 14.48) |
| Only mother smokes | 16.97<br>(16.59 – 17.36) | 16.59<br>(16.22 – 16.98) | 16.67<br>(16.23 – 17.12) | 13.00<br>(12.61 – 13.40) |

<sup>d</sup> ORs adjusted for age and grade level; <sup>e</sup> ORs additionally adjusted for exposure to anti-tobacco marketing; <sup>f</sup> ORs adjusted for the effect of all independent and control variables (Full model).

#### 4.4 Exposure to pro-tobacco marketing and current smoking status

There was a statistically significant relationship between exposure to pro-tobacco marketing and current smoking status. In the crude regression model, adolescents were more likely to be current smokers if they had been exposed to average (OR= 2.08; 95 % CI = 2.07 – 2.10) and high (OR= 2.76; 95 % CI = 2.73 – 2.80) levels of pro-tobacco marketing as compared to those who had been exposed to low levels of marketing. After adjusting for all the covariates (Model III), adolescents were still more likely to be current smokers if they had reported exposure to average or high levels of pro-tobacco marketing (Table 9). The results were also significant when stratified by gender (Table 10).

**Table 9:** Crude and adjusted odds ratios and 95% confidence intervals for association between exposure to pro-tobacco marketing and current smoking

|                  | <b>Crude</b>          | <sup>a</sup> <b>Model I</b> | <sup>b</sup> <b>Model II</b> | <sup>c</sup> <b>Model III</b> |
|------------------|-----------------------|-----------------------------|------------------------------|-------------------------------|
| Low exposure     | Ref.                  | Ref.                        | Ref.                         | Ref.                          |
| Average exposure | 2.08<br>(2.07 – 2.10) | 2.07<br>(2.05 – 2.08)       | 1.83<br>(1.81 – 1.84 )       | 1.48<br>(1.46 – 1.49)         |
| High exposure    | 2.76<br>(2.73 – 2.80) | 2.64<br>(2.61 – 2.68)       | 2.12<br>(2.09 – 2.15 )       | 1.36<br>(1.34 – 1.39)         |

<sup>a</sup> ORs adjusted for age, gender, and grade level; <sup>b</sup> ORs additionally adjusted for exposure to pro-tobacco marketing; <sup>c</sup> ORs adjusted for the effect of all independent and control variables (Full model).

**Table 10:** Crude and adjusted odds ratios and 95% confidence intervals for association between exposure to pro-tobacco marketing and current smoking status stratified by gender

|                  | <b>Crude</b>          | <sup>d</sup> <b>Model I</b> | <sup>e</sup> <b>Model II</b> | <sup>f</sup> <b>Model III</b> |
|------------------|-----------------------|-----------------------------|------------------------------|-------------------------------|
| <b>MALE</b>      |                       |                             |                              |                               |
| Low exposure     | Ref.                  | Ref.                        | Ref.                         | Ref.                          |
| Average exposure | 1.72<br>(1.70 – 1.74) | 1.77<br>(1.75 – 1.79)       | 1.54<br>(1.53 – 1.56)        | 1.37<br>(1.35 – 1.39)         |
| High exposure    | 1.91<br>(1.88 – 1.94) | 1.91<br>(1.87 – 1.94)       | 1.56<br>(1.53 – 1.59)        | 1.04<br>(1.02– 1.06)          |
| <b>FEMALE</b>    |                       |                             |                              |                               |
| Low exposure     | Ref.                  | Ref.                        | Ref.                         | Ref.                          |
| Average exposure | 2.74<br>(2.70 – 2.78) | 2.71<br>(2.67 – 2.75)       | 2.42<br>(2.38 – 2.46)        | 1.81<br>(1.78 – 1.85)         |
| High exposure    | 4.60<br>(4.50 – 4.70) | 4.59<br>(4.50 – 4.69)       | 3.84<br>(3.74 – 3.93)        | 2.37<br>(2.31 – 2.44)         |

<sup>d</sup> ORs adjusted for age and grade level; <sup>e</sup> ORs additionally adjusted for exposure to anti-tobacco marketing; <sup>f</sup> ORs adjusted for the effect of all independent and control variables (Full model).

