DIRECT EFFECTS AND INTERACTIONS OF INDIVIDUAL CHARACTERISTICS, PEERS, PARENTS, SCHOOLS, AND COMMUNITY INFLUENCES ON RURAL ADOLESCENT SUBSTANCE USE AND SCHOOL CONNECTEDNESS

by

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(Under the Direction of Jessica Muilenburg)

ABSTRACT

Within the past decade, overall prevalence of legal and illegal drug use has decreased, but the use of alcohol and other drugs during adolescence remains a current public health problem. Among rural youth, alcohol and other drug use increased over the past decade. Past research on contextual factors influencing drug use revealed that protective factors in the community, school, and home all interact to influence youth drug use; however, these studies lack information about the casual pathways and interactions of protective factors and their role in preventing drug use. Few studies have examined school connectedness as a mediator between contextual factors and drug use. In addition, research in rural areas is lacking, and those studies focusing on adolescents in rural areas often do not account for moderating effects of demographic variables, cultural influences, community connectedness, and the influence of religion.

The current study examined a structural model based on an ecological framework to determine how protective factors deter rural adolescent substance use and promote school connectedness. Structural equation modeling was utilized to analyze the relation

between these constructs. Data were collected from a convenience sample of middle and high schools from three rural school districts in Georgia. Paper-and-pencil surveys were used to collect data from 1059 students.

Results provide evidence that contextual factors from the individual, family/peer, school, and community level all directly or indirectly influence rural adolescent drug use, but individual and school variables play the largest role in preventing rural adolescent substance use. In particular, refusal efficacy and social norms were significant protective factors for all types of substance use. School connectedness was the third strongest protective factor for all substance use and mediated the relation between many contextual factors and substance use. Contextual factors from all levels of the socio-ecological framework have differing effects based on type of drug use, race, gender, and age. Discussion of the study results includes implications for future research and practice.
INDEX WORDS: Adolescents, Teens, Rural, Substance use, School connectedness, Social ecological framework, Theory of Planned Behavior, Problem Behavior Theory, Social Disorganization Theory, Structural equation modeling, Mediation, Moderation, Path analysis

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DEDICATION

To my husband and best friend James Barlament

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TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER 1: INTRODUCTION

Background/Rationale

Within the past decade, overall prevalence of legal and illegal drug use has decreased, but the use of alcohol and other drugs during adolescence remains a current public health problem (Johnston, O'Malley, Bachman, & Schulenberg, 2012). Curbing drug use among adolescents and teens is a national priority. Four of the seven goals for substance use and abuse in Healthy People 2020 address adolescent behaviors, including an increase in the proportion of adolescents who remain alcohol free and reduction of past month use of illegal substances, steroids, and inhalants (Office of Disease Prevention and Health Promotion, 2012). Among rural youth, alcohol and other drug use increased over the past decade. Currently, both underage drinking and tobacco use are elevated in rural areas, and the use of illegal drugs by rural youth is on the rise (Johnston, et al., 2012; Van Gundy, 2006)

Past research on contextual factors influencing drug use revealed that protective factors in the community, school, and home all interact to influence youth drug use (Hawkins, Catalano, & Miller, 1992; Mayberry, Espelage, & Koenig, 2009). However, these studies lack information about the casual pathways and interactions of protective factors and their role in preventing drug use. In particular, previous researchers focused on contextual factors influencing drug use or school connectedness (Chilenski & Greenberg, 2009; Duncan, Duncan, & Lisa, 2000; Mayberry, et al., 2009; Resnick, 2000; Wang, Matthew, Bellamy, & Syretta, 2005). Few studies have examined school

connectedness as a mediator between contextual factors and drug use. In addition, research in rural areas is lacking, and those studies focusing on adolescents in rural areas often do not account for moderating effects of demographic variables, cultural influences, community connectedness, and religion practices.

Due to the multiple risk and protective factors that determine health behaviors, single theories do not explain all the direct and indirect influences contributing to adolescent substance use. An integration of cognitive, ecological, and social theories may present a better understanding of the proximal, distal, and ultimate influences of health behavior (Petraitis, Flay, & Miller, 1995). Unlike previous research, this study will examine adolescent substance use incorporating constructs from the Theory of Planned Behavior, Social Disorganization Theory, social ecological framework, and Jessor's Problem Behavior Theory.

Understanding the causal pathways of different contextual factors and theoretical constructs could lead to more tailored interventions and anti-drug programs in rural communities. With limited resources and growing minority populations in rural areas, it is important to understand how protective factors are interacting to influence youth drug use (Robertson, 1999). Successful programs in rural areas may involve understanding how churches, communities, and schools influence youth to make better decision about health behaviors.

Rural Cultural and Contextual Factors

Specific cultural and community characteristics of rural areas present unique challenges when examining substance use and school connectedness in adolescents and teens. In rural areas, heavy drinking is tolerated and is often considered a "norm". Youth

in rural areas are less likely to report that binge drinking is risky when compared to their urban counterparts (Van Gundy, 2006). Rural areas lack the funds, infrastructure, and personnel to implement anti-drug programs or provide substance abuse treatment (Robertson, 1999; Van Gundy, 2006). People in rural places have a "take care of our own" mentality, which hinders the successful implementation of programs and deters those seeking treatment for drug use problems (Van Gundy, 2006). Rural areas provide ideal samples for studying contextual factors influencing drug use because they are not close to other social units like urban areas and have clear boundaries for studying social processes (Robertson, 1999; Columbia University, 2000). Furthermore, the diverse populations of rural communities provide researchers the opportunity to study contextual influences for adolescent substance use (Robertson, 1999; Columbia University, 2000).

Due to unique cultural, ethnic, socioeconomic, and historical characteristics of rural areas, national substance use initiatives and drug prevention strategies may not apply to small rural towns lacking the resources and personnel for implementation (Robertson, 1999). Rural areas often lack mental healthcare services, substance abuse services, and prevention programs for adolescent drug use (Robertson, 1999). In addition to a lack of resources, rural populations are more skeptical of substance use programs and services (Van Gundy, 2006). Compared with urban counterparts, people living in rural areas often rely on family members and close friends for help and support during difficult times (Conger & Elder, 1994). Residents in rural areas have larger support networks from friends and family members, which enables individuals to work together to supervise and direct adolescents towards positive behaviors (Edwards, 1992).

It is important to identify protective factors in rural areas because a lack of adequate resources and trained professionals make it difficult to provide accessible drug treatment programs (Columbia University, 2000). Identifying positive influences from family members and already existing protective contextual factors for drug use on a local level could strengthen the limited resources of rural areas. More research should be conducted to identify solutions for preventing adolescent drug use, due to the special circumstances of rural areas. In particular, it is important to study the community and school factors influencing drug use in rural youth because small populations in these areas can come together to provide communitywide social control mechanisms (Robertson, 1999).

School-level protective factors are key to decrease adolescent substance use behaviors; however, in the United States, youth living in rural areas have 9.4% fewer school protective factors than youth living in towns or cities (Rhew, Hawkins, & Oesterle, 2011). Students in rural schools often report low levels of school commitment and academic failure. Further, rural school systems often lack opportunities and rewards for prosocial involvement (Rhew, et al., 2011). The present research will examine if school connectedness in rural areas is a protective factor for substance use, or if lack of resources and opportunities for students in these areas decrease the protective effect. The present study contributes to the literature by examining the relationships between school connectedness and drug use using the socio ecological framework, which more adequately represent the influences on rural adolescent drug use than analyses presented in prior research.

Research Questions

The current study will examine the casual pathways of protective factors that have been identified to deter youth drug use and promote school connectedness. In particular, this study will focus on the relation between youth drug use, school connectedness, and a variety of community, school, peer, and individual factors. Based on the findings of previous literature and theory, a structural equation model was constructed relating rural youth substance use and school connectedness to community, school, familial, peer, and individual characteristics. The study will test this structural model based on an ecological framework and other health behavior theories to determine how protective factors deter rural adolescent substance use and promote school connectedness. The following research questions will be addressed in this study:

1. What is the association between risk and protective factors, school connectedness, and rural adolescent substance use?

   Aim 1: To identify individual, family, school, and community predictors of school connectedness and substance use in rural adolescents.

   Hypotheses:

   1a. A higher score on individual protective factors (self-control and religion) will have a significant negative association with substance use and significant positive association with school connectedness, and individual protective factors will be a significant predictor of rural youth substance use.

   1b. A higher score on refusal efficacy (individual protective factor) will have a significant negative association with substance use. Refusal efficacy should not have a significant association with school connectedness.

1c. A higher score on social support and family involvement will have a significant negative association with substance use and a significant positive association with school connectedness, and family and peer protective factors will be a significant predictor of rural youth substance use.

1d. A higher score on social norms (family/peer level) will have a significant positive association with substance use. This relationship indicates that the more students perceive substance use as a norm among their peers, the more likely they are to use substances. Social norms should not have a significant association with school connectedness.

1e. A higher score on school protective factors (academic achievement and teacher support) will have a significant negative association with substance use and a significant positive association with school connectedness, and school protective factors will be a significant predictor of rural youth substance use.

1f. A higher score on community protective factors (community connectedness and community safety) will have a significant negative association with substance use and a significant positive association with school connectedness, and community protective factors will be a significant predictor of rural youth substance use.

Aim 2: To describe the effects of school connectedness and the individual context, family context, school context, and community context, and determine whether there are statistical mediations between school connectedness and other protective factors in their effects on rural youth substance use.

Hypothesis:

2a. Protective factors at the community, school, peer/familial, and individual level will have a positive association with school connectedness, and protective factors will interact with school connectedness and mediate the effects of rural youth substance use.

Aim 3: To investigate differences in predictors of school connectedness and substance use by gender, grade, and race/ethnicity.

Hypothesis:

3a. There will be differences in predictors of school connectedness and substance use by gender, grade, and race/ethnicity due to differences in adolescent development. These demographic factors will act as moderators between contextual factors and drug use.

2. Is the relationship between risk and protective factors and school connectedness the same for different types of drugs?

Aim 4: To examine whether the same contextual factors that predict alcohol use also predict tobacco or marijuana use in rural youth.

Hypothesis:

4a. Due to societal and cultural influences, some protective factors will deter the use of certain drugs like marijuana, but have less impact of the use of alcohol or cigarettes.

Chapter Summary

This chapter provided an overview of rural cultural and contextual factors influencing adolescent substance use, as well as a brief rationale for examining these factors based on theory. The major research questions and hypotheses of the study were presented. Chapter 2 provides an overview of the literature on contextual factors influencing adolescent substance use and school connectedness and theoretical underpinnings, which illustrate the significance of further examining these contextual factors in rural areas.

CHAPTER 2: REVIEW OF LITERATURE

This chapter provides an overview of adolescent substance use rates and discusses public health problems associated with drug use. Demographic factors related to substance use in adolescents are discussed and geographic and cultural issues influencing drug use are examined. Theories and the theoretical framework are presented in this chapter and primary constructs within the theoretical framework are discussed.

Adolescent Substance Use and Public Health

Early use of alcohol and other drugs is related to increased problem behaviors including risky sexual activity, unintentional accidents, and violence (Dunn et al., 2008; Johnson et al., 2008). Early onset of use predicts increased risk for substance use disorders and associated psychopathology later in life (Young et al., 2002). Health problems associated with adolescent substance use include unwanted sexual activity, unwanted pregnancy, sexually transmitted infections, alcohol and drug abuse, traffic crashes, and trauma (Rahdert & Czechowicz, 1995). Mental health issues, respiratory and circulatory problems, and malnutrition are commonly associated with alcohol and drug use (Rahdert & Czechowicz, 1995). School and social problems are prevalent among substance using youth, including dropping out of school, poor academic performance, and disruptive behavior (Aronson, Feinberg, & Kozlowski, 2009). Criminal activity, engagement in violent acts, and other antisocial behaviors are strongly related to youth ATOD use (Aronson, et al., 2009).

The earlier adolescents try substances the more likely they are to become addicts later in life, so it is vital to understand the factors that contribute to experimental substance use (Bonino, Cattelino, & Ciairano, 2005). Adolescents who first use any substance by the age of 15 have an addiction rate of 28%, while adults who first use a substance after 21 years of age have a 4% addiction rate (NCASA, 2011). During middle school years (ages 12-13), adolescents begin to act out behavior types that are considered normal in adults, such as smoking cigarettes and drinking alcohol (Bonino, et al., 2005). Regardless of this experimental development phase, some adolescents choose to abstain from substance use. It is critical to understand the interaction of factors at the school, community, family, and individual level that promote positive behaviors in youth to decrease public health issues associated with adolescent drug use.

Prevalence of Adolescent Drug use and Recent Trends

Alcohol

According to the 2011 Monitoring the Future Study (MTF), the rates of drinking alcoholic beverages over a 30-day period were 13% for 8th graders, 27% for 10th graders, and 40% for 12th graders. More than 30% of eight graders had already tried alcohol, and 15% indicated having already been drunk at least once. Recent trends show alcohol use in adolescents decreasing overall, and students reporting lifetime, annual, 30-day, and binge drinking in the prior two weeks reached all-time lows in the 2011 MTF survey (Johnston, et al., 2012).

Patterns of binge drinking also decreased over the past two decades. Binge drinking among twelfth graders peaked at about 41% in 1979 and decreased to 21% in

2011. Declines in binge drinking since more recent peaks in the 1990s are 52%, 39%, and 31% for grades 8, 10, and 12, respectively (Johnston, et al., 2012).

Tobacco

In 2011, smoking rates in a 30-day period were 6% for 8th graders, 10% for 10th graders, and 19% for 12th graders (Johnston, et al., 2012). Among 8th graders, 18% had tried smoking cigarettes at some point during their lifetime, and 13% had tried smokeless tobacco. The downward trend of smoking in 8th and 10th graders, which began in the 1990's, ceased in 2010 with both lower grades showing increases in cigarette use. For 12th grade students, cigarette use has declined since 1997 from 38% of students reporting current smoking (within the past 30 days) to 19% in 2011. Disapproval and perceived risk of cigarette and tobacco use steadily increased over the past two decades and reached all time highs in 8th, 10th, and 12th grade students in 2011 (Johnston, et al., 2012).

Marijuana

Marijuana use rose among all teens from 2008 to 2010, and this trend continued in 2011 for 10th and 12th grade students; however, there was a slight decrease in marijuana use in 2011 for 8th grade students. The proportions of 8th, 10th, and 12th graders that reported smoking marijuana in 2011 over a 12-month period were 16%, 25%, and 38%, respectively. Daily use of marijuana is at 1.3%, 3.6%, and 6.6% in grades 8, 10, and 12. Furthermore, disapproval of marijuana use has declined as prevalence in use has increased. One possible explanation for the recent upward trend of marijuana use could be access. In 2011, 38% of 8th graders, 68% of 10th graders, and 82% of 12th graders reported that marijuana was fairly or very easy to get in their area (Johnston, et al., 2012).

Illegal Drugs

In 2011, the rate for any illegal drug use other than marijuana over a 12-month period was 17% in 8th graders, 31% in 10th graders, and 40% in 12th graders. Overall, 26% of 8th graders in 2011 tried some type of illegal drug, while 9.8% tried some illegal drug other than marijuana or inhalants (Johnston, et al., 2012). The proportion of students using any illegal drugs other than marijuana decreased gradually since 2001, but this trend ended in 2010. Use of several illegal drugs remained constant in 2011, including: LSD, hallucinogens, salvia, heroin, OxyContin, amphetamines (Ritalin), club drugs, methamphetamines, crystal meth, and anabolic steroids.

Demographic Factors Associated with Adolescent Drug Use

Age

The rate of alcohol, tobacco, marijuana, and illegal drug use varies according to age. In the transition from childhood to adulthood, adolescents undergo important biological, cognitive, emotional, and social changes (Castellanos-Ryan, O'Leary-Barrett, & Conrod, 2013). This developmental period includes the onset of and progression of puberty, greater autonomy, changes in self-concept, broadening of social interests, less self-regulation, and changes in parental and peer relationships (Bonino, et al., 2005; Castellanos-Ryan, et al., 2013; Petraitis, et al., 1995). Previous studies have found fluctuating rates in drug use among age groups, but consistently, the likelihood of substance use increases as adolescents age into young adulthood (Harris Abadi, Shamblen, Thompson, Collins, & Johnson, 2011).

According to the Substance Abuse and Mental Health Services Administration (SAMHSA), 2011 rates of current alcohol use increased with age: 2.5% among persons

aged 12 or 13, 11.3% among those aged 14 or 15, 25.3% among those aged 16 or 17, and 46.8% among those aged 18 to 20. Rates of current tobacco were 1.4% for the 12 to 13 age category, 6.0% for 14 to 15 years old, 15.4% for 16 to 17 years old, and 31.6% for 18 to 20 years old. Rates of current illegal drug use showed the same trend: 3.3% among 12 to 13 year olds, 9.2% among 14 to 15 year olds, 17.2% among 16 to 17 year olds, and 23.8% among 18 to 20 year olds (SAMHSA, 2011).

Gender

Substance use and related deviant behaviors escalate in boys at a greater rate than girls (Hicks et al., 2007). Historically, studies consistently show greater use of alcohol among men (Hicks, et al., 2007; SAMHSA, 2011; Young, et al., 2002). However, recent reports find that the gender gap in alcohol use has decreased in the past decade due to changes in cultural norms (Raitasalo & Holmila, 2005; SAMHSA, 2011). In 2011, among youths aged 12 to 17, the percentage of boys who were current drinkers (13.3%) was the same as the rate for girls (13.3%) (SAMHSA, 2011).

Gender differences in cigarette smoking remain small compared to the use of marijuana and illegal drugs. In 2011 among youths aged 12 to 17, the rates of current cigarette smoking were 8.2% for boys and 7.3% for girls. Among youths aged 12 to 17, the percentage of boys who were current marijuana users (9.0%) was higher than the current rate for girls (6.7%). Similar trends emerge in illegal drug use, with the percentage of 12 to 17 year old boys currently using at 10.7% compared to girls at 9.3%. There are a few illegal substances that are used more frequently by adolescent girls. Girls aged 12 to 17 are more likely than boys to be current nonmedical users of

psychotherapeutic drugs (3.2% versus 2.4%) and current nonmedical users of pain relievers (2.6% versus 1.9%) (SAMHSA, 2011).

Race

Racial differences exist in adolescent substance use (Blum et al., 2000; Blum & Ireland, 2004; Johnston, et al., 2012; SAMHSA, 2011). In 2011, Alaska Natives and American Indians had the highest rate of current alcohol use with 15.2% (SAMHSA, 2011). Historically, White adolescents were most likely to use alcohol, but these studies generally lacked information about Native American youths (Blum, et al., 2000; Johnston, et al., 2012). White students reported the second highest rate of alcohol use in 2011 at 14.6% compared to 12.6% of Hispanic youths, 10.5% of African American youths, and 7.4% of Asian American youths (SAMHSA, 2011).