#### 4.5 Trends in Results of GYTS of South Africa in 1999, 2002, and 2008

An examination of the GYTS survey results for 1999, 2002, and 2008 showed that current smoking rates among adolescents had decreased from 23% in 1999 to about 17% in 2008. The proportion of adolescents who had at least a parent who smoked had also decreased from nearly 52% in 1999 to about 35% in 2008. The proportion of adolescents who had at least one close friend

who smoked had declined from nearly 50% to about 39%. Similarly, adolescents exposed to average and high levels of pro-tobacco marketing had decreased from 65% and 15% respectively in 1999, to 47% and 7% in 2008 (Appendix 1). The prevalence of smoking among males decreased from about 29% in 1999 to nearly 23% in 2008. Within this same period smoking prevalence among females declined from almost 18% to 11% (Appendix 2).

## CHAPTER V

### DISCUSSION AND CONCLUSION

#### 5.1 Discussion

Tobacco use kills several million people worldwide each year. Most smokers start the habit in their childhood, and due to the addictive nature of nicotine, continue into adulthood. Smoking is associated with various negative health effects, which is more pronounced in individuals who start smoking at younger ages. A lot of research studies have been done in developed countries on factors that influence smoking behavior among young people. Some of these factors include parental smoking status, peer smoking status and the influence of tobacco marketing. Developing countries, which currently have low prevalence of smoking, have been targeted by tobacco industries as suitable areas for market expansion. International health organizations in partnership with local governments have also targeted such regions as prime areas to implement tobacco control efforts. By doing this, the projected increase in rates of tobacco-attributable diseases and deaths can be prevented in developing countries. However, knowledge available on the predictors and determinants of tobacco use behavior in Africa, especially among the youth is scarce.

This study aimed to determine the impact of parental smoking, peer smoking and tobacco marketing on current smoking status among adolescents in South Africa. Several studies that have determined the association between these factors and youth smoking behavior have been conducted in developed countries. What remains to be seen is whether these observations will occur in developing countries, such as in South Africa. A secondary analysis was also carried out

to examine the trend in the selected characteristics for populations in the GYTS administered in 1999, 2002, and 2008.

The results showed that 12 year olds made up only 0.5% ( $n = 35$ ) of the total population. However within this age group, 29% were found to be current smokers. This may be a random observation due to the small number of 12 year-olds who participated in the survey. Even before regression analyses were performed, statistically significant differences were found in the influences of the independent variables on smoking status; a greater proportion of current smokers had parents and friends who smoked, and had been exposed to higher levels of pro-tobacco marketing as compared to non-current smokers. The findings also indicated that adolescents who had at least a parent who smoked were at great odds of being current smokers as compared to those with non-smoking parents. Similar results have been obtained by Gilman et al. (2009), Fleming et al. (2002) and Peterson et al (2006), who showed that parental smoking was significantly associated with current adolescent smoking. Having parents who were both smokers appeared to have greater influence on current smoking than if only one parent was a smoker. Maternal smoking also appeared to influence smoking behavior more than paternal smoking in both male and female adolescents. This is similar to results obtained by Howell (2009) who found maternal smoking was associated with an increased likelihood of being a current smoker among adolescents in Africa. This has policy implications as South African mothers may be playing a greater role in molding the behavior of their children as compared to fathers.

Adolescents who had at least some friends who smoked were more likely to be current smokers than those who had only non-smoking friends. This finding is similar to that of Christophi et al (2009) who found that youth smoking behavior was significantly associated with having a close friend who smoked. The risk of smoking also increased as the number of friends

who smoke increases. A search of available literature did not yield any studies to substantiate this finding.