Current cigarette use rates are highest in American Indians or Alaska Native youths aged 12 to 17 at 12.3% compared to 9.3% of White youths, 6.1% of Hispanic youths, 4.9% of African American youths, and 3.3% of Asian American youths. Similar to alcohol use, cigarette use has been historically associated as a problem for White adolescents (Blum, et al., 2000; Shih, Miles, Tucker, Zhou, & D'Amico, 2010). Rates of illegal drug use among youths aged 12 to 17 were highest for youths of two or more races at 13.5%, followed by American Indians or Alaska Natives at 13.4%, Native Hawaiians or Other Pacific Islanders at 11%, African Americans at 10%, Whites at 8.7%, and Hispanics at 8.4%. Use of Illegal substances has increased dramatically for Hispanic youth over the last two decades, while remaining steady or decreasing slightly for African American and White adolescents (SAMHSA, 2011).

Data for the current study will come from rural southeast Georgia. The racial and ethnic background for this area is similar to the rest of the state. The current study's population is primarily White and African American. In the state of Georgia, White high school students are significantly more likely to have ever smoked cigarettes compared to African American students (CDC, 2011). While not significant, White high school students report higher rates of using alcohol in the past and African American students report higher rates of using marijuana in the past (Table 1) (CDC, 2011). No significant differences were found when examining race and drug use in middle school students. White middle school students report higher rates of ever using cigarettes, while African American students report higher rates of ever using alcohol or marijuana (Table 2) (CDC, 2011).

Data for illegal drug use in this population is scarce, but the Youth Risk Behavior Survey found that White high school students are significantly more likely to have ever used cocaine and sniffed glue compared to African American students (CDC, 2011). African American middle school students report higher rates of sniffing glue. There are no significant differences for use of heroin, methamphetamines, ecstasy, and steroids in both middle and high school students.

Table 1*: Georgia Middle School (6th-8th Grade) Drug Use Rates by Race*

Drug Use **(Ever Tried)**	African American/Black	Caucasian/White	P-Value
Cigarettes	42.1%	50.6%	.03*
Alcohol	62.9%	69.8%	.07
Marijuana	40.8%	36.4%	.13

*****$p<.05$ *is significant*

Table 2*: Georgia High School (9th-12th Grade) Drug Use Rates by Race*

Drug Use **(Ever Tried)**	African American/Black	Caucasian/White	P-Value
Cigarettes	24.3%	27.2%	.37
Alcohol	35.0%	31.3%	.23
Marijuana	13.7%	9.1%	.10

Geographic Area: Rural Vs. Urban

Drug use rates vary over time and by geographical area. Some studies have demonstrated higher substance use rates in urban adolescent (Cronk & Sarvela, 1997; Galea & Vlahov, 2005; Hanson et al., 2008), while others showed higher rates of use in rural areas (Aronson, et al., 2009; Lambert, Gale, & Hartley, 2008). Other studies have reported an increase in the use of alcohol, smokeless tobacco, and cigarettes among rural youth compared to urban youth (Aronson, et al., 2009; Hanson, et al., 2008; Rhew, et al., 2011). In addition, rural adolescents and teens are more likely to engage in binge drinking and drinking and driving (Lambert, et al., 2008).

Results from a recent study provided the following drug use prevalence of rural 12th grade teens: 41% used alcohol in the past 30 days, 36% smoked cigarettes in the past 30 days, 31% had tried marijuana in the past year, and 16% tried some type of illegal drug (other than marijuana) in the past year (Johnston, O'Malley, Bachman, & Schulenberg, 2013). The same study examined prevalence in urban areas and found the following rates: 48% used alcohol in the past 30 days, 18% smoked cigarettes in the past 30 days, 40% had tried marijuana in the past year, and 19% tried some type of illegal drug (other than marijuana) in the past year (Johnston, et al., 2013). Factors influencing adolescent drug use are different depending on the substances and vary across locations, with higher levels of risk for tobacco products and binge drinking reported in rural adolescents (Spoth, Redmond, & Hockaday, 1996).

Regions of the United States

Several trends emerge when examining substance use among different regions of the United States. In particular, age seems to be a driving factor behind use of substances in certain regions, with across the board high substance use among 8th graders in the South, and generally high substance use among 10th and 12th graders in the West and Northeast. In 2012, 8th grade alcohol use was highest in South and West regions; however, during the 10th and 12th grades alcohol use was highest in the Northeast (Johnston, et al., 2013). Cigarette use among 8th and 10th graders was highest in the South region, while cigarette use among 12th graders is highest in the Midwest. Marijuana annual prevalence among 8th graders was highest in the South and West regions; however, during the 10th and 12th grade marijuana prevalence was highest in the West and Northeast. In 2012, the prevalence of any illicit substance use among 8th graders was highest in the South and West region of the United States, while illicit drug use among 10th and 12th graders was highest in the West and Northeast area (Johnston, et al., 2013).

Overview of Theoretical Models

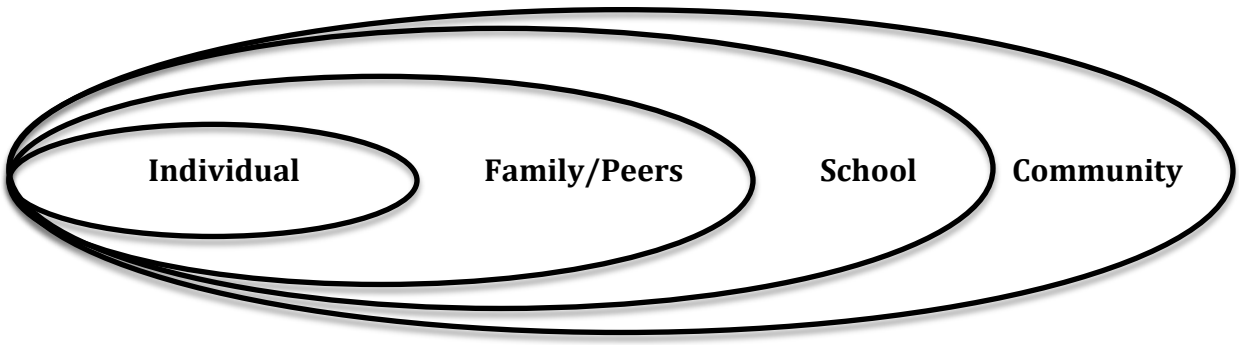
The social ecological framework

The social ecological model is a framework developed to examine the multiple effects of social elements in an environment. Bronfenbrenner's theory labels multiple "layers" of environment, each affecting behavior. According to Bronfenbrenner (1977), "the model includes immediate settings containing the developing person and the larger social contexts, both formal and informal, in which these settings are embedded" (p. 541) (Bronfenbrenner, 1977).

According to the social ecological model, drug use is not only influenced by personality traits, but also by peer pressure, characteristics of schools, and community factors. A revised model of the social ecological model (Figure 1) proposes that individual factors (knowledge, attitudes, and skills) are influenced by family/peer factors (family support, peer support/pressure, social networks), school factors (school connectedness, academic achievement, teacher support), and community factors (relationship with the community, community connectedness, neighborhood characteristics). All of these contexts are nested within each other and interact to influence youth health outcomes.

The social ecological framework guides the overarching goal of the current study. Multiple factors from each context will be examined to determine their influence on school connectedness and adolescent risk behaviors. Due to the complexity of the ecological model, some constructs were excluded from the current research. An effort was made to include constructs from each level as predictors of rural adolescent risk and health outcomes.

Figure 1: Social Ecological Model



Jessor's Problem Behavior Theory

Jessor's Problem Behavior Theory (PBT) focuses on how both the environment and person influence problem behaviors (Jessor, 1991). According to Jessor (1991), adolescents who are prone to one problem behavior (i.e. substance use) are also prone to other problem behaviors (i.e. violence). The PBT includes three major systems of explanatory variables: the perceived environment, the personality system, and the behavior system. Each of the systems contains variables that are instigators (risk factors) or controls (protective factors) for engaging in a problem behavior (Jessor, 1998). The balance of risk and protective factors determines the susceptibility to problem behaviors (Jessor, 1991).

The concepts that comprise the behavior system include problem behaviors and conventional behaviors. Problem behaviors include alcohol and drug use, risky driving, violence, and risky sexual behaviors. Conventional behaviors include those that are socially approved and seen as appropriate for adolescents. These behaviors include church attendance, academic course work and achievement, and school activities. Susceptibility to problem behavior includes high involvement in other problem behaviors and low involvement in conventional behaviors (Jessor, 1991). Problem Behavior Theory also includes constructs related to the social environment like family composition and school environment, as well as demographic influences.

The constructs associated with the perceived-environment system include social controls, models, and support. The environmental influence on behavior is divided into proximal and distal structures. Attachment to peers and family influences behavior in the distal structure, and social modeling by friends and family influences behavior in the

proximal structure (Petraitis, et al., 1995). Problem Behavior Theory argues that if adolescents are unattached to family members and have friends performing deviant behavior, they are more likely to participate in problem behaviors (Jessor, 1991).

The personality system includes individual concepts related to health risk-behaviors such as values, beliefs, and attitudes. Personality concepts reflect social learning and developmental experience (Jessor, 1991). Within the personal belief structure, adolescents perform risky behaviors if they are alienated, have low self-esteem, and have an external locus of control (Petraitis, et al., 1995). In addition, susceptibility to problem behavior in the personality system includes lower value on academic achievement, higher value on autonomy, greater social criticism, lower religiosity, and higher value on deviance (Jessor, 1991).

Jessor's Problem Behavior Theory illustrates how constructs hang together within a system of interrelationships. Systems within Jessor's Problem Behavior Theory can include factors from the individual, family/peer, school, and community level. The perceived environment system includes family support, teacher support, and subjective norms, all of which influence adolescent behavior. Jessor's systems within the Problem Behavior Theory provide a way to organize constructs from all levels of social ecological framework and allows for easy integration of constructs from the Theory of Planned Behavior and Social Disorganization Theory.

Theory of Planned Behavior

Azjen's Theory of Planned Behavior (TPB) argues that individuals will perform a behavior if they believe the benefits outweigh the costs, if certain individuals or groups think he or she should undertake the behavior, and if there is high perceived control over

the behavior (Ajzen, 1991). Behavioral intentions are influenced by individuals' attitudes towards the behavior and are a function of consequences expected and the affective value placed on those consequences (Shumaker, Schron, Ockene, & McBee, 1998). Intentions to perform a behavior are affected by social norms; therefore, individuals will only perform behaviors they feel are important to significant others (Petraitis, et al., 1995). For some behaviors attitude will be the major determinant of intention, and others will be more socially influenced by perceived norms (Shumaker, et al., 1998).

Social norms are influenced by culture, family, friends, and community and school factors (Miller-Day & Barnett, 2004). For example, a student attending a school with high-drug use rates may be more likely to use substances because other students at the school engage in drug use. Due to the binge drinking culture in rural areas and a "take care of our own" mentality, social norms should be considered when examining factors influencing rural adolescent drug use (Miller-Day & Barnett, 2004; Van Gundy, 2006).

In addition to attitudes and normative beliefs, Azjen states that self-efficacy will directly affect intentions and behaviors (Ajzen, 1991). Individuals will perform a behavior if they have high-perceived control over the situation and if they are confident in successfully performing the behavior (Shumaker, et al., 1998). Factors influencing perception of behavioral control include past experience, self-knowledge, confidence about control, and a detailed plan of action (Shumaker, et al., 1998). Refusal self-efficacy is an important construct in adolescent substance use. Research shows that adolescents who believe in their ability to resist social pressure to use drugs are less likely to engage in experimental substance use (Basen-Engquist & Parcel, 1992; Ludwig & Pittman, 1999; Petraitis, et al., 1995).

Constructs from the Theory of Planned Behavior will be examined to strengthen the influence of beliefs on behavior. Jessor's Problem Behavior Theory includes a wide variety of constructs, but deemphasizes cognitive-affective influences and downplays the influence of beliefs on behavior (Petraitis, et al., 1995). Because rural areas are diverse, it is important to understand the norms in the area that may drive adolescent behavior. Refusal Efficacy will be examined because of its established relationship with adolescent drug use (Basen-Engquist & Parcel, 1992; Furrer & Skinner, 2003).

Social Disorganization Theory

The Social Disorganization Theory attributes deviant behavior and substance use to disorganized communities and neighborhoods where crime and unemployment are common. Due to a breakdown of established institutions and a community's inability to control or supervise adolescent behavior, youth feel uncommitted to conventional society and act out through drug use or deviant behavior (Mayberry, et al., 2009; Petraitis, et al., 1995). High levels of school and community connectedness combat disorganization and deter adolescent drug use (Mayberry, et al., 2009; Petraitis, et al., 1995). Rural areas have the ability to come together and provide communitywide social control mechanisms because of smaller populations and "tight-knit" communities (Robertson, 1999). Constructs from the Social Disorganization Theory will be examined to research the protective effects of living in small rural towns.

Conceptual Framework

The conceptual framework for the study (Figure 2) is based on Brofenbrenner's social ecological framework and Jessor's Problem Behavior Theory. Due to their complementary nature, constructs from the Social Disorganization Theory and the

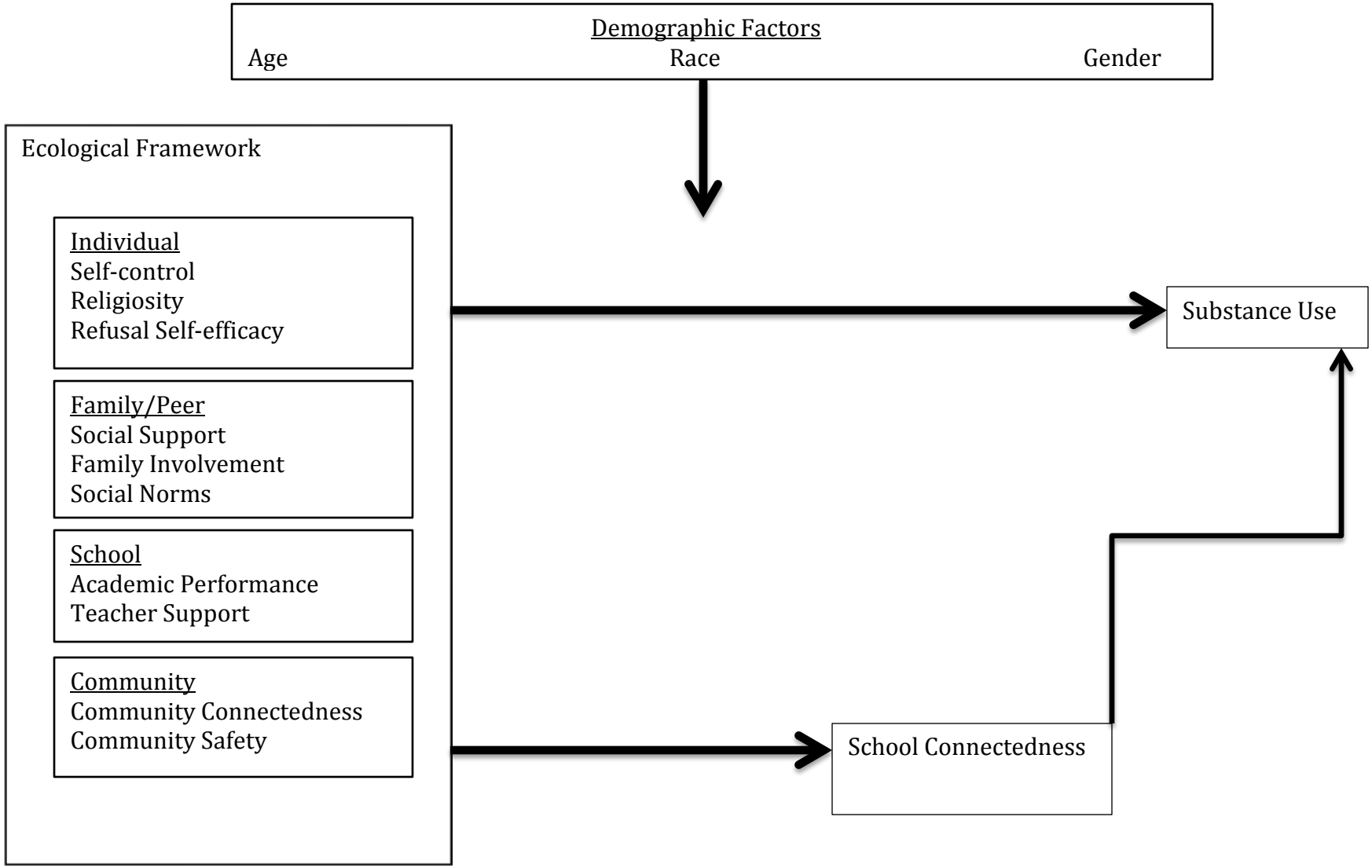
Theory of Planned Behavior have been integrated into the model to examine individual, family/peer, school, and community factors influencing health behavior. Social norms could be examined within the family/peer system, while refusal efficacy fits within the individual system. This integration increases emphasis on cognitive-affective influences and increases influences of beliefs on behaviors, which is a major argument from critics of PBT. Constructs from the Social Disorganization Theory will be incorporated into the model because of the implications of these factors in rural areas. Community connectedness and safety will be examined in the community system, while teacher support and academic performance will be examined in the school system.

Ecological models provide strong frameworks for investigating risk and protective factors and how they relate to youth health outcomes (Blum, McNeely, & Nonnemaker, 2001). Previous research shows that youth involved in contexts that involve positive influences from family, schools, and communities are less likely to have negative outcomes and more likely to show positive development (Resnick et al., 1997; Youngblade et al., 2007). Though many studies examine factors influencing adolescent drug use, literature is lacking that examines school and community protective factors that deter drug use in rural youth. Furthermore, this dynamic model allows for the environment and contextual factors to influence health outcomes, which may develop into risk or protective factors.

Examining the changing relationships between risk and protective factors and how they are influenced by the community, school, and family can lead to better understanding of resiliency in adolescents. Substance use (tobacco, alcohol, and marijuana use) and school connectedness were examined as outcomes. Community,

school, family/peer, and individual factors were explored to identify risk and protective factors that predict risk behaviors and health outcomes of rural adolescents. School connectedness was examined as a protective factor (mediator) for rural adolescent substance use. The proposed model for this research suggests that all contexts may have a direct or indirect effect on specific outcomes. The strengths of these influences may be mediated by school connectedness and moderated by age, gender, and race/ethnicity. The current ecological model developed for this study proposes that community, school, family, peer, and individual context influence adolescent behavior and produce either risky health behaviors or positive youth outcomes.

Figure 2: Conceptual Model for Examining Contextual Protective Factors and Youth Drug Use



Primary Constructs

School Connectedness

School connectedness is often defined as the belief held by students about the importance of school and their perception that adults and peers in their school care about their learning (CDC, 2013). The Social Disorganization Theory and Social Control Theory suggest that school connectedness deters adolescent drug use. Disorganization within schools and a lack of support from leaders influence youth to feel uncommitted to their school and community. This breakdown and lack of commitment will lead to poor academic performance and deviant behavior (Mayberry, et al., 2009; Petraitis, et al., 1995).

Previous studies have included peer connectedness as a component of school connectedness, which may lead to risky behavior if students are connected to deviant peers (Catalano, Haggerty, Oesterle, Fleming, & Hawkins, 2004; McNeely & Falci, 2004). The current study examined school connectedness based on school value, enjoyment of school, and importance of school. Teacher and social support were examined as constructs in the social ecological framework, which may influence school connectedness and/or adolescent drug use.

Previous research links strong school connectedness and lower youth substance use rates (Chilenski & Greenberg, 2009; Duncan, et al., 2000; Resnick, 2000; Wang, et al., 2005). A low degree of behavioral and emotional school engagement increases the risk of substance use and delinquent behavior in adolescents (Li et al., 2011). Rural areas often lack school protective factors; however, when present, positive school climate and

connection with school are protective factors that deter rural adolescent drug use (Mayberry, et al., 2009).

Other research is contradictory, linking school connectedness to elevated substance use rates. For example, McNeely & Falci concluded that students who feel a sense of belonging to their school are not protected from the initiation of cigarette smoking, binge drinking, and marijuana use (McNeely & Falci, 2004). Catalano *et. al.* stated that higher school bonding is associated with lifetime alcohol, cigarette, marijuana, and other drug use in 12th grade students (Catalano, et al., 2004).

These findings could be associated with the inconsistent definition of school connectedness or the lack of examination of other contextual factors influencing school connectedness and substance use. In this study, school connectedness is based on school value, enjoyment of school, and importance of school. Peer support and teacher support were examined as contextual factors because they could influence enjoyment and value of school. It is vital to study the relationships between contextual factors and school connectedness to determine whether there is a direct, indirect, or no effect on substance use in adolescents. In particular, it is important to examine these relationships in rural adolescents because of the lack of school protective factors in these areas (Rhew, et al., 2011).

Individual Constructs

Self-Control

Self-Control is a person's ability to restrain impulses, emotions, or desires. Self-control in adolescents has been linked to deviant-behavior, psychosocial resilience, school connectedness, and drug use (Botvin, et al., 1998; Rhodes & Jason, 1990; Wills, et

al., 2003). High self-control is associated with less drug use and deviant behavior (Rhodes & Jason, 1990; Wills, et al., 2003). For rural adolescents, high self-control is associated with a decrease in frequency of drunkenness (Botvin, et al., 1998). Self-control is not only linked to drug use, but has been a significant predictor of school connectedness and psychosocial resilience (Rhodes & Jason, 1990; Wang, et al., 2005). Due to inconsistent findings and lack of research in rural areas, future research should examine how self-control and religion interacts with other contextual factors to influence rural adolescent drug use.

Religion

Individual factors such as self-control, religion, and refusal efficacy are associated with adolescent substance use (Botvin, Malgady, Griffin, Scheier, & Epstein, 1998; Hodge, Cardenas, & Montoya, 2001; Newcomb & Felix-Ortiz, 1992). Religion is at the forefront of rural culture and has been examined as protective factors for adolescent drug use. Rural Americans are more religious than their urban counterparts and many community activities are associated with religious institutions (Dillon & Savage, 2006). Religious importance and church attendance is linked with lower drug use rates in rural adolescents (Brownfield & Sorenson, 1991; Milot & Ludden, 2008). Religion importance and church attendance are positively associated with higher school motivation and less school misbehavior (Milot & Ludden, 2008). Some studies have contradicted these findings and stated that religion only has an indirect effect on drug use (Wills, et al., 2003). In addition, some research found religion and spirituality is significantly related to non-use of marijuana or hardcore drugs, but has no protective effect on alcohol use (Benda & Corwyn, 2000; Hodge, et al., 2001).

Family/Peer Constructs

As adolescents age, they become more peer-focused and spend less time with family members (Bahr, Hoffmann, & Yang, 2005; Barnes, Farrell, & Dintcheff, 2006). Adolescents begin to attach importance to the activities they do with peers, which take precedence over school activities and time with family (Eccles & Gootman, 2002). Time spent with peers influences adolescent identity, attitudes, norms, and behaviors (Eccles & Gootman, 2002). Confidence in early adolescence is associated with physical appearance and social acceptance, increasing susceptibility to negative peer influence (Lerner & Steinberg, 2009). Adolescents who associate with deviant peers are more likely to participate in problematic behavior, such as substance use, drinking and driving, and violent behaviors (Bonino, et al., 2005; Hawkins, et al., 1992; Pettit, et al., 1999; Wolff & Crockett, 2011).

Even though peer related factors influence adolescent behavior, researchers argue that parental influence is still important during the developmental period (Pettit, et al., 1999; Smetana, Campione-Barr, & Metzger, 2006). In fact, adolescents tend to associate with peers who hold similar values as their parents on issues such as religion, morality, education, and politics (Eccles & Gootman, 2002). Parental monitoring, parental support, and family involvement are protective factors against association with deviant peers and are important for positive adolescent development (Barnes & Farrell, 1992).

Social Support

Social support from family and adult friends is a significant predictor of school connectedness, which decreases chances for youth substance use (Wang, et al., 2005). Parental support increased school-related interest and goal orientations (Wentzel, 1998).

Furthermore, adolescents with greater family support are less likely to engage in deviant behavior and more likely to have psychosocial resilience (Dillon & Savage, 2006; Duncan, et al., 2000; Rhodes & Jason, 1990; Tusaie, Puskar, & Sereika, 2007). Affiliation with older adults or mentors that provide social support is directly associated with positive behavioral effects and alcohol abstinence (Spoth, et al., 1996). Because few studies have examined the relationship between rural adolescent substance use, social support, and school connectedness, more research should be conducted to examine the direct and indirect effects of these variables.

Family Involvement

From the large body of research on adolescent problem behaviors, parental and peer influences are among the most widely cited predictive factors, and these predictive factors influence adolescent drug use (Barnes, et al., 2006; Fallu et al., 2010; Hawkins, et al., 1992; Wang, Hsu, Lin, Cheng, & Lee, 2010; Wolff & Crockett, 2011). Adolescents who spend more time with family members have greater self-control and are less likely to engage in deviant behaviors (Duncan, et al., 2000; Wills, Gibbons, Gerrard, Murry, & Brody, 2003). Research on rural adolescents reveals that a close connection to parents deters substance use (De Haan, et al., 2009). While family involvement has been indirectly connected to school connectedness by increasing self-control and social support, few studies have examined if family involvement has a direct effect on school connectedness in rural adolescents (Wang, et al., 2005).

There are inconsistencies in study findings regarding family involvement and adolescent drug use. Cheng & Lo found that family involvement is significantly associated with less marijuana use in rural adolescents; however, Lo *et. al.* concluded that

family involvement offered more protection against the use of alcohol and other drugs, and less protection against recent marijuana use in rural youth (Cheng & Lo, 2011; Lo, Anderson, Minugh, & Lomuto, 2006). Barnes *et. al.* concluded that family involvement reduces the rate of delinquency and alcohol consumption in rural adolescents, but it is not a protective factor for illegal drug use (Barnes, et al., 2006). These inconsistencies could be attributed to different contextual influences and age differences.

School Constructs

The school context plays a crucial role in positive adolescent development. Researchers have suggested a link between school transition and problem behaviors (Simmons, Burgeson, Carlton-Ford, & Blyth, 1987). Students transitioning into middle and high-school often have a hard time adjusting to new environments, which can lead to mental and social problems (Eccles & Gootman, 2002). During this transition period, there is a greater decline in girls self-esteem and increased victimization due to bullying in boys (Simmons, et al., 1987). Transition to middle-school often results in decreased interest in school, lowered intrinsic motivation, decreased self-concept, and low confidence levels, and decreased academic performance (Eccles, Wigfield, Harold, & Blumenfeld, 1993; Eccles & Gootman, 2002).

Students that transition into schools that do not fit their psychological needs may not be motivated to academically succeed (Eccles & Gootman, 2002). Increases in school problem behaviors are observed more frequently in poor neighborhoods where students are struggling academically before the school transition (Eccles, et al., 1993). Adolescents often shift from a smaller to larger school where there is less contact with adults and less opportunity to be engaged in school activities (Eccles & Gootman, 2002).

Shifts in classroom and school environments often lead to lower motivation and increased problem behavior as adolescents age (Eccles & Gootman, 2002; Simmons, et al., 1987). To promote positive development, adolescents need safe and intellectually challenging environments where academic motivation is encouraged by supportive teachers (Simmons, et al., 1987).

Teacher Support

According to some researchers, school context accounts for more variance in drug use when compared to other contexts (i.e. family, individual) (Allison et al., 1999). Teacher support is a positive predictor of school connectedness and has been linked to decreased drug use (Cleveland, Feinberg, & Greenberg, 2010; Wentzel, 1998; Zullig, Huebner, & Patton, 2011). Adolescents who perceive their teachers as more supportive and caring are less likely to initiate cigarette smoking, binge drinking, and marijuana use (McNeely & Falci, 2004). Few studies have examined teacher support in rural adolescents, but Cleveland *et. al.* indicated that teacher support and high functioning schools decrease rural youth substance use rates (Cleveland, et al., 2010).

Academic Performance

School involvement and high academic success decreases adolescent substance use. Students who perform well in school report higher levels of school connectedness and satisfaction (Zullig, et al., 2011). This connection between high academic success and decreased substance use is also seen in rural areas (Connell, Gilreath, Aklin, & Brex, 2010). However, Branstrom *et al.* reported that high self-perceived school ability among rural adolescents is a protective factor that deters alcohol, cigarette, and most illegal drug

use, but does not deter youth from marijuana use (Branstrom, Sjostrom, & Andreasson, 2008).

Academic performance can be influenced by many school related factors. Teacher support, administrator support, peer environment, and safety are all school-level factors associated with academic performance (Eccles et al., 1993; Goldstein, 1999; Juvonen, 1996; Resnick, et al., 1997). Adolescents attending schools that foster a supportive and safe environment have higher motivation and better academic performance (Furrer & Skinner, 2003; Stipek, 2002). Academic performance cannot be studied in isolation of the school context (Eccles, et al., 1993). Being successful at school is not only dependent on individual level factors and extends beyond adolescent motivation and interest in school. Academic performance is examined as a school level factor in the current study because the interests and concerns of schools and teachers influence success (Wentzel, & Wigfield, 1998). Past research shows that academically successful adolescents often pursue goals that are valued by others in the school environment (Hanson, & Ginsburg, 1988; Wentzel, 1989).

Community Constructs

Community Connectedness

Community connectedness is associated with school connectedness and decreased adolescent drug use (Chipuer, 2001). Research suggests that youths' sense of community within environmental context (i.e. neighborhood) influences their psychological well-being and connectedness in other contexts (i.e. schools). The Social Disorganization Theory and Social Control Theory support community connectedness and neighborhood safety as contributing factors of adolescent substance use (Mayberry, et al., 2009;

Petraitis, et al., 1995). Adolescents who are not connected to their community experience higher levels of loneliness, which could result in engagement in risky behaviors (Chipuer, 2001). Studies among rural adolescents reveal that community connectedness is a protective factor (De Haan, Boljevac, & Schaefer, 2009; Mayberry, et al., 2009).

Information is limited concerning whether or not community connectedness has a direct or indirect effect on drug use and school connectedness. More research should be conducted to determine the relationship between community connectedness, school connectedness, and adolescent substance use. This is particularly important for rural areas because of the lack of social resources and cultural reliance on each other (Robertson, 1999)

Community Safety

Community safety is a significant protective factor for adolescent drug use (Chilenski & Greenberg, 2009; Mayberry, et al., 2009; Pettit, Bates, Dodge, & Meece, 1999). Adolescents living in an unstable community often have lower social cohesion, which is related to neighborhood youth drug and alcohol arrests and lower community safety (Duncan, Duncan, & Lisa, 2002). Rural adolescents who live in unsafe or unstable communities have a greater chance of externalizing risky behaviors, while students who live in safe communities are less likely to participate in substance use and delinquent behaviors (Mayberry, et al., 2009). Community safety is associated with increased social competence, decreased externalization of behavior, and greater school safety (Youngblade, et al., 2007). The relationship between community safety and school connectedness has been assumed but not positively linked by researchers (Whitlock, 2006). Some research contradicts the above findings. Duncan *et al.* concluded that

adolescents who perceived more neighborhood problems had lower initial levels of alcohol use; however, this effect changed as adolescents got older (Duncan, et al., 2000).

Chapter Summary

The literature review above provides the rationale for the conceptual design and research questions addressed in this study. Adolescent substance use rates vary by gender, age, and geographic area and are influenced by developmental and contextual factors. An integration of Problem Behavior Theory, the Theory of Planned Behavior, Social Disorganization Theory, and the social ecological framework may provide a clearer picture of the factors deterring adolescent substance use and promoting positive conventional behaviors. This study will examine the relationships between school connectedness and drug use within a system of interrelationships, which more adequately represent the influences on rural adolescent drug use than analyses presented in prior research.

Chapter Three provides an overview of the methodology and describes how the research questions and aims below will be addressed:

1. What is the relationship between risk and protective factors, school connectedness, and rural adolescent substance use?
    - *Aim 1: To identify individual, family, school, and community predictors of school connectedness and substance use in rural adolescents.*
    - *Aim 2: To describe the effects of school connectedness and the individual context, family context, school context, and community context, and determine whether there are statistical mediations between school*

connectedness and other protective factors in their effects on rural youth substance use.

- *Aim 3: To investigate differences in predictors of school connectedness and substance use by gender, grade, and race/ethnicity.*

2. Is the relationship between risk and protective factors and school connectedness the same for different types of drugs?
    - *Aim 4: To examine whether the same contextual factors that predict alcohol use also predict tobacco or marijuana use in rural youth.*

CHAPTER 3: METHODOLOGY

Study Design

The proposed study is a cross-sectional design with data collected from students at one point in time. A quantitative methodology based in theory was used to collect information about adolescent drug use and the protective factors that deter adolescents from engaging in substance use. Structural Equation Modeling (SEM) was used to examine the mediating effects of school connectedness on protective factors at different levels of the social ecological framework. Moderating effects of race, age, and gender were examined. SEM was used to explore the pathways through which protective factors deter rural adolescent drug use. Quantitative methods using SEM and a large sample size provided this study with strong and statistically sound results.

Setting and Population

Setting

This study collected data from three rural school districts in Southeast Georgia. Convenience sampling was used because of an established relationship with two rural community liaisons in Southeast Georgia. The sample included two middle-high schools with students in grades 6-12; one high school with students in grades 9-12; and one middle school with students in grades 6-8.

According to the Census Bureau, all of the participating schools are in rural areas of Georgia. The term rural is used to classify people who live in places with small populations or unincorporated areas with population density less than 1,000 per square

mile. Table 3 provides population information about counties included in the study. Table 4 provides information about population demographics.

These three counties have a diverse population, low socio-economic status, and geographical isolation. Adolescents in these rural areas have reduced access to resources due to demographic characteristics of their families and geographic contexts. The isolation of these areas from large metropolitan cities provided the opportunity to examine the association between substance use and contextual factors without confounds that exist in urban areas.

Table 3*: County Demographics*

	County 1	**County 2**	**County 3**
Population	9,065	30,099	7,939
Population Density	34/m^2	41/m^2	21/m^2
% Below 18 Years of Age	24.3%	25.8%	19.8%
%> 65 Years Old	11.1%	12.3%	10.7%

Table 4*: County Population Demographics*

	County 1	**County 2**	**County 3**
% Female	48.9%	48%	38.5%
% African American	25.1%	20.2%	35.2%
% Hispanic	5.1%	4.9%	5.7%
HS Graduation	71.0%	80.0%	82.0%
Some College	39.0%	45.0%	27.0%
Unemployment	10.7%	12.4%	10.9%
Median Household Income	$35,133	$36,562	$29,834
Children Eligible Free Lunch	64.0%	52.0%	63.0%
Children in Poverty	33.0%	35.0%	35.0%
Children in Single-Parent House	39.0%	33.0%	36.0%
Illiteracy	21.0%	18.0%	25.0%
% Living in a Rural Area	98.5%	52.0%	100.0%

Population

This study collected information from 1,509 middle and high school students. Students participating in the study were in grades 6-12. The study design was such that a gender and racial mix are representative of the population being measured. In other

words, students participating in the study are similar to students attending rural middle and high schools in Georgia. Students who could not read the survey on their own were excluded from the study. The survey was not administered to special education classes.

Sample Size

Structural equation modeling techniques require large sample sizes with consideration to the complexity of the model (Kline, 2005). Kline (2005) recommends that the ratio of the number of cases to the number of free parameters be in between 10:1 to 20:1. To achieve a desired power level and given the complexity of the model, this study needed a minimum sample of approximately 900 to conduct structural equation modeling. The sample size goal was exceeded for this study.

Data Collection Procedures

This study collected data to examine community, school, family/peer, and individual factors that influence drug use in rural adolescents. The survey administered to the students are included in Appendix B. Students from all grade levels were given the same survey. Teachers administered paper-and-pencil surveys during physical education or homeroom class. Four weeks before the survey was administered, a letter was sent home to parents/guardians outlining the purpose of the study. The letter served as consent form for the parent/guardian, providing them an opportunity to notify the school if they *did not* want their child to participate in the study. The letter sent to parents is included in Appendix C. Teachers read instructions to participants regarding the survey. The survey took approximately 30 minutes to complete.

There was no individual identifying information on the survey, and students were reminded that their answers remained anonymous. Prior to data collection, teachers read

instructions for the survey and informed the students about anonymity. The written instructions provided to teachers are included in Appendix D. There were no major risks for participants. Some of the survey questions were mildly intrusive (i.e drug use, religion). To minimize potential risk, participants were notified that they were not obligated to participate in the study. Participants were told in advance that questions would be asked about their personal drug use.

Several precautions were taken to ensure anonymity. Participants were reminded several times about the anonymity of the study in the consent forms to parents and instructions before survey administration. All students received a copy of the survey, and if they did not wish to participate they turned in a blank survey. The Institutional Review Board at the University of Georgia approved this study.

Students attending schools with positive attitudes towards drugs might over report their current and past drug use on the survey. In order to control for this problem, a scale was added to the questionnaire to determine social norms towards drug use. This problem was addressed by the repeated instructions reminding participants of confidentiality.

Measures

Researchers from the UGA School of Public Health developed the questionnaire. Survey items from the National Social Norms Institute, CSAP National Youth Survey, Dunst Family Support Scale, the Classroom Life Measure, Social Skills Rating Scale, Drug Use Resistance Self-efficacy Scale, the Youth Involved in Community Issues Survey, the Community Safety Scale, and the Monitoring the Future Study were used to measure constructs. All measures are self-reported. The questionnaire includes 87 items concerning demographic information, lifetime drug use, current drug use, self-control,

self-efficacy, social norms, family involvement, religion/spirituality, social support, teacher support, community connectedness, and school connectedness.