Exposure to tobacco marketing was also significantly associated with current smoking. Adolescents who have been exposed to average, and high levels of pro-tobacco marketing are more likely to be current smokers than those who have been exposed to low levels. This finding is supported by DiFranza et al. (2006) and Hannewinkel et al (2010) who found that adolescents who had been exposed to higher levels of tobacco marketing were more likely to be current smokers. The results also showed that a greater proportion of current smokers had been exposed to average and high levels of tobacco marketing (57.6% and 10.8% respectively) as compared to non-current smokers (43.7% & 6.2%). On the other hand, a smaller proportion of current smokers (31.6%) had been exposed to low levels of tobacco marketing as compared to non-current smokers (50.1%). Sargent et al., (2009) demonstrated that individuals who had already initiated smoking were more attentive and responsive to tobacco advertising. Adolescents who smoke may have been more receptive to tobacco marketing as compared to adolescents who don't. Therefore they may have recalled past exposure to tobacco advertisements more readily than non-current smokers.

Among all the three factors, peer smoking was associated with the highest odds of being a current smoker. This finding is similar to that of various studies – Avenevoli & Merikangas (2003); Rose et al., (1999); Hu et al., (2006); Webster et al., (1994) – that found that peer smoking exerts a stronger influence on adolescents than the smoking behavior of parents or siblings. Adolescents who had smoking parents also had a higher likelihood of being current smokers than those who had been exposed to pro-tobacco marketing. As stated by Dawson (1989), this showed that family and peer influences had the most direct influence on individuals.

There are several dimensions that may be influencing this observation. Christophi et al (2009) showed that other factors that increase the likelihood of an adolescent being a current smoker include having a belief that smokers have more friends, parents with little education, more pocket money, grandparents who smoke, and attending a school where half or more students smoke – factors which more or less are subsets of parental and peer influence.

The results also showed that between 1999 and 2008, the prevalence of smoking among adolescents has decreased. Comprehensive tobacco control policies in South Africa which were introduced and implemented from 1993 onwards may have contributed to the declines in the observed prevalence. Smoking prevalence among females also decreased to less than 50% of the smoking prevalence among males. This suggests that the proportion of smokers who are males is rising with associated reductions in female rates. Further research can provide information on why this result is being observed.

## **5.2 Study Limitations**

The GYTS is a cross-sectional study that provides valuable information on the factors associated with adolescent smoking behavior. However, the information obtained cannot be considered to indicate causation of smoking. For instance, some adolescents select their friends based on shared personal characteristics whilst some join friendship groups and adopt the group behavior. Therefore, current friendship networks may or may not be the cause of smoking behavior among adolescents. Also, the GYTS cannot be used to predict future smoking behavior of the survey population.

This study relies on self-reported behavior. Some of the respondents may not be prepared to identify themselves, their parents or their close friends as smokers. This introduces the

possibility of social desirability bias. As has been stated previously, current smokers were more likely to remember past exposure to pro-tobacco marketing as compared to non-current smokers. Therefore current smokers may have recalled greater levels of tobacco exposure since they will be more receptive to tobacco marketing as compared to non-smokers and this will lead to the likelihood of recall bias.

South Africa is a racially diverse country but there was no question in relation to race or ethnic origin. This made it impossible to determine if any differences exist among the different racial or ethnic groups in the country. Another issue was the fact that the data was made available in a nationally representative format, which makes it impossible to detect differences that will exist between the different provinces, as well as urban and rural locations.

### **5.3 Recommendations**

There is the need for the development of tobacco use surveillance systems in South Africa to monitor tobacco use among young people over time. This will help identify the factors that promote or prevent smoking among adolescents and will also provide information on the trend in the influence of these factors over time. More effective tobacco use prevention and control programs can then be designed.

Parental smoking, peer smoking, and exposure to pro-tobacco marketing like all other factors interact to impact youth smoking behavior. Further research is needed to determine the cumulative impact of these factors, as well as other associated factors, on adolescent smoking behavior. The differences observed between male and female adolescents with respect to the independent variables are also areas that will need further research.