Drug Use

Items from the Monitoring the Future Study were used to measure current and lifetime alcohol, tobacco, marijuana, and illegal drug use. Four items were used to measure tobacco use (smokeless & cigarette use), three items were used to measure alcohol use, three items were used to measure marijuana, and three items were used to measure illegal drug use. Each respondent reported alcohol, cigarette, smokeless tobacco, marijuana, and illegal drug use for the past 30 days, past year, and lifetime. Item responses for lifetime use were*: (1) never, (2) once or twice, (3) occasionally but not regularly, (4) regularly in the past, and (5) regularly now.* Item responses for the past year and past 30 days were as follows: *(1) 0 times, (2) 1-2, (3) 3-5, (4) 6-9, (5) 10-19, (6) 20-39, (7) 40 or more.* These measures have been used in national panel studies for decades and have adequate psychometric properties (Johnston et al., 2012).

School Connectedness

School Connectedness items were adapted from the CSAP National Youth Survey. School Connectedness measures the degree the children perceived that the school was important, how often they tried their best in school, etc. The school connectedness construct consisted of six items. Response options: *(1) never (2) once in a while (3) sometimes (4) frequently (5) always.* This scale has demonstrated adequate internal consistency in the past (α=0.69).

Self-control

Self-control was measured using the self-control subscale of the Social Skills Rating Scale, which is a standardized instrument that was developed to broadly assess social skills. The self-control subscale consists of seven items and indicates the extent to which students avoid inappropriate behaviors (ie, "I disagree with adults without fighting or arguing"). Response options were: *(1) never, (2) once in a while, (3) sometimes, (4) frequently, (5) always*. In past studies, the internal consistency coefficient alpha ranged from 0.83 to 0.94.

Religion

Items from the Monitoring the Future Study were used to measure religion. Three items measured the religion construct, which focused on religious ceremony attendance, religiosity, and importance of religion. Items used include: (1) How often do you attend religious services, (2) How important is religion in your life, (3) How often do you participate in church related activities, organizations, sports, or special programs. Response options varied for each item. These measures have been used in national panel studies for decades and have adequate psychometric properties (Johnston et al., 2012).

Refusal self-efficacy

Self-efficacy was measured using the Drug Use Resistance Self-efficacy Scale (DURSE), which is an instrument developed to assess refusal self-efficacy in young adolescents. Four items from the DURSE survey were adopted to measure refusal self-efficacy. Response options for the items were: *(1) not sure at all, (2) not very sure, (3) pretty sure, (4) definitely sure.* This scale has demonstrated good internal consistency in the past (α=0.98).

Social Support

Social Support was measured using the Dunst Family Support Scale (FSS). The FSS measures how helpful support from older adults is on adolescents. The Social Support construct consisted of six items. Response options were: *(1) strongly agree, (2) agree, (3) not sure, (4) disagree, and (5) strongly disagree.* This scale has demonstrated adequate internal consistency in the past (α=0.79).

Family Involvement

Family Involvement was adopted from the CSAP National Youth Survey. Family Involvement items measures the extent to which children were together with parents in various family activities from doing house chores to discussing schoolwork. Family Involvement construct consisted of seven items. Response options were: (*1) never, (2) once in a while, (3) sometimes, (4) frequently, (5) always*. This scale has demonstrated adequate internal consistency in the past (α=0.82).

Social Norms

Items from the National Social Norms Institute were used to measure social norms associated with rural adolescent drug use. Participants were asked to indicate how often they think students at their school typically use alcohol and other drugs. Response options were: *daily, nearly every day, 2–3 times per week, 1 time per week, 2–3 times per month, 1 time per month, 3–6 times per year, 1–2 times per year, and never.* This measure has been used to successfully assess self and peer substance use in other reports (Buckner, Ecker, Cohen, 2010; Buckner, Ecker, Proctor, 2011).

Perception of friends approval and norms was assessed with four questions asking "which statement about (1) marijuana use, (2) alcohol use, (3) tobacco use, and (4)

illegal drug use is the most common attitude about students in your grade". Response options were: *never a good thing, occasional use is ok (no daily), daily use is ok if that what the individual wants to do.* This scale has demonstrated adequate internal consistency in the past (α=0.76).

Teacher Support

Teacher support items were adopted from the Classroom Life Measure Survey. Teacher support measures the degree to which students feel supported by school faculty and staff. Six items measured the teacher support construct. Response options were: *(1) strongly disagree, (2) disagree, (3) not sure, (4) agree, (5) strongly agree.* This scale has demonstrated adequate internal consistency in the past (α=0.66).

Academic Performance

Academic performance items were adopted from the Monitoring the Future Study. Three items measured the academic performance construct, which examined school grades, completion of assignments, and effort at school. Response options varied for each item. These measures have been used in national panel studies for decades and have adequate psychometric properties (Johnston et al., 2012).

Community Connectedness

Community connectedness items were adopted from the Youth Involved in Community Issues Survey. The Youth Involved in Community Issues Survey is used to determine if adolescents and teens have a positive relationship with their community and older adults. Four items measured the community connectedness construct. Response options were: *(1) strongly disagree, (2) disagree, (3) not sure, (4) agree, (5) strongly agree.* This scale has demonstrated good internal consistency in the past (α=0.92).

Community Safety

Community safety items were adopted from the Community Safety Scale, which focuses on the link between neighborhood environment and adolescent deviancy. Seven items measured the community safety construct. Response options were: *(1) strongly disagree, (2) disagree, (3) not sure, (4) agree, (5) strongly agree.* This scale has demonstrated adequate internal consistency in the past (α=0.84).

Analysis Plan

A structural model was created based on the social ecological framework and Problem Behavior Theory to study youth school connectedness, substance use, and the predictors of these variables (Figure 3). Reliability of scales was confirmed using Cronbach's alpha. All but one construct demonstrated internal consistency (this construct was removed from the model after it was indicated as a bad fit). Multiple regression and structural equation modeling (SEM) using maximum likelihood estimation was used to analyze data and model fit. Maximum likelihood estimation (ML) assists in finding the parameter values that make the observed data most likely (Harrington, 2009). This method provides standard errors for each parameter estimate that can be used to calculate p-values and confidence intervals. Maximum likelihood estimation is also ideal for handling missing data because likelihood is computed separately for cases with complete data on some variables and those with complete data on all variables. These two likelihoods are then maximized together to find the estimates. ML was used to calculate goodness-of-fit indices. Analyses were conducted using Mplus 7.11 Software (Muthen & Muthen).

Data analysis was conducted in a series of steps. A regression analysis was run with all substance use, alcohol, tobacco, and marijuana use as the dependent variables. In order to test for the moderating effect of demographic factors, interaction terms between demographic factors and risk/protective factors were re-entered into the regression equation as independent variables. Moderating variables were entered separately to control for the influence of multiple moderators. This analytic method followed procedures outlined by Baron and Kenny (Baron & Kenny, 1986).

In order to test for the moderation effect of gender or race, the data were dummy coded because these categorical variables cannot be treated as continuous. Gender was dummy coded with 0=male and 1=female. A majority of the students were African American or White, so the other race categories were not appropriate for analysis. Race was dummy coded with 0=White and 1=African American. The reference groups for these analyses were white students and males.

Mediation effect of school connectedness was tested by demonstrating a significant association between contextual factors (independent variable) and school connectedness (mediating variable). School connectedness was significantly associated with rural adolescent substance use (dependent variable). Mediation effects of school connectedness were present if the indirect path to substance use was significant. Pearson correlations were conducted to verify the predictions, and multiple regression and the Delta Method using Mplus software was used to test mediation effects. This process was repeated for tobacco use, alcohol use, and marijuana use.

A confirmatory factor analysis (CFA) was run to test the measurement model. The measurement model illustrates the association between the observed variables and

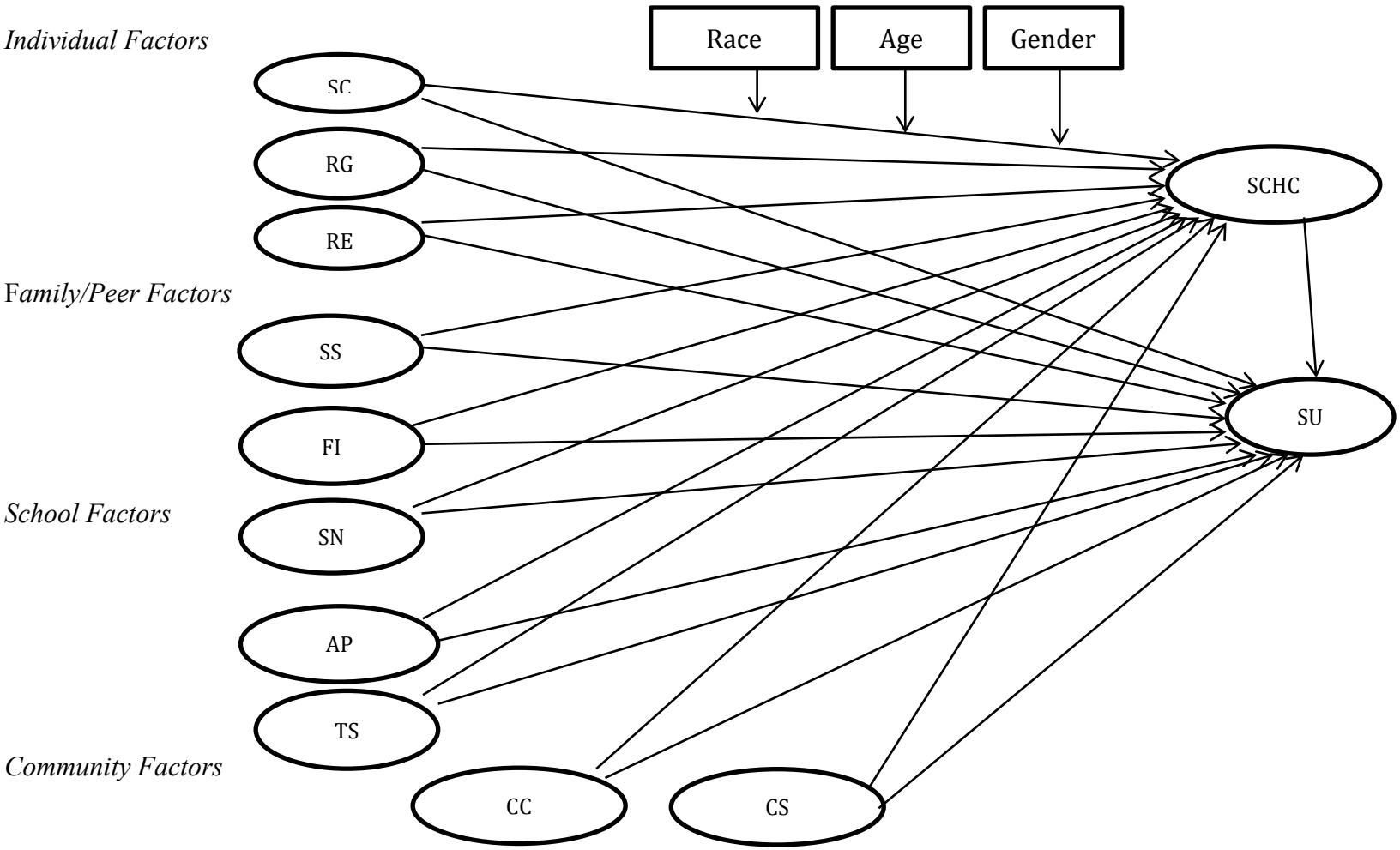
the latent constructs. Structural equation modeling using maximum likelihood estimation was used to analyze the structural model fit. The structural model illustrated the relationship between latent constructs. All structural models tested were just-identified; therefore, path analysis was used to determine direct and indirect effects. Model fit was assessed using multiple absolute fit-indices and was repeated for all models run in the analysis. Absolute fit indices calculation measured how well the model fit in comparison to no model at all (Joreskog & Sorbom, 1993). First, model fit was estimated using a Chi square test, where a non-significant Chi square ($p>.05$) indicated a good model fit. Because Chi square test can be affected by large sample sizes, root mean square error of approximation (RMSEA) was used to measure model fit, with a value less than .06 indicating a good model fit. Because scales in the current study contain items with varying levels, a standardized root mean square residual (SRMR) was used to examine model fit. Values for SRMR range from zero to one with a value less than .08 indicating a good model fit. A summary of model fit indices is presented in Table 5.

Table 5: *Summary of Model Fit Indices*

Criterion/Index	**Usage**	**Rule of Thumb**
χ^2 p-value	To check model fit	> 0.05 (or other confidence alpha) indicates a good fit
RMSEA	To check model fit	RMSEA <= 0.06 indicates a reasonable model
SRMR	To check model fit	Value of 0=perfect fit, Value less than .08 indicates a good fit
TLI	To check model fit	TLI > 0.90 indicates a good fit of a model
CFI	To check model fit	CFI >.90 indicates a good fit of a model

Incremental fit indices were also used to examine model fit. Incremental fit indices do not use chi-square in its raw form, but they compare the chi-square value to the baseline model (Hooper, Coughlan, & Mullen, 2008). The Comparative Fit Index (CFI) takes sample size into account and assumes that all latent variables are uncorrelated (Hooper, et al., 2008). CFI values range from zero to one, with a value closer to one indicating a good-fit. Because of the large sample size in this study, the Tucker-Lewis Index will be examined with a value >.90 indicating a good model fit.

Figure 3: Hypothesized Structural Model



**sc = self-control, rg = religion, re = refusal efficacy, ss =social support, fi = family involvement, sn = social norms, ap=academic performance, ts = teacher support, cc = community connectedness, cs = community safety, schc = school connectedness, su = substance use*

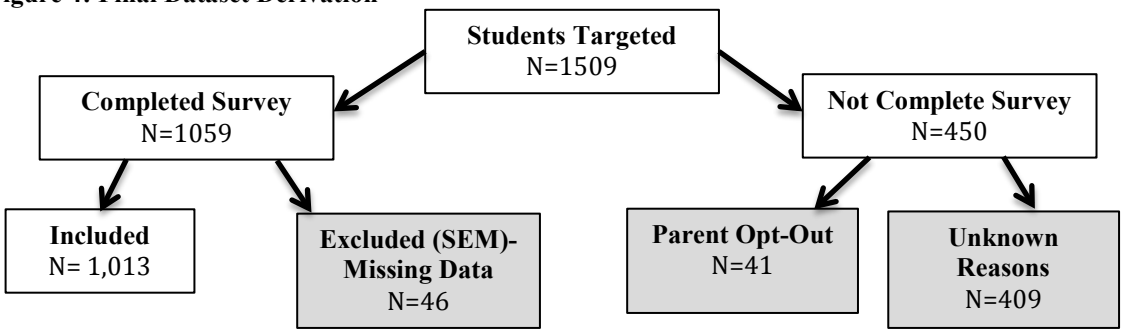
CHAPTER 4: RESULTS

Based on the findings of previous literature and theory, a structural equation model was constructed relating rural youth substance use and school connectedness to community, school, familial, peer, and individual characteristics. This study tested this structural model based on an ecological framework and other health behavior theories to determine how protective factors deter rural adolescent substance use and promote school connectedness. This chapter will cover survey response rates, descriptive statistic results, scale performance, model fit, and the relationship between contextual factors and different types of substance use. Mediating and moderating variables of the results are discussed. Research questions and hypotheses related to results are discussed throughout this chapter. Please refer to Appendix A for construct variables and definitions.

Survey Response

A total of about 2,900 students are enrolled in the middle and high schools. For the purpose of this study, 1509 surveys were distributed to students and 1,059 filled out a survey. Approximately 40 of these students handed in parent opt-outs. That left 409 students that were absent from school on the day of the survey or turned in a blank survey. Of the students that filled out a survey, 46 surveys had more than 15% missing data and were thrown out. The final dataset used for structural equation modeling analysis contained 1,013 cases. Figure 4 depicts the derivation of the final dataset.

Figure 4: Final Dataset Derivation



Missing Data

As mentioned above, cases with 85% or better completeness on the survey were included in the final dataset. A total of 46 cases had greater than 15% missing data on the survey and were excluded from structural equation analysis. To handle the missing data, full maximum-likelihood estimation was utilized. This method is appropriate for use when data are missing at random or missing completely at random (Enders & Bandalos, 2001). Listwise deletion was not utilized in this study since it is considered a weaker method of handling missing data compared to FML (Enders & Bandalos, 2001). Pairwise deletion is another method of handling missing data, but was not considered because it is an unacceptable method for SEM analyses (Kline, 2005).

Multicollinearity

To check for multicollinearity between all variables used in the analyses, the correlation matrix was examined. The correlation matrix showed no correlations above the cut-off of .80 that is generally accepted. The full correlation matrix is available by contacting the researcher.

Descriptive Statistics

Table 6 includes demographic information of the survey respondents. A majority of the students were male (51.4%) and White (64.5%). Students responding to the survey ranged from 11 years old or younger to 19 years old or older with most answering in the

15 year old age group. Only 46.5% of respondents lived with both parents, which is below the state average of 66.8% (Annie E. Casey Foundation, 2014). A majority of the students lived in the country or on a farm (54.5%) outside of the rural suburbs or city limits. The sample used for descriptive statistics included those who were excluded from structural equation analysis because of missing information (N=1059).

Table 6*: Demographic Information of Student Respondents* (N=1,059)

Variable	N	%
Gender		
Male	544	51.4
Female	515	48.6
Race		
White/Caucasian	683	64.5
African American	287	27.1
Multiracial	18	1.7
Other	24	2.3
Ethnicity		
Hispanic	82	7.7
Non-Hispanic	971	91.7
Age		
11 years old or younger	42	4.0
12 years old	79	7.5
13 years old	105	9.9
14 years old	171	16.1
15 years old	201	19.0
16 years old	186	17.6
17 years old	175	16.5
18 years old	87	8.2
19 years old or older	12	1.1
Family Structure		
Both parents	484	46.5
Mother only	193	18.6
Father only	55	5.3
Grandparents	77	7.4
Step-parent and father	42	4.0
Step-parent and mother	157	15.1
Extended family	21	2.0
Aunt/Uncle	11	1.1
Geographic/Housing Type		
On a farm	84	8.1
In the country, not on a farm	484	46.4
In a city, town, or suburb	474	45.5

Table 7 highlights distribution of the response variables of interest. Regarding cigarette use, 32.8% of respondents had tried smoking, 11.8% were current smokers (past

30 days), and 5.6% were daily smokers. Concerning smokeless tobacco use, 19.7% of student respondents had tried smokeless tobacco, 10.6% were current smokeless tobacco users (past 30 days), and 4.5% were daily users of smokeless tobacco. About 54% of student respondents had ever drank alcohol, 43.4% of students had drank in the past year, and 22.7% of student respondents were current alcohol users (past 30 days).

Table 7: *Substance Use Distribution of Student Respondents* (N=1,059)

Variable	N	%
Cigarette Use		
Ever smoked cigarettes	342	32.8
Smoked at least 1 day in the past 30 days (current smoker)	123	11.8
Smoked cigarettes daily (at least 1cigarette everyday for 30 days)	58	5.6
Smokeless Tobacco Use		
Ever used smokeless tobacco	206	19.7
Used smokeless tobacco at least 1 day in past 30 days (current use)	111	10.6
Used smokeless tobacco daily	47	4.5
Alcohol Use		
Ever drank alcohol	561	53.6
Drank alcohol in past year	454	43.4
Drank alcohol in past 30 days (current use)	237	22.7
Marijuana Use		
Ever used marijuana	285	27.3
Used marijuana past year	231	22.1
Used marijuana in past 30 days (current use)	133	12.8
Illegal Drug Use (excludes marijuana)		
Ever used illegal drugs	58	5.6
Used illegal drugs past year	43	4.1
Used illegal drugs past 30 days (current use)	30	2.9

When examining marijuana use, 27.3% of respondents had tried marijuana, 22.1% had used marijuana in the past year, and 12.8% were current marijuana users (past 30 days). In regard to other illegal drug use, 5.6% of student respondents had ever tried illegal drugs, 4.1% had used illegal drugs in the past year, and 2.9% were currently using illegal drugs (past 30 days).

Race and Gender Differences in Substance Use

Race

Table 8 highlights the differences in smoking behaviors of African American and White students. Current smokers were more likely to be White students than African American students ($p<.001$). Approximately 14% of White students were current smokers, compared to 6.4% of African American students. Ever smokers were also more likely to be White students than African American students ($p<.05$). Of White students, 31.4% were ever smokers compared to 27.0% of African American students.

Table 8: *Chi-Square Analysis of Smoking Behaviors by Race*

	African American%	**White %**	***P* Value**
Current Smoker			.000
Yes	6.4% (N= 18)	14.1% (N=95)	
No	93.6% (N=264)	85.9% (N=580)	
Ever Smoker			.038
Yes	27.0% (N=76)	31.4% (N=214)	
No	73.0% (N=205)	68.5% (N=461)	

Table 9 highlights the differences in smokeless tobacco behaviors of African American and White students. Proportionately speaking, current smokeless tobacco users were more likely to be White students than African American students ($p<.05$). Of White students, 13.6% were current users of smokeless tobacco, compared to 4.3% of African American students. Ever users of smokeless tobacco were also more likely to be White students than African American students ($p<.001$). Of White students, 24.5% had tried smokeless tobacco during their lifetime, compared to 8.2% of African American students.

Table 9*: Chi-Square Analysis of Smokeless Tobacco Behaviors by Race*

	African American %	White %	*P* Value
Current Use			.031
Yes	4.3% (N= 12)	13.6% (N=92)	
No	95.1%% (N=269)	86.4% (N=584)	
Ever Use			.000
Yes	8.2% (N=23)	24.5% (N=164)	
No	91.8% (N=258)	75.5% (N=511)	

Table 10 highlights the differences in alcohol use of African American and White students. There were no statistically significant differences between the two groups. White students had higher rates of current and ever alcohol use. Of White students, 24.1% were current users of alcohol, compared to 17.8% of African American students. Of White students, 55.5% had tried alcohol during their lifetime, compared to 49.8% of African American students.

Table 10*: Chi-Square Analysis of Alcohol Use by Race*

	African American %	White %	*P* Value
Current Use			.187
Yes	17.8% (N= 50)	24.1% (N=170)	
No	82.2% (N=231)	74.9% (N=507)	
Ever Use			.077
Yes	49.8% (N=140)	55.5% (N=374)	
No	50.2% (N=141)	44.5% (N=301)	

Table 11 highlights the differences in marijuana use of African American and White students. There were no statistically significant differences between the two groups. White students and African American students had similar rates for ever and current use of marijuana. Of White students, 11.9% were current users of marijuana, compared to 11.8% of African American students. Of White students, 25.0% had tried marijuana during their lifetime, compared to 30.0% of African American students.

Table 11: *Chi-Square Analysis of Marijuana Use by Race*

	African American %	White %	*P* Value
Current Use			.138
Yes	11.8% (N= 33)	11.9% (N=80)	
No	88.2% (N=246)	88.1% (N=593)	
Ever Use			.098
Yes	30.0% (N=84)	25.0% (N=169)	
No	70.0% (N=196)	75.0% (N=506)	

Gender

Table 12 highlights the differences in smoking behaviors of male and female students. Proportionately speaking, current smokers were more likely to be males than females ($p<.05$). Of male students, 15.6% were current smokers compared to 7.7% of female students. Ever smokers were also more likely to be male students than female students ($p<.001$). Of male students, 38.5% were ever smokers compared to 26.6% of female students.

Table 12: *Chi-Square Analysis of Smoking Behaviors by Gender*

	Male %	Female %	*P* Value
Current Use			.002
Yes	15.6% (N= 84)	7.7% (N=39)	
No	84.4% (N=456)	92.3% (N=467)	
Ever Use			.001
Yes	38.5% (N=208)	26.6% (N=134)	
No	61.5% (N=332)	73.4% (N=370)	

Table 13 highlights the differences in smokeless tobacco behaviors of male and female students. Proportionately speaking, current smokeless tobacco users were more likely to be males than females ($p<.001$). Of male students, 18.0% were current smokeless tobacco users compared to 2.8% of female students. Ever smokeless tobacco users were also more likely to be male students than female students ($p<.001$). Of male students, 30.4% were ever smokeless tobacco users compared to 8.3% of female students.

Table 13: *Chi-Square Analysis of Smokeless Tobacco Behaviors by Gender*

	Male %	Female %	*P* Value
Current Use			.000
Yes	18.0% (N= 97)	2.8% (N=14)	
No	82.0% (N=442)	97.2% (N=492)	
Ever Use			.000
Yes	30.4% (N=164)	8.3% (N=32)	
No	69.6% (N=375)	91.7% (N=464)	

Table 14 highlights the differences in alcohol use of male and female students. There were no statistically significant differences between the two groups. Male students had slightly higher rates of current alcohol use. Of male students, 24.3% were current users of alcohol, compared to 20.9% of female students. Male and female students had similar rates of ever alcohol use. Of female students, 53.8% had tried alcohol during their lifetime, compared to 53.5% of male students.

Table 14*: Chi-Square Analysis of Alcohol Use by Gender*

	Male %	Female %	*P* Value
Current Use			.089
Yes	24.3% (N= 131)	20.9% (N=106)	
No	75.7% (N=409)	79.1% (N=400)	
Ever Use			.116
Yes	53.5% (N=289)	53.8% (N=272)	
No	46.5% (N=251)	46.2% (N=234)	

Table 15 highlights the differences in marijuana use of male and female students. When examining current marijuana use, there were no statistically significant differences between the two groups. Of male students, 15.3% were current users of marijuana, compared to 10.1% of female students. Ever marijuana users were significantly more likely to be male students than female students ($p<.05$). Of male students, 30.6% had tried marijuana during their lifetime, compared to 23.8% of female students.

Table 15*: Chi-Square Analysis of Marijuana Use by Gender*

	Male %	Female %	*P* Value
Current Use			.076
Yes	15.3% (N= 82)	10.1% (N=51)	
No	84.7% (N=455)	89.9% (N=452)	
Ever Use			.024
Yes	30.6% (N=165)	23.8% (N=120)	
No	69.4% (N=374)	76.2% (N=384)	

Scale Performance

Reliability of scale scores was examined using Cronbach's alpha. The mean, standard deviation and Cronbach's alpha for each of the scales is provided in Table 16. Most of the constructs showed adequate to very good reliability. The original 7-item scale measuring community safety had a total reliability of .48. Cronbach's alpha if-item-deleted indicated that the reliability would improve significantly by removing the following item: " A lot of things get stolen in my neighborhood community". Based on the improved reliability of the construct when neighborhood theft was removed (.67), the item was eliminated from further analysis. The original 5-item scale measuring social norms had a total reliability of .61. Cronbach's alpha if-item deleted indicated dropping the item "How often do you think students at your school typically use alcohol and drugs?" would increase reliability to .86. This item was also eliminated from further analyses.

Academic performance showed low reliability (α=.418) and was not a good fit in the measurement model. The low reliability and internal consistency of this construct could indicate an over-inflation of grades by the respondents. In addition, some respondents who indicated trying their best in school may not receive good academic grades, which would decrease reliability of the scale. The construct of academic performance was removed from further analysis.

Table 16: *Descriptive Statistics and Internal Reliability for Total Scale Scores* (N=1013)

Scale	**Mean**	**SD**	Alpha	Internal Consistency
School Connectedness	3.55	.84	.823	Good
Self-Control	3.43	.79	.761	Good
Religion	3.34	.88	.749	Good
Refusal Efficacy	3.64	.69	.881	Good
Academic Performance	3.63	.77	.418	Unacceptable*
Social Support	3.88	.83	.852	Good
Family Involvement	3.74	.93	.874	Good
Social Norms	2.23	.64	.862	Good
Teacher Support	3.88	.88	.909	Excellent
Community Connectedness	3.31	.84	.670	Acceptable
Community Safety	3.21	.67	.700	Good
Tobacco Use	1.40	.75	.771	Good
Alcohol Use	2.08	1.2	.890	Good
Marijuana Use	1.67	1.3	.919	Excellent
All Substance Use	1.55	.84	.899	Good

**Construct dropped from analysis*

Model Fit and Confirmatory Factor Analysis

The measurement model in this study consisted of 11 latent variables. Each of these constructs was measured by at least 2 observed variables. The original measurement model (with all factors set to correlate) was estimated and all items loaded on to their respective factor and were all significant. The reliability values indicated that academic performance variables did not contribute adequately to uniquely explaining the variance of their respective latent factors. Fit indices of the original model indicated a bad fit (χ^2=22541.014, P<.001; RMSEA=.010; CFI= .609; TLI=.575; SRMR= .145).

After adjusting the model, the chi-square for the modified measurement model was significant (χ^2= 22855.713, p<.001). Although a non-significant chi-square would have proven a model fit, the significant chi-square does not necessarily mean the model is a bad fit. Other fit indices were examined to determine model fit.

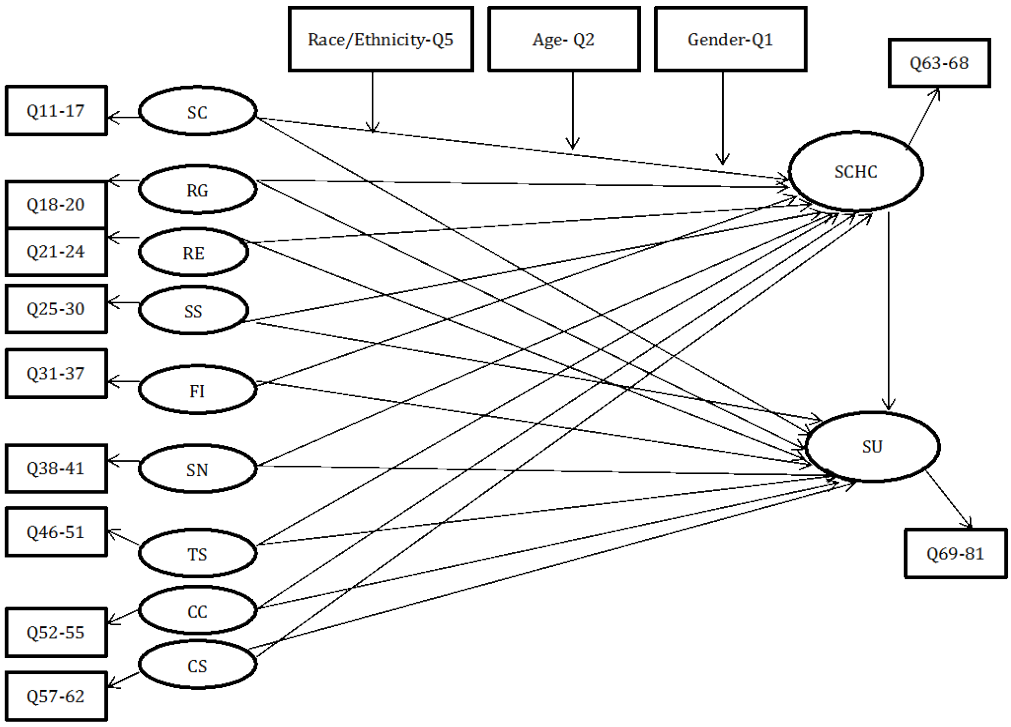
The RMSEA is not sensitive to sample sizes and compares the observed variances and the covariances with those resulting from the model's parameter estimates. The RMSEA value in this model was .06, which is close to the recommendation of <.06 for a good model fit. The SRMR value was .023, which is less than .05 and indicates a good fit. The comparative fit index for the measurement model is close to one, which indicates a good model fit. The Tucker Lewis Index is closer to one (TLI=.884), but not over the optimal value of .90. Overall the fit indices and factor loadings support the reliability and validity of the constructs for their indicator variables (Table 17). The modified model had a moderate fit and was adjusted accordingly based on guiding theories (Figure 5).

Table 17: *Fit Indices for Modified Measurement Model*

χ^2	22855.713
Df	1976
p-value	.000
RMSEA	.060
SRMR	.023
CFI	.900
TLI	.884

Based on all the above findings, it was concluded that the theoretical constructs of self-control, religion, refusal efficacy, community safety, community connectedness, teacher support, school connectedness, social norms, social support, and family involvement were assessed with an acceptable degree of precision and that the observed variables were adequate indicators of these factors.

Figure 5: Depiction of Modified Measurement Model



**sc = self-control, rg = religion, re = refusal efficacy, ss =social support, fi = family involvement, sn = social norms, ts = teacher support, cc = community connectedness, cs = community safety, schc = school connectedness, su = substance use*

Relationship between Contextual Factors, School Connectedness, and Substance Use

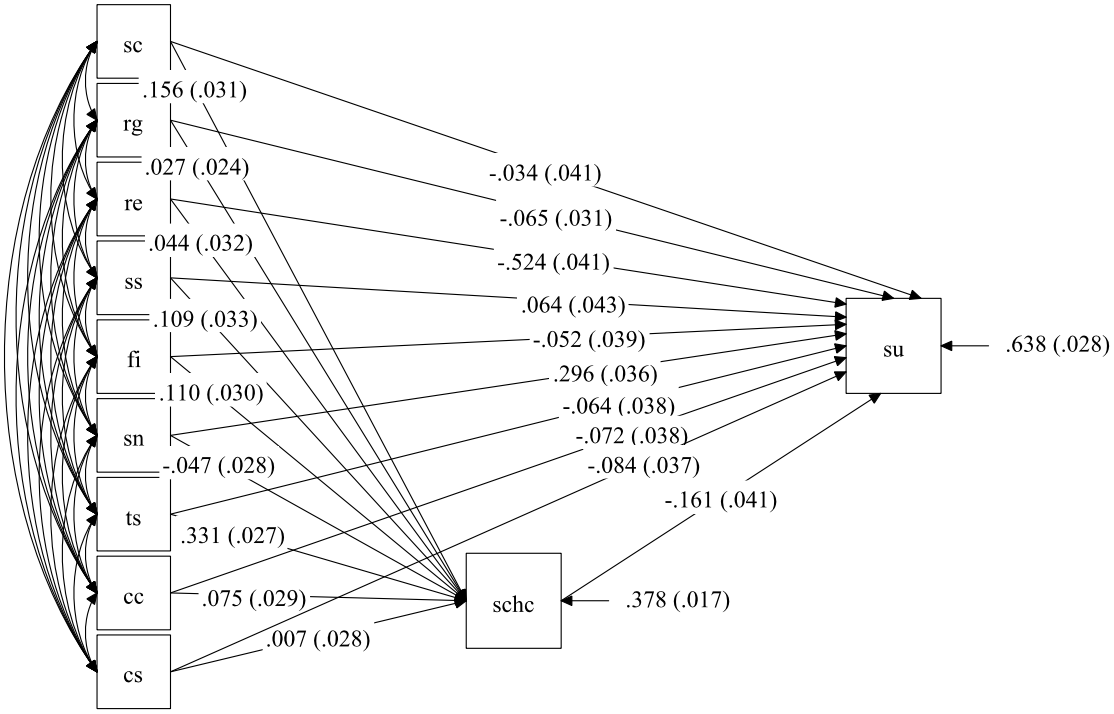
Mediation Model

The hypothesized mediation model with the latent constructs and the maximum likelihood estimates for the parameters of the model are presented in Figure 6. The model was just identified because the number of free parameters equals the number of known values. This model provides unique parameter estimates relating to the research questions of this study. The overall model yielded a chi-square of 1105.47, df=0, p<.001. The RMSEA of .000 and other comparative indices indicated a just identified model (Table 18).

Table 18*: Model Fit Indices Mediation Model*

χ^2 p-value	.000
CFI	1.000
TLI	1.000
RMSEA	.000
SRMR	.000
AIC	4359.880
BIC	4473.101

Figure 6: Structural Mediation Model with Parameter Estimates



**sc = self-control, rg = religion, re = refusal efficacy, ss =social support, fi = family involvement, sn = social norms, ts = teacher support, cc = community connectedness, cs = community safety, schc = school connectedness, su = substance use*

The path coefficients indicated direction and magnitude of the associations. Most of the contextual constructs showed a negative relationship with substance use indicating a protective effect (Table 19). Constructs with a significant negative relationship to substance use were: school connectedness (coefficient=-.161, z=-3.950, p<.001); religion (coefficient=-.065, z=-2.105, p<.05); refusal efficacy (coefficient=-.524, z=-12.747, p<.001); and community safety (coefficient=-.084, z=-2.297, p<.05). These findings

indicate that school connectedness, religion, refusal efficacy, and community safety are protective factors for all types of substance use. Social norms showed a significant positive relationship with substance use (coefficient=.296, z=8.264, p<.001). This relationship indicates that the more students perceive substance use as a norm among their peers, the more likely they are to use substances. The R^2 shows the amount of explained variance among construct variables. The explained variance for school connectedness was 45%, and for substance use, it was 40%. This model did an adequate job of explaining variation in both dependent variables.

A majority of the contextual constructs showed a positive relationship with school connectedness (Table 20). Constructs with a significant positive relationship to school connectedness include: self-control (coefficient=.156, z=4.996, p<.001); social support (coefficient=.109, z=3.306, p<.001); family involvement (coefficient=.110, z=3.670, p<.001); community connectedness (coefficient=.075, z=2.597, P<.05); and teacher support (coefficient=.331, z=12.040, p<.05). All of these factors promote school connectedness in rural adolescents.