The results have implications for tobacco use prevention programs targeted at adolescents. There is the need for educational messages aimed at reducing smoking among adolescents. Parents must also be educated about the effect of their smoking behavior on their children. Tobacco-control programs specifically targeted at mothers should be implemented as the results showed that maternal smoking had a greater impact on smoking behavior as compared to paternal smoking. Incorporating a theoretical framework to guide anti-tobacco marketing campaigns will have important effects. For instance, social network theory can be used to recruit influential community members such as entertainment and sports personalities to portray abstinence from smoking as a positive behavior. A campaign to strengthen the family unit in South African society is also an important strategy as the theory of primary socialization posits that adolescents who come from dysfunctional family backgrounds are more susceptible to peer group influence.

South Africa has comprehensive tobacco control policies. However, considering that the respondents reported being exposed to pro-tobacco marketing, there may be challenges associated with implementing the law. Policies that are aimed at preventing adolescent smoking must therefore be implemented effectively. Individuals who want to quit smoking should also be provided with the necessary smoking cessation services.

#### **5.4. Conclusion**

Parental smoking status, peer smoking, and exposure to pro-tobacco marketing are factors that have been shown to influence adolescent smoking behavior. Available studies are mostly conducted in developed countries. In developing countries, there is the need to understand how these factors affect smoking behavior. This will help in the design and

implementation of tobacco use prevention and control programs. Parental smoking was significantly associated with current smoking status among adolescents. Educational programs must be implemented to educate the youth about the adverse health effects of smoking, and also to show parents how their smoking behavior is being transmitted to their children. Peer smoking also appeared to be the most significant factor in tobacco use among this survey population, with the odds of being a current smoker increasing as the number of close friends who smoked also increased. Finally, exposure to pro-tobacco marketing was also associated with increased odds of being a current smoker, which implies the need for more effective implementation of laws restricting tobacco marketing.

## APPENDIX

### Appendix1: Trends in Frequencies of Selected Characteristics among study populations in GYTS of South Africa 1999, 2002 &-2008

| CHARACTERISTIC                           | YEAR      |           |           |
|--|-----------|-----------|-----------|
|  | 1999<br>% | 2002<br>% | 2008<br>% |
| <b>Gender</b>                            |           |           |           |
| Male                                     | 47.4      | 47.1      | 49.4      |
| Female                                   | 52.6      | 52.9      | 50.6      |
| <b>Smoking Status</b>                    |           |           |           |
| Current smoker                           | 23.0      | 18.5      | 16.5      |
| Non-current smoker                       | 77.0      | 81.5      | 83.5      |
| <b>Parental smoking status</b>           |           |           |           |
| None smoke                               | 48.7      | 61.5      | 65.3      |
| Both parents smoke                       | 11.0      | 8.8       | 8.3       |
| Only father smokes                       | 32.0      | 24.2      | 20.8      |
| Only mother smokes                       | 8.3       | 5.5       | 5.6       |
| <b>Peer smoking status</b>               |           |           |           |
| None of them smoke                       | 49.6      | 59.5      | 61.0      |
| Some of them smoke                       | 32.0      | 27.6      | 27.4      |
| Most of them smoke                       | 12.0      | 8.1       | 7.2       |
| All of them smoke                        | 6.4       | 4.8       | 4.5       |
| <b>Exposure to pro-tobacco marketing</b> |           |           |           |
| Low exposure                             | 20.0      | 39.1      | 46.3      |
| Average exposure                         | 65.0      | 51.2      | 46.8      |
| High exposure                            | 15.0      | 9.7       | 6.8       |

### Appendix 2: Trends in proportions of current smokers within male and female populations 1999, 2002 & 2008

| Gender     | Current Smoking Status |      |      |
|------------|------------------------|------|------|
|            | 1999                   | 2002 | 2008 |
| Male (%)   | 28.8                   | 26.7 | 22.8 |
| Female (%) | 17.5                   | 11.5 | 10.5 |

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