Table 19*: All Substance Use on Protective Factors (*p<.05, **p<.001)* (N=1059)

Regressions	**Estimate**	**SE**	**Z-Value**	**P-Value**
Substance Use on School Connectedness	-.161	.041	-3.950	.000**
Substance Use on Self-Control	-.034	.041	.819	.413
Substance Use on Religion	-.065	.031	-2.105	.035*
Substance Use on Refusal Efficacy	-.524	.041	-12.747	.000**
Substance Use on Social Support	.064	.043	1.479	.139
Substance Use on Family Involvement	-.052	.039	-1.337	.181
Substance Use on Social Norms	.296	.036	8.264	.000**
Substance Use on Teacher Support	-.064	.038	-1.690	.091
Substance Use on Community Connectedness	-.072	.038	-1.926	.054
Substance Use on Community Safety	-.084	.037	-2.297	.022*

**A negative relationship indicates a protective relationship (excludes social norms which is reverse coded)*

Table 20*: School Connectedness on Protective Factors (*p<.05, **p<.001)*

Regressions	Estimate	Standard Error	Z-Value	P-Value
School Connectedness on Self-Control	.156	.031	4.996	.000**
School Connectedness on Religion	.027	.024	1.111	.267
School Connectedness on Refusal Efficacy	.044	.032	1.389	.165
School Connectedness on Social Support	.109	.033	3.306	.001**
School Connectedness on Family Involvement	.110	.030	3.670	.000**
School Connectedness on Social Norms	-.047	.028	-1.685	.092
School Connectedness on Teacher Support	.331	.027	12.040	.000**
School Connectedness on Community Connectedness	.075	.029	2.597	.009*
School Connectedness on Community Safety	.007	.028	.235	.814

**A positive relationship indicates a promotion of school connectedness (excludes social norms which is reverse coded)*

Significant indirect effects were found in the mediation model. A significant indirect effect indicates that the independent variable is acting through a mediator on the dependent variable. Results from this model show school connectedness as a full mediator for the following relationships: self-control and substance use, social norms and substance use, social support and substance use, family involvement and substance use, teacher support and substance use, and community connectedness and substance use ($p<.05$). School connectedness was not a mediator between religion, refusal efficacy, social norms, and community safety. The direct effects of these constructs on substance use were stronger than the non-significant indirect effects (Table 21).

Table 21: *Direct and Indirect Effects of Mediation Model (*p<.05, **p<.001)*

Effects	Estimate	SE	Z-Value	P-Value
Self-Control to Substance Use				
Direct	-.034	.041	-.819	.413
Indirect (School Connectedness Mediator)	-.025	.008	-3.098	.002*
Religion to Substance Use				
Direct	-.065	.031	-2.105	.035*
Indirect (School Connectedness Mediator)	-.004	.004	-1.069	.285
Refusal Efficacy to Substance Use				
Direct	-.524	.041	-12.747	.000**
Indirect (School Connectedness Mediator)	-.007	.005	-1.310	.190
Social Support to Substance Use				
Direct	.064	.043	1.515	.139
Indirect (School Connectedness Mediator)	-.018	.007	-2.535	.011*
Family Involvement to Substance Use				
Direct	-.052	.039	-1.337	.181
Indirect (School Connectedness Mediator)	-.018	.007	-2.689	.007*
Social Norms to Substance Use				
Direct	.296	.036	8.264	.000**
Indirect (School Connectedness Mediator)	.007	.005	1.550	.121
Teacher Support to Substance Use				
Direct	-.064	.038	-1.690	.091
Indirect (School Connectedness Mediator)	-.053	.014	-3.754	.000**
Community Connectedness to Substance Use				
Direct	-.072	.037	-1.948	.054
Indirect (School Connectedness Mediator)	-.012	.006	-2.169	.030*
Community Safety to Substance Use				
Direct	-.001	.005	-2.297	.022*
Indirect (School Connectedness Mediator)	-.001	.005	-.234	.815

The above results correspond with the following aims of this study:

Aim 1: To identify individual, family, school, and community predictors of school connectedness and substance use in rural adolescents.

- *Hypothesis* 1a: A higher score on individual protective factors (self control and religion) will have a significant negative association with substance use and significant positive association with school connectedness, and individual protective factors will be a significant predictor of rural youth substance use.

Result 1a: Self-control did not have a significant negative association with substance use, but it had a significant positive association with school connectedness. Religion had a significant negative association with substance use, but did not have a significant positive relation with school connectedness. These results partially confirm *Hypothesis* 1a.

- *Hypothesis* 1b: A higher score on refusal efficacy (individual protective factor) will have a significant negative association with substance use. Refusal efficacy should not have an significant association with school connectedness.

  Result 1b: Refusal efficacy had a significant negative association with substance use. Refusal efficacy was not significantly associated with school connectedness. *Hypothesis* 1b was confirmed by the results.

- *Hypothesis* 1c. A higher score on social support and family involvement will have a significant negative association with substance use and a significant positive association with school connectedness, and family and peer protective factors will be a significant predictor of rural youth substance use.

  Result 1c: Social support and family involvement were not associated with substance use, but both constructs had a significant positive relationship with school connectedness. These results partially confirm *Hypothesis* 1c.

- *Hypothesis*1d. A higher score on social norms (family/peer level) will have a significant positive association with substance use. This relationship indicates that the more students perceive substance use as a

norm among their peers, the more likely they are to use substances. Social norms should not have a significant association with school connectedness.

Results 1d: Social norms had a significant negative association with substance use. Social norms were not significantly associated with school connectedness. *Hypothesis* 1d was confirmed by the results.

- *Hypothesis* 1e: A higher score on school protective factors (academic achievement and teacher support) will have a significant negative association with substance use and a significant positive association with school connectedness, and school protective factors will be a significant predictor of rural youth substance use.

  Result 1e: Academic achievement was dropped from the model due to low reliability. Teacher support was not associated with substance use, but it had a significant positive association with school connectedness. These results partially confirm *Hypothesis* 1e.

- *Hypothesis* 1f: A higher score on community protective factors (community connectedness and community safety) will have a significant negative association with substance use and a significant positive association with school connectedness, and community protective factors will be a significant predictor of rural youth substance use.

  Results 1f: Community connectedness did not have a significant negative association with substance use, but it did have a significant positive association with school connectedness. Community safety had a

significant negative association with substance use, but it did not have a significant positive association with school connectedness These results partially confirm *Hypothesis* 1f.

Aim 2: To describe the effects of school connectedness and the individual context, family context, school context, and community context, and determine whether there are statistical mediations between school connectedness and other protective factors in their effects on rural youth substance use.

- *Hypothesis* 2a: Protective factors at the community, school, peer/familial, and individual level will have a positive association with school connectedness, and protective factors will interact with school connectedness and mediate the effects of rural youth substance use. *Results* 2a: Results from this model show school connectedness as a full mediator for the following relationships: self-control and substance use, social norms and substance use, social support and substance use, family involvement and substance use, teacher support and substance use, and community connectedness and substance use. School connectedness was not a mediator between religion, refusal efficacy, social norms, and community safety. These results partially confirm *Hypothesis* 2a.

Moderation

Gender Differences

The model was further explored by gender differences using moderation. The overall model yielded a chi-square of .000, df=0, p<.001, which indicates a just identified model. The RMSEA of .000 and all of the comparative fit indices (SRMR, CFI, and TLI) indicated a just identified model. A just identified model indicates that for each free parameter a value can be obtained through one manipulation of the observed data. Unique parameter estimates can be obtained for this model, but the model fit cannot be tested. The mediation model with gender moderation Mplus diagram and the maximum likelihood estimates for the parameters of the model are presented in Appendix E.

Results showed that boys and girls were similar in pathway differences and parameter estimates when examining contextual factors and substance use (Table 22). Social norms and refusal efficacy were significant predictors of substance use for both boys and girls (p<.001). Significant gender differences in boys and girls were found for the effect of substance use on social norms and refusal efficacy (p<.001). Refusal efficacy showed a stronger protective relationship with substance use for girls (coefficient = -.786) than for boys (coefficient = -.511). Social norms showed a stronger positive relationship with substance use for boys (coefficient=.690) than for girls (coefficient =- .107)

Table 22*: All Substance Use on Interaction of Gender and Protective Factors (*p<.05, **p<.001)*

Regressions	Estimate	SE	Z-Value	P-Value
Substance Use on School Connectedness				
Gender Difference	-.005	.069	-.065	.948
Substance Use on Self-Control				
Gender Difference	.071	.069	1.024	.306
Substance Use on Religion				
Gender Difference	-.078	.052	-1.404	.135
Substance Use on Refusal Efficacy				
Gender Difference	.275	.063	4.349	.000**
Substance Use on Social Support				
Gender Difference	-.056	.072	-.777	.437
Substance Use on Family Involvement				
Gender Difference	-.086	.065	-1.311	.190
Substance Use on Social Norms				
Gender Difference	-.797	.056	-14.348	.000**
Substance Use on Teacher Support				
Gender Difference	-.067	.064	-1.044	.297
Substance Use on Community Connectedness				
Gender Difference	-.050	.063	-.797	.425
Substance Use on Community Safety				
Gender Difference	-.016	.060	-.266	.790

**Gender differences illustrate the difference between the moderating effects of girls-boys*

Results showed that boys and girls were similar in pathway differences and parameter estimates when examining contextual factors and school connectedness (Table 23). Self-control, social support, family involvement, teacher support, social norms, and community connectedness were significant predictors of school connectedness for both boys and girls (p<.05). Significant differences in boys and girls were found for the effect of school connectedness on self-control, social support, and family involvement (p<.05). Self-control showed a stronger positive relationship with school connectedness for boys (coefficient = .226) than for girls (coefficient = .000). Social support showed a stronger positive relationship with school connectedness for boys (coefficient=.135) than for girls (coefficient =.001). Family involvement showed a stronger positive relationship with school connectedness for girls (coefficient=.214) than for boys (coefficient =.105).

Table 23*: School Connectedness on Interaction of Gender and Protective Factors (*p<.05, **p<.001)*

Regressions	Estimate	SE	Z-Value	P-Value
School Connectedness on Self-Control				
Gender Differences	-.226	.047	-4.085	.000**
School Connectedness on Religion				
Gender Differences	-.041	.036	-1.141	.254
School Connectedness on Refusal Efficacy				
Gender Differences	-.046	.043	-1.059	.289
School Connectedness on Social Support				
Gender Differences	-.134	.049	-2.706	.007*
School Connectedness on Family Involvement				
Gender Differences	-.109	.045	-2.420	.016*
School Connectedness on Social Norms				
Gender Differences	.076	.035	2.182	.029*
School Connectedness on Teacher Support				
Gender Differences	-.311	.043	-1.059	.289
School Connectedness on Community Connectedness				
Gender Differences	-.076	.043	-1.059	.289
School Connectedness on Community Safety				
Gender Differences	-.029	.041	-.700	.484

Age Differences

The model was further explored by age differences using moderation. The mediation model with age moderation Mplus results and the maximum likelihood estimates for the parameters of the model are presented in Appendix E. The overall model yielded a chi-square of .000, df=0, p<.001, which indicates a just identified model.

Results showed some moderating effects of age between contextual factors and substance use (Table 24). The parameters for substance use regressed on contextual factors shows the relationship between a contextual factor (i.e. self-control) and substance use when age is constant. Significant age differences were found for the effect of substance use on social norms, self-control, school connectedness, and refusal efficacy (p<.05). As age increased, protective effects of school connectedness increased

(coefficient=.061). As students got older, protective effects of self-control (coefficient= -.034), social norms (coefficient=.071), and refusal efficacy (coefficient= -.102) decreased.

Table 24*: All Substance Use on Interaction of Age and Protective Factors (*p<.05, **p<.001)*

Regressions	Estimate	SE	Z-Value	P-Value
Substance Use on School Connectedness	-.553	.075	-6.728	.000**
Substance Use on School Connectedness*Age	.061	.041	4.183	.000**
Substance Use on Self-Control	.154	.081	1.897	.058
Substance Use on Self-Control*Age	-.034	.015	-2.306	.021*
Substance Use on Religion	.001	.061	.014	.988
Substance Use on Religion*Age	-.010	.011	-.925	.355
Substance Use on Refusal Efficacy	.415	.089	4.640	.000**
Substance Use on Refusal Efficacy*Age	-.102	.014	-7.359	.000**
Substance Use on Social Support	-.038	.085	-.448	.654
Substance Use on Social Support*Age	.008	.015	.538	.590
Substance Use on Family Involvement	.017	.079	.222	.824
Substance Use on Family Involvement*Age	-.004	.014	-.286	.775
Substance Use on Social Norms	-.296	.075	-3.938	.000**
Substance Use on Social Norms*Age	.071	.014	5.103	.000**
Substance Use on Teacher Support	.045	.077	.575	.565
Substance Use on Teacher Support*Age	-.008	.013	-.602	.547
Substance Use on Community Safety	-.023	.074	-.307	.759
Substance Use on Community Safety*Age	.000	.014	.030	.976
Substance Use on Community Connectedness	.048	.076	.626	.532
Substance Use on Community Connectedness*Age	-.006	.014	-.430	.667

Results showed some moderating effects of age between contextual factors and school connectedness (Table 25). The parameters for school connectedness regressed on contextual factors shows the relationship between a contextual factor (i.e. self-control) and school connectedness when age is constant. Significant age differences were found for the effect of school connectedness on self-control, social support, teacher support, social norms, and refusal efficacy (p<.05). As students got older, the positive effects of self-control on school connectedness (coefficient= -.037), social support on school

connectedness (coefficient=-.018), teacher support on school connectedness (coefficient = -.054), social norms on school connectedness (coefficient= -.016), and refusal efficacy on school connectedness (coefficient= -.011) decreased.

Table 25: *School Connectedness on Interaction of Age and Protective Factors (*p<.05, **p<.001)*

Regressions	Estimate	SE	Z-Value	P-Value
School Connectedness on Self-Control	.211	.030	6.959	.000**
School Connectedness on Self-Control *Age	-.037	.006	-6.605	.000**
School Connectedness on Religion	.039	.023	1.699	.089
School Connectedness on Religion *Age	-.005	.004	-1.296	.195
School Connectedness on Refusal Efficacy	.076	.034	2.220	.026*
School Connectedness on Refusal Efficacy *Age	-.011	.005	-2.089	.037*
School Connectedness on Social Support	.099	.032	3.085	.002*
School Connectedness on Social Support *Age	-.018	.006	-3.189	.001*
School Connectedness on Family Involvement	.048	.030	1.600	.110
School Connectedness on Family Involvement *Age	-.005	.005	-1.019	.308
School Connectedness on Social Norms	.061	.029	2.14	.034*
School Connectedness on Social Norms *Age	-.016	.005	-2.999	.003*
School Connectedness on Teacher Support	.327	.028	11.776	.000**
School Connectedness on Teacher Support *Age	-.054	.005	-11.154	.000**
School Connectedness on Community Safety	.000	.028	.006	.995
School Connectedness on Community Safety *Age	.003	.005	.631	.528
School Connectedness on Community Connectedness	-.004	.029	-.141	.888
School Connectedness on Community Connectedness *Age	.001	.005	.239	.811

Race

The model was further explored by race differences using moderation. A majority of the sample was African American or White, so differences between other race/ethnicities could not be examined. The mediation model with race moderation Mplus results and the maximum likelihood estimates for the parameters of the model are presented in Appendix E. The overall model yielded a chi-square of .000, df=0, p<.001, which indicates a just identified model.

Results showed that African American and White students were similar in pathway differences and parameter estimates when examining contextual factors and

substance use (Table 26). School connectedness, refusal efficacy, and social norms were significant protective factors against substance use for both races ($p<.05$). Community connectedness and community safety were significant protective factors against substance use for African Americans ($p<.05$). Significant differences in race were found for the effect of substance use on community safety, teacher support, and refusal efficacy ($p<.05$). Refusal efficacy showed a stronger protective relationship with substance use for White students (coefficient = -.629) than for African Americans (coefficient = -.309). Community safety showed a stronger protective relationship with substance use for African Americans (coefficient=-.309) than for Whites (coefficient =- .135). Teacher support showed a stronger protective relationship with substance use for African Americans (coefficient=-.212) than for Whites (coefficient =- .002).

Table 26: *All Substance Use on Interaction of Race (African American and White) and Protective Factors (*p<.05, **p<.001)*

Regressions	**Estimate**	**SE**	**Z-Value**	**P-Value**
Substance Use on School Connectedness				
Racial Differences	-.011	.091	-.123	.902
Substance Use on Self-Control				
Racial Differences	.059	.086	.688	.492
Substance Use on Religion				
Racial Differences	.123	.077	1.607	.108
Substance Use on Refusal Efficacy				
Racial Differences	.320	.081	3.937	.000**
Substance Use on Social Support				
Racial Differences	-.036	.093	-.386	.700
Substance Use on Family Involvement				
Racial Differences	.015	.088	.176	.861
Substance Use on Social Norms				
Racial Differences	-.102	.072	-1.403	.161
Substance Use on Teacher Support				
Racial Differences	-.210	.083	-2.529	.011*
Substance Use on Community Connectedness				
Racial Differences	-.057	.085	-.668	.504
Substance Use on Community Safety				
Racial Differences	-.174	.080	-2.177	.029*

**Racial differences illustrate the difference between the moderating effects of African Americans and Whites*

Results showed some moderating effects of race between contextual factors and school connectedness (Table 27). Self-control, social support, teacher support, and community connectedness had a significant positive relationship with school connectedness for both races ($p<.05$). Religion, family involvement, and community safety had a significant positive relationship with school connectedness for African Americans ($p<.001$). Significant differences in African Americans and Whites were found for the effect of school connectedness on self-control, social support, and teacher support ($p<.05$). Self-control showed a stronger positive relationship with school connectedness for Whites (coefficient = .192) than for African Americans (coefficient = .006). Social support showed a stronger positive relationship with school connectedness for Whites (coefficient=. 147) than for African Americans (coefficient=. 003). Teacher support showed a stronger positive relationship with school connectedness for Whites (coefficient=. 342) than for African Americans (coefficient =.008).

Table 27: *School Connectedness on Interaction of Race (African American & White) and Protective Factors (*p<.05, **p<.001)*

Regressions	**Estimate**	**SE**	**Z-Value**	**P-Value**
School Connectedness on Self-Control				
Racial Differences	-.198	.056	-3.554	.000**
School Connectedness on Religion				
Racial Differences	.003	.050	.067	.946
School Connectedness on Refusal Efficacy				
Racial Differences	-.066	.053	-1.241	.214
School Connectedness on Social Support				
Racial Differences	-.150	.061	-2.461	.014*
School Connectedness on Family Involvement				
Racial Differences	-.056	.057	-.976	.329
School Connectedness on Social Norms				
Racial Differences	-.038	.047	-.796	.329
School Connectedness on Teacher Support				
Racial Differences	-.350	.053	-6.602	.000**
School Connectedness on Community Connectedness				
Racial Differences	-.071	.055	-1.281	.200
School Connectedness on Community Safety				
Racial Differences	-.042	.052	-.807	.419

The above results correspond with the following aims of this study:

Aim 3: To investigate differences in predictors of school connectedness and substance use by gender, grade, and race/ethnicity.

- *Hypothesis* 3a: There will be differences in predictors of school connectedness and substance use by gender, grade, and race/ethnicity due to differences in adolescent development. These demographic factors will act as moderators between contextual factors and drug use.

  Results 3a: Age, race, and gender were all moderators between some of the contextual factors and the dependent variables (school connectedness and substance use). Significant differences in gender were found for the effect of substance use on social norms and refusal efficacy. Significant differences in gender were found for the effect of school connectedness on self-control, social support, and family involvement. Significant age differences for the effect of substance use on social norms, self-control, school connectedness, and refusal efficacy. Significant age differences were found for the effect of school connectedness on self-control, social support, teacher support, social norms, and refusal efficacy. Significant differences in race were found for the effect of substance use on community safety, teacher support, and refusal efficacy. Significant differences were found for the effect of school connectedness on self-control, social support, and teacher support. The results of the above section partially confirm *Hypothesis* 3a.

Relationship of Contextual Factors and Types of Substance Use

Tobacco Use

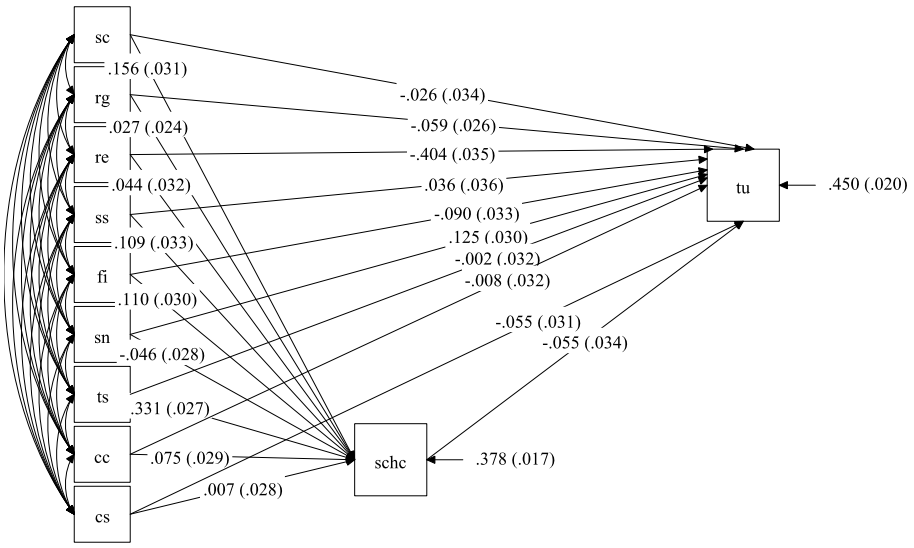
The hypothesized mediation model and the maximum likelihood estimates for the parameters of the model are presented in Figure 7. The overall model yielded a chi-square of 916.948, df=0, p<.001. The RMSEA of .000 indicated a just identified model. All of the comparative fit indices (SRMR, CFI, and TLI) indicated a just identified model (Table 28).

Table 28: *Model Fit Indices Tobacco Use Mediation Model*

χ^2 p-value	**.000**
CFI	1.000
TLI	1.000
RMSEA	.000
SRMR	.000
AIC	4004.951
BIC	4118.171

The path coefficients indicated direction and magnitude of the associations. Most of the contextual constructs showed a negative relationship with tobacco use indicating a protective effect (Table 29). Constructs with a significant negative relationship to tobacco use include: religion (coefficient=-.059, z=-2.273, p<.05); refusal efficacy (coefficient=-.404, z=-11.702, p<.001); and family involvement (coefficient=-.090, z=-2.734, p<.05). Social norms showed a positive relationship with tobacco use. The positive relationship between social norms and tobacco use was significant (coefficient=.125, z=4.140, p<.001). This relationship indicates that the more students perceive tobacco use as a norm among their peers, the more likely they are to use tobacco. The R^2 shows the amount of explained variance among construct variables. The explained variance for school connectedness was 45%, and for tobacco use, it was 27%. School connectedness was not a mediator between any of the contextual factors and tobacco use.

Figure 7: Tobacco Use Mediation Model



**sc = self-control, rg = religion, re = refusal efficacy, ss =social support, fi = family involvement, sn = social norms, ts = teacher support, cc = community connectedness, cs = community safety, schc = school connectedness, tu = tobacco use*

Table 29*: Tobacco Use on Protective Factors (*p<.05, **p<.001)*

Regressions	Estimate	SE	Z-Value	P-Value
Tobacco Use on School Connectedness	-.055	.034	-1.618	.106
Tobacco Use on Self-Control	-.026	.034	-.764	.445
Tobacco Use on Religion	-.059	.026	-2.273	.023*
Tobacco Use on Refusal Efficacy	-.404	.035	-11.702	.000**
Tobacco Use on Social Support	.036	.036	.993	.321
Tobacco Use on Family Involvement	-.090	.033	-2.734	.006*
Tobacco Use on Social Norms	.125	.030	4.140	.000**
Tobacco Use on Teacher Support	-.002	.032	-.070	.944
Tobacco Use on Community Connectedness	-.008	.032	-.244	.807
Tobacco Use on Community Safety	-.055	.031	-1.794	.073

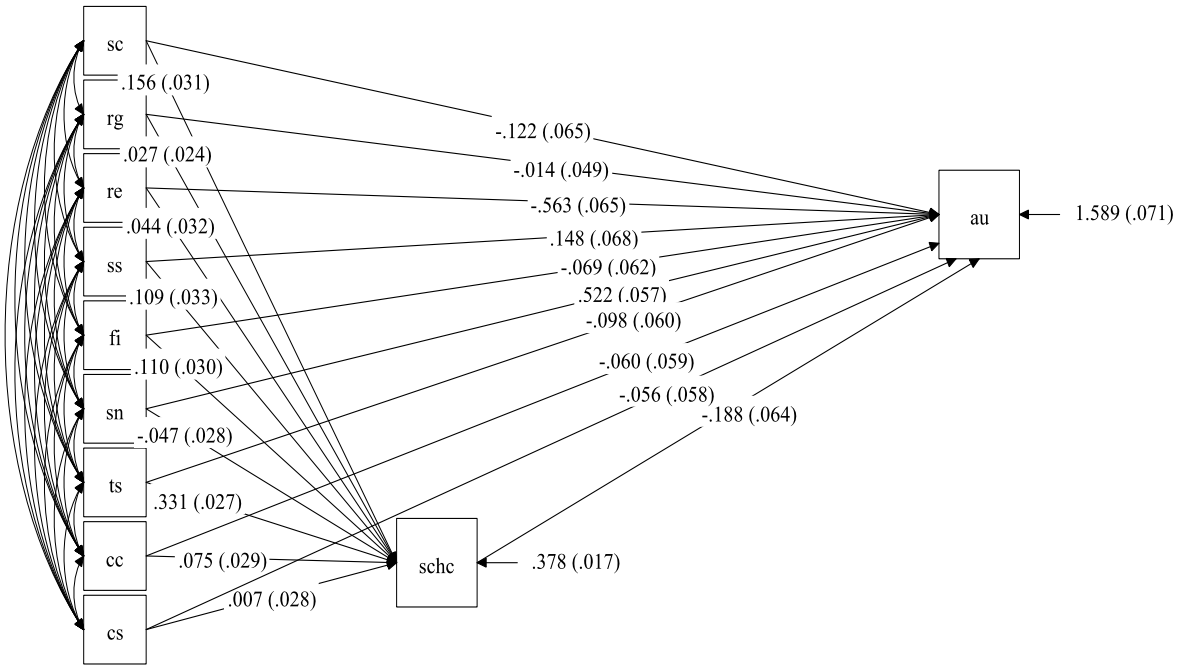
Alcohol Use

The hypothesized mediation model and the maximum likelihood estimates for the parameters of the model are presented in Figure 8. The overall model yielded a chi-square of 940.684, df=0, p<.001. The RMSEA of .000 indicated a just identified model. All of the comparative fit indices (SRMR, CFI, and TLI) indicated a just identified model (Table 30).

Table 30*: Model Fit Indices Alcohol Mediation Model*

χ^2 p-value	.000
CFI	1.000
TLI	1.000
RMSEA	.000
AIC	5283.535
BIC	5396.756

Figure 8: Alcohol Use Mediation Model



**sc = self-control, rg = religion, re = refusal efficacy, ss =social support, fi = family involvement, sn = social norms, ts = teacher support, cc = community connectedness, cs = community safety, schc = school connectedness, au = alcohol use*

Most of the contextual constructs showed a negative relationship with alcohol use indicating a protective effect (Table 31). Constructs with a significant negative relationship to alcohol use include school connectedness (coefficient=-.188, z=-2.9163.950, p<.05) and refusal efficacy (coefficient=-.563, z=-8.678, p<.001). Social norms and social support showed a positive relationship with alcohol use. The positive relationship between social norms and alcohol use was significant (coefficient=..522, z=9.221, p<.001). This relationship indicates that the more students perceive alcohol use as a norm among their peers, the more likely they are to use alcohol. Social support

showed a significant positive relationship with alcohol use (coefficient=.148, z=2.172, P<.05). The explained variance for school connectedness was 45%, and for alcohol use, it was 29%.

Table 31: *Alcohol Use on Protective Factors (*p<.05, **p<.001)*

Regressions	Estimate	SE	Z-Value	P-Value
Alcohol Use on School Connectedness	-.188	.064	-2.916	.004*
Alcohol Use on Self-Control	-.122	.065	-1.878	.060
Alcohol Use on Religion	-.014	.049	-.278	.781
Alcohol Use on Refusal Efficacy	-.563	.065	-8.678	.000**
Alcohol Use on Social Support	.148	.068	2.172	.030*
Alcohol Use on Family Involvement	-.069	.062	-1.111	.267
Alcohol Use on Social Norms	.522	.057	9.221	.000**
Alcohol Use on Teacher Support	-.098	.060	-1.625	.104
Alcohol Use on Community Connectedness	-.060	.059	-1.012	.311
Alcohol Use on Community Safety	-.056	.058	-.961	.337

Significant indirect effects were found in the alcohol mediation model. Results from this model show school connectedness as a full mediator for the following relationships: self-control and alcohol use, family involvement and alcohol use, and teacher support and alcohol use (P<.05). School connectedness is a partial mediator between social support and alcohol use (P<.05). School connectedness is not a mediator between religion, refusal efficacy, social norms, community safety, and community connectedness. The direct effects of these constructs on alcohol use were stronger than the non-significant indirect effects (Table 32).

Table 32*: Direct and Indirect Effects of the Alcohol Mediation Model (*p<.05, **p<.001)*

Effects	Estimate	SE	Z-Value	P-Value
Self-Control to Alcohol Use				
Direct	-.122	.065	-1.878	.060
Indirect (School Connectedness Mediator)	-.029	.012	-2.518	.012*
Religion to Alcohol Use				
Direct	-.014	.049	-.278	.781
Indirect (School Connectedness Mediator)	-.005	.005	-1.308	.299
Refusal Efficacy to Alcohol Use				
Direct	-.563	.065	-8.678	.000**
Indirect (School Connectedness Mediator)	-.008	.007	-1.254	.210
Social Support to Alcohol Use				
Direct	.148	.068	2.172	.030*
Indirect (School Connectedness Mediator)	-.021	.009	-2.187	.029*
Family Involvement to Alcohol Use				
Direct	-.069	.062	-1.111	.267
Indirect (School Connectedness Mediator)	-.018	.009	-2.284	.022*
Social Norms to Alcohol Use				
Direct	.522	.057	9.221	.000**
Indirect (School Connectedness Mediator)	.009	.006	1.458	.145
Teacher Support to Alcohol Use				
Direct	-.098	.060	-1.625	.104
Indirect (School Connectedness Mediator)	-.062	.022	-2.835	.005*
Community Connectedness to Alcohol Use				
Direct	-.060	.059	-1.012	.311
Indirect (School Connectedness Mediator)	-.014	.007	-1.939	.053
Community Safety to Alcohol Use				
Direct	-.056	.058	-.961	.337
Indirect (School Connectedness Mediator)	-.001	.005	-.234	.815

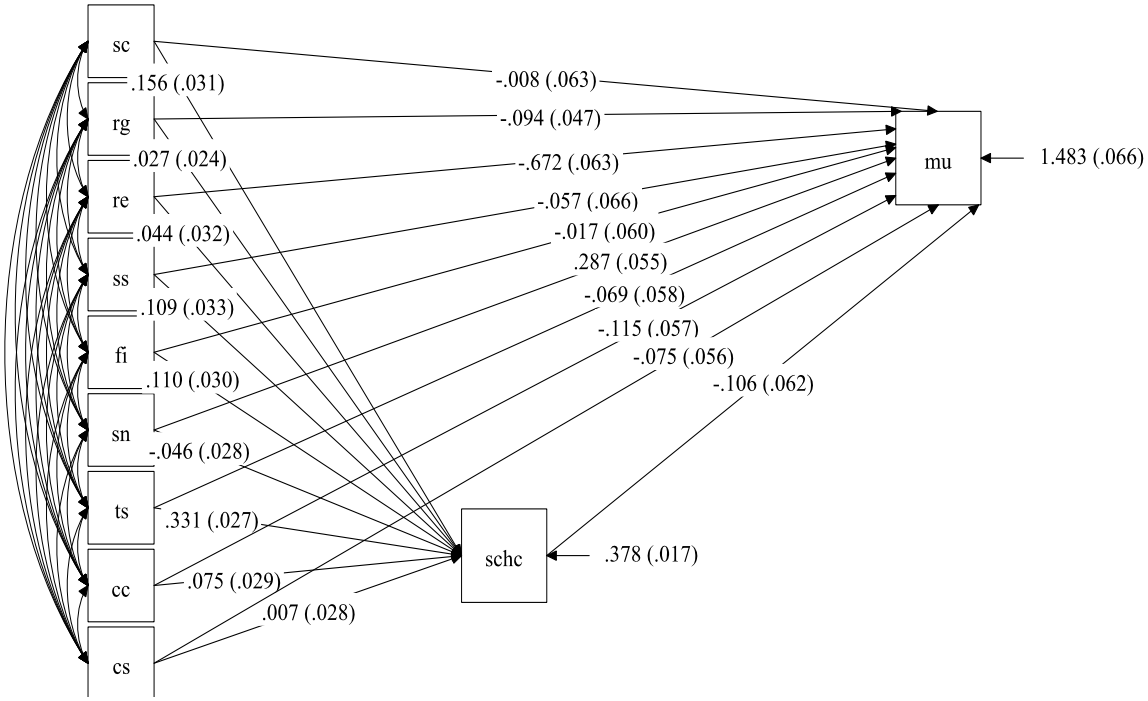
Marijuana Use

The hypothesized mediation model and the maximum likelihood estimates for the parameters of the model are presented in Figure 9. The overall model yielded a chi-square of 922.321, df=0, p<.001. The RMSEA of .000 indicated a just identified model. All of the comparative fit indices (SRMR, CFI, and TLI) indicated a just identified model (Table 33).

Table 33: *Model Fit Indices Marijuana Mediation Model*

χ^2 p-value	.000
CFI	1.000
TLI	1.000
RMSEA	.000
SRMR	.000
AIC	5213.405
BIC	5326.626

Figure 9: Marijuana Use Mediation Model



**sc = self-control, rg = religion, re = refusal efficacy, ss =social support, fi = family involvement, sn = social norms, ts = teacher support, cc = community connectedness, cs = community safety, schc = school connectedness, mu = marijuana use*

Most of the contextual constructs showed a negative relationship with marijuana use indicating a protective effect (Table 34). Constructs with a significant negative relationship to marijuana use include: religion (coefficient=-.094, z=-1.970, p<.05); refusal efficacy (coefficient=-.672, z=-10.725, p<.001); and community connectedness (coefficient=-.115, z=-2.009, p<.05). Social norms showed a positive significant relationship with marijuana use (coefficient=.287, z=5.243, p<.001). The explained variance for school connectedness was 45%, and for marijuana use, it was 27%. School

connectedness was not a mediator between any of the contextual factors and marijuana use.

Table 34: *Marijuana Use on Protective Factors (*p<.05, **p<.001)*

Regressions	Estimate	SE	Z-Value	P-Value
Marijuana Use on School Connectedness	-.106	.062	-1.708	.088
Marijuana Use on Self-Control	-.008	.063	-.135	.893
Marijuana Use on Religion	-.094	.047	-1.970	.049*
Marijuana Use on Refusal Efficacy	-.672	.063	-10.725	.000**
Marijuana Use on Social Support	-.057	.066	-.866	.387
Marijuana Use on Family Involvement	-.017	.060	-.278	.781
Marijuana Use on Social Norms	.287	.055	5.243	.000**
Marijuana Use on Teacher Support	-.069	.058	-1.195	.232
Marijuana Use on Community Connectedness	-.115	.057	-2.009	.045*
Marijuana Use on Community Safety	-.075	.056	-1.340	.180

The above results correspond with the following aims of the study:

Aim 4: To examine whether the same contextual factors that predict alcohol use also predict tobacco or marijuana use in rural youth.

Hypothesis 4a: Due to societal and cultural influences, some protective factors will deter the use of certain drugs like marijuana, but have less impact of the use of alcohol or cigarettes.

Results 4a: When examining different types of drug use, refusal efficacy had a significant negative association with all types of drug use. Social norms had a significant positive association with all types of drug use. Religion had a significant negative association with tobacco and marijuana, but was not significantly associated with alcohol use. School connectedness had a significant negative association with alcohol use, but was not significantly associated with marijuana or tobacco use. Family involvement had a significant negative association with tobacco use, but was not significantly associated with alcohol or marijuana. Community connectedness had a significant negative association with

marijuana use, but was not significantly associated with alcohol or tobacco use. These findings partially confirm *hypothesis* 4a.

- Social support had a significant positive relationship with alcohol use, but was not significantly related to tobacco or marijuana use. These findings do not support *Hypothesis* 4a.

Table 35 summarizes the findings on all direct and indirect paths for all substance use and different types of substance use.

Table 35*: Direct and Indirect (#School Connectedness Mediator) Effects (*p<.05, **p<.001)*

	Direct/ Indirect#	Substance Use	Alcohol Use	Tobacco Use	Marijuana Use
School Connectedness	Direct	**.000***	.004*	NS	NS
	Indirect	**-**	-	-	-
Self-Control	Direct	**NS**	NS	NS	NS
	Indirect	**.002***	.012*	-	-
Religion	Direct	**.035***	NS	.023*	.049*
	Indirect	**NS**	NS	-	-
Refusal Efficacy	Direct	**.000****	.000**	.000**	.000**
	Indirect	**NS**	NS	-	-
Social Support	Direct	**NS**	.030*	NS	NS
	Indirect	**.011***	.029*	-	-
Family Involvement	Direct	**NS**	NS	.006*	NS
	Indirect	**.007***	.022*	-	-
Social Norms	Direct	**.000****	.000**	.000**	.000**
	Indirect	**NS**	NS	-	-
Teacher Support	Direct	**NS**	NS	NS	NS
	Indirect	**.000****	.005*	-	-
Community Connectedness	Direct	**NS**	NS	NS	.045*
	Indirect	**.030***	NS	-	-
Community Safety	Direct	**.022***	NS	NS	NS
	Indirect	**NS**	NS	-	-

Direct=contextual factors regressed on substance use, indirect=contextual factors mediated by school connectedness

CHAPTER 5: DISCUSSION

Important Findings

Findings from this study confirm that school connectedness is a protective factor for substance use; however, previous research may underestimate the power that the school environment can have on preventing adolescent substance use. Students who valued and enjoyed going to school and associated school with life goals, were less likely to engage in substance use, which confirms previous research (Chilenski & Greenberg, 2009; Duncan, et al., 2000; Resnick, et al., 1997; Wang, et al., 2005). School connectedness is important for rural youth because of lack of opportunities and other activities within the area (Mayberry, et al., 2009). Factors positively associated with school connectedness in this study include: self-control, social support, family involvement, teacher support, and community connectedness. Previous researchers found these protective factors to be directly associated with low substance use rates, but the current study found school connectedness to be a mediator between these contextual factors and substance use (Chipuer, 2001; De Haan, et al., 2009; McNeely & Falci, 2004; Rhodes & Jason, 1990; Spoth, et al., 1996; Wills, et al., 2003).

These findings illustrate the importance of stressing school connectedness in anti-drug interventions and programs. Further, it is vital to include the community and family in interventions because these directly influence school connectedness. In particular, it is important to stress family and community involvement in African Americans because of the significant effect these contextual factors can have on promoting school

connectedness and ultimately decreasing adolescent substance use. This study is one of the first studies to link family involvement and community connectedness directly to school connectedness in rural areas.

School connectedness had a strong protective effect against alcohol use. This is particularly important for this area because of the social norms surrounding alcohol use in rural populations. Rural adolescents report easy access to alcohol and lower rates of perceived risk associated with use (Gale, Lenardson, Lambert, & Hartley, 2012; Pettigrew, Miller-Day, Krieger, & Hecht, 2012). While rural areas struggle to combat high alcohol use rates, this study shows that school connectedness could provide a solution to decreasing this problem.

Rural schools need to provide safe and intellectually challenging environments where family, teachers, and community members encourage academic motivation. A curriculum that provides experiential and hands-on learning opportunities, as well as using a wide variety of instructional methods and technologies promotes school connectedness (National Research Council and Institute of Medicine, 2004; Pettigrew, et al., 2012). Further schools should implement programs that create positive and purposeful peer support and peer norms (Wilson & Elliott, 2003). Because social norms and refusal efficacy have a strong relationship with rural adolescents substance use, the school could provide an outlet for teaching social skills and addressing drug norms in this area.

All the protective contextual factors examined were either directly or indirectly related to substance use. Self-control, social support, family involvement, teacher support, and community connectedness were all significantly positively associated with school connectedness, which decreased adolescent substance use. Social norms, refusal

efficacy, religion, community safety, and school connectedness were all significant protective factors directly associated with adolescent substance use. These results indicate that multiple contextual factors from different levels of the social ecological framework are directly or indirectly influencing rural adolescent substance use, which verifies the importance of using multilevel approaches in anti-drug interventions or programs. Overall substance use rates, moderating effects of age, race, and gender, and findings related to other protective factors are discussed below.

Discussion of Findings

Substance Use Rates

Results from this study confirm previous findings with elevated use of alcohol, smokeless tobacco, and cigarettes among rural youth compared to national samples (Aronson, et al., 2009; Hanson, et al., 2008; Rhew, et al., 2011). Lower marijuana and illicit drug use in this rural area confirm previous findings (Johnston, et al., 2013). Comparisons of study findings and national substance use rates are presented in Table 36.

Cigarette Use

Overall, this study found that 32.8% of survey respondents had ever tried cigarettes and 11.8% were current cigarettes smokers. Smoking behaviors were further analyzed by grade and compared to the Monitoring the Future (MTF) study results. Lifetime cigarette smoking rates among the rural study population were 21.1% for 8th graders, 36% for 10th graders, and 48.9% for 12th graders. According to the 2012 MTF study, the national rates of ever-smoking cigarettes were 14.8% for 8th graders, 27.5% for 10th graders, and 38.1% for 12th graders. Current cigarette smoking rates (smoked in the past 30 days) were higher in the rural study population than national rates. Of students

participating in the study, current smoking rates were 6.3% for 8th graders, 13.4% for 10th graders, and 18.3% for 12th graders compared to national rates of 4.5% for 8th graders, 9.10% for 10th graders, and 16.3% for 12th graders.

Table 36: *Comparison of Study findings and 2012 National Substance Use Rates*

Grade	8th National	8th Study	10th National	10th Study	12th National	12th Study
Cigarettes						
Ever Use	14.8%	21.1%	27.5%	36.0%	38.1%	48.9%
Current Use	4.5%	6.3%	9.10%	13.4%	16.3%	18.3%
Smokeless Tobacco						
Ever Use	7.9%	11.3%	14.0%	24.4%	17.2%	28.0%
Current Use	2.8%	5.6%	6.4%	11.4%	8.1%	14.5%
Alcohol						
Ever Use	27.8%	33.1%	52.1%	62.6%	68.2%	72%
Current Use	10.2%	8.5%	25.7%	27.3%	39.2%	36.6%
Marijuana						
Ever Use	16.5%	14.1%	35.8%	34.0%	45.5%	45.7%
Current Use	7.0%	5.6%	18.0%	16.1%	22.7%	20.7%
Illicit						
Ever Use	11.0%	2.1%	17.1%	5.5%	24.0%	12.0%
Current Use	5.0%	0.0%	10.0%	1.3%	9.0%	8.2%

Residents of rural areas are more likely to use tobacco, to start at an earlier age, and to be exposed to secondhand smoke at home more than their urban counterparts (American Lung Association, 2012). In addition, poverty, targeting by the tobacco industries, and economic dependence on tobacco crops lead to social and personal acceptance of use, and policies that do not discourage smoking in rural areas (Nemeth, Liu, Ferketich, Kwan, & Wewers, 2012; Department of Health and Human Services, 2010; Slater, Chaloupka, Wakefield, Johnston, & O'Malley, 2007). These factors may

contribute to elevated smoking rates among rural adolescents in this study due to a culture that perpetuates tobacco use.

Smokeless Tobacco Use

This study found that 19.7% of survey respondents had ever tried smokeless tobacco and 10.6% were current smokeless tobacco users. When stratified by age, lifetime use of smokeless tobacco among the rural study population was 11.3% for 8th graders, 24.4% for 10th graders, and 28% for 12th graders. According to the 2012 Monitoring the Future Study (MTF), the national rates of ever using smokeless tobacco were 7.9% for 8th graders, 14.0% for 10th graders, and 17.2% for 12th graders. Current smokeless tobacco use rates (past 30 days) were higher in the rural study population than national rates. Of students participating in the study, current smokeless tobacco use rates were 5.6% for 8th graders, 11.4% for 10th graders, and 14.5% for 12th graders compared to national rates of 2.8% for 8th graders, 6.4% for 10th graders, and 8.1% for 12th graders.

Similar to trends found in cigarette smoking, higher rates of the survey respondents' smokeless tobacco use could be associated with higher rates of adult smokeless tobacco users in the Southeastern United States (CDC, 2011). Higher rates of smokeless tobacco use in rural adults along with cultural norms surrounding tobacco use in rural areas may be cultivating an environment with higher acceptance of adolescent smokeless tobacco use in the study respondents. In addition, interventions to reduce tobacco use in areas with cultural ties to tobacco may be met with more resistance in rural and farming areas (Bell, Spangler, & Quandt, 2000; Glover, O'Brien, & Holbert, 1987).

Alcohol Use

This study found that 53.6% of survey respondents had used alcohol during their lifetime and 22.7% were current alcohol users. When stratified by age, lifetime use of alcohol among the rural study population was 33.1% for 8th graders, 62.6% for 10th graders, and 72% for 12th graders. According to the 2012 Monitoring the Future Study (MTF), the national rates of ever using alcohol were 27.8% for 8th graders, 52.10% for 10th graders, and 68.2% for 12th graders. Current alcohol use (past 30 days) in study participants was similar to national rates. Of students participating in the study, the rates for current alcohol use were 8.5% for 8th graders, 27.3% for 10th graders, and 36.6% for 12th graders compared to national rates of 10.2% for 8th graders, 25.7% for 10th graders, and 39.2% for 12th graders.

In rural areas, heavy drinking is more often tolerated and considered a norm (Van Gundy, 2006). Adolescents learn social behaviors from family, peers, and community members, which plays a role in elevated rates of alcohol use. Rural family members often allow consumption of alcohol at family events and purchase alcohol on behalf of adolescents (Meyer, Toborg, Denham, & Mande, 2008; Pettigrew, et al., 2012). In addition, adolescents in rural areas report lower rates of perceived risk of alcohol use and are less likely to disapprove of youth drinking compared to urban youth (Gale, et al., 2012). Substance use initiatives and anti-drug campaigns should focus on reducing elevated rates of tobacco and alcohol use in rural adolescents.

Marijuana and Illicit Drug Use

Even though rates of marijuana and illicit drug use among the rural survey respondents were lower than national rates, current marijuana use has surpassed current

cigarettes use among these adolescents. This could reflect a recent general shift in cultural norms among adolescents showing less disapproval of marijuana and a decreased perception that it is dangerous (Johnston, et al., 2013). The decrease in risk perceptions of marijuana could be attributed to recent public discussions over medicinal marijuana and movements to legalize the drugs in some states (National Institute on Drug Abuse, 2014). Other illicit drug use in this area is well below national rates; therefore, given the current trends in marijuana use across the country, substance use programs in the studied area should focus on changing norms and perceptions of risk related to marijuana.

Protective Factors of all Substance Use

The strongest predictors of all substance use were within the individual and school contexts. Individual context constructs associated with the Theory of Planned Behavior (refusal self-efficacy and social norms) were the strongest protective factors against all substance use. Students who felt confident in their ability to refuse drugs and did not perceive drug use as a norm among their peers were the least likely to engage in substance use. These findings are consistent with previous research and support the importance of examining cognitive-affective influences when researching rural adolescent substance use (Basen-Engquist & Parcel, 1992; Ludwig & Pittman, 1999; Petraitis, et al., 1995; Shumaker, et al., 1998; Van Gundy, 2006).

Religion had a direct negative relationship with substance use. These results support previous literature relating religious importance and church attendance with lower drug use rates in rural adolescents (Brownfield & Sorenson, 1991; Milot & Ludden, 2008). Religion is at the forefront of rural culture and may deter drug use by providing adolescents with opportunities for extracurricular activities. Attending church

provides individuals with a network of social support from other church members and creates a sense of belonging in the community (Krause & Wulff, 2005). Research shows that religiosity is associated with personal meaning in life, which leads to more prosocial involvement in adolescents (Furrow, King, & White, 2004). In addition, moral consequences taught at church services, classes, and religious events may prevent adolescents from engaging in delinquent behaviors and substance use (Stark, 1984).

Community safety had a direct negative relationship with substance use, which is consistent with previous research (Chilenski & Greenberg, 2009; Mayberry, et al., 2009; Pettit, et al., 1999). Rural adolescents living in safe communities are less likely to externalize risky behaviors, and to observe violence and substance use (Mayberry, et al., 2009). Adolescents living in unsafe neighborhoods are more likely to witness violence and drug use, which could lead to social norms and expectations that are accepting of substance use at an early age (Case & Katz, 1991).

Family context variables were not strong direct protective factors against substance use, which is not consistent with previous research (Barnes & Farrell, 1992; De Haan, et al., 2009; Eccles & Gootman, 2002; Pettit, et al., 1999). The small impact of protective effects from the family context could indicate that adolescents are attaching greater importance to their activities at school and with peers, which take precedence over involvement with family (Eccles & Gootman, 2002). In addition, social support from older individuals showed a non-significant positive effect, which may indicate that older adults are modeling social norms that support substance use.

Gender Differences

Boys among the current study population smoked cigarettes, and used smokeless tobacco at significantly high rates when compared to girls. Boys were significantly more likely to have ever used marijuana. While not significant, boys had higher rates of current marijuana and alcohol use when compared to girls. These findings confirm previous research about high rates of substance use among adolescent boys compared to girls (Hicks, et al., 2007; SAMHSA, 2011; Young, et al., 2002). Girls and boys had similar rates of ever drinking alcohol, which reflects a general trend of decrease in gender gaps in alcohol consumption and changes in adolescent cultural norms (Raitasalo & Holmila, 2005).

Significant gender differences were observed when examining contextual factors and substance use among the current study population. Refusal efficacy showed a stronger protective relationship with substance use for girls, which is consistent with previous research. Boys have poorer refusal skills and find it difficult to deny drugs when offered (Scheier, Botvin, Diaz, & Griffin, 1999). Social norms were a stronger protective factor for boys. This indicates that boys are more influenced by positive social norms, while girls are less influenced by the behaviors and beliefs of others. Previous findings on gender differences are inconsistent when examining the influence of social norms on substance use (Biddle, Bank, & Marlin, 1980; Lewis & Neighbors, 2004).

Gender was a moderator between some contextual factors and school connectedness. Self-control and social support showed a stronger positive relationship with school connectedness for boys. Previous research indicates that girls have higher self-control rates throughout their lifespan; however, elevated levels of self-control for

boys are more influential in promoting positive behaviors (i.e. school connectedness) (Blackwell & Piquero, 2005; Schreck, 1999; Turner & Piquero, 2002). Similarly while girls report higher rates of social support, the influence of social support is greater for boys (Furman & Buhrmester, 1992). Family involvement showed a stronger relationship with school connectedness for girls. Families often spend more time with girls and generally encourage boys to be more independent (Grolnick, Benjet, Kurowski, & Apostoleris, 1997). Boys rely on self-control and support from older mentors, while girls still rely heavily on the family for support. Anti-drug programs and interventions should encourage self-control and provide guidance for boys, and encourage family support for girls. By taking gender differences into account for programmatic efforts, interventions could increase school connectedness and ultimately decrease substance use.

Age Differences

The likelihood of substance use increased as adolescents from the current study population got older, which reflects previous research (Harris Abadi, et al., 2011).While constructs at the individual and school level are the strongest predictors of all substance use, these influences changed over time as students got older. As age increased, protective effects of school connectedness increased. These findings contradict previous research that students become less engaged with school as they age (Eccles, et al., 1993; McNeely, Nonnemaker, & Blum, 2002).

This contradiction could result from differing definitions of school connectedness. Previous studies have included peer connectedness as a component of school connectedness, while this study does not examine peer connectedness and focuses more on school values. Peer connectedness increases as students get older, which may lead to

risky behavior if students are connected to deviant peers (Catalano, et al., 2004; McNeely & Falci, 2004). Another possible explanation is the rural location of the study. Older adolescents in this area do not have many options for outside activities; therefore, school could be their only outlet for support and engagement. In fact, rural areas often lack school protective factors; however, when present, positive school climate and connection with school are protective factors that deter adolescent drug use (Mayberry, et al., 2009). This effect may increase with age as students gain autonomy and look to connect to something other than their family or home life (Bonino, et al., 2005).

For older students, protective effects of self-control, social norms, and refusal efficacy decreased. This developmental change is related to greater autonomy, changes in self-concept, broadening of social interests, less self-regulation, and changes in parental and peer norms (Bonino, et al., 2005; Castellanos-Ryan, et al., 2013; Petraitis, et al., 1995). As students get older, they are more influenced by the actions of peers in their environment and lack the self-control and self-efficacy to refuse drugs.

Significant age differences were found for the effect of school connectedness on self-control, social support, teacher support, social norms, and refusal efficacy. The effect of all of these protective factors on school connectedness decreased, as students got older. These results are consistent with previous findings and indicate that as students age and become more autonomous, they are less influenced by the support of teachers or older mentors (Eccles, et al., 1993; McNeely, et al., 2002; Petraitis, et al., 1995). Age differences must be taken into account when designing anti-drug interventions, and it may be beneficial for rural areas to focus on school connectedness as students get older; however, more research should be conducted to examine why school connectedness

increases in rural adolescents as they age. Most contextual factors known to promote school connectedness decreased in this study as students got older; therefore, other unexamined variables were influencing the higher rate of school connectedness for older youth in this rural area.

Race Differences

Among the current study population, Whites used tobacco and smokeless tobacco at a significantly high rate when compared to African Americans. While not significant, Whites had higher rates of current and ever alcohol use when compared to African Americans. These findings are consistent with previous research (Blum, et al., 2000; Johnston, et al., 2012). Marijuana use is generally higher among African Americans (SAMHSA, 2011); however, findings from the current study show similar marijuana use rates among Whites and African Americans. Though African Americans reported higher rates of ever using marijuana, this finding was not significant, and Whites and African Americans used marijuana in the past 30 days at the same rate.

While school connectedness, refusal efficacy, and social norms were significant protective factors against substance use for both races, racial differences were observed among the current study population when examining contextual factors and substance use. Community connectedness and community safety were significant protective factors against substance use for African Americans, confirming previous research on community effects on African Americans (Lillie-Blanton & Laveist, 1996). Community contextual factors are a key predictor of substance use for ethnic minority adolescents (Gruenewald, Millar, Ponicki, & Brinkley, 2000; Lambert, Brown, Phillips, & Ialongo, 2004). Community disorganization, community safety, and collective efficacy are all

important contextual constructs that disproportionally affect substance use in African Americans (Lambert, et al., 2004). Community safety accounts for racial differences in substance use; therefore, when implementing anti-drug interventions, social factors in African American's environment should be addressed.

Refusal efficacy showed a stronger protective relationship with substance use for White students, which is consistent with previous research (Ellickson & Morton, 1999). African Americans refuse drugs at lower rates than Whites, especially at an early age, which triples the odds of future substance use (Ellickson & Morton, 1999). Past programs aimed at increasing social skills and refusal efficacy in African American adolescents have been shown to be successful in preventing risky behaviors (Corneille & Belgrave, 2007; Short, 1997).

Confirming previous findings, teacher support showed a stronger protective relationship with substance use for African Americans (Booker, 2006). African American students are more likely to be influenced by affirmative interactions with their teachers, which is critical to success (Ogbu, 2003; Rosenbloom & Way, 2004). Because of their minority status, African Americans can be more sensitive to unsupportive teachers (Booker, 2006). Negative interactions and experiences with teachers and other students can increase isolation and deviant behaviors, which can lead to substance use.

Results showed some moderating effects of race between contextual factors and school connectedness. Self-control, social support, teacher support, and community connectedness had a significant positive relationship with school connectedness for both races. Religion, family involvement, and community safety had a significant positive relationship with school connectedness for African Americans. Previous research shows

that African American youth are more religious when compared to their White counterparts, and religiosity is more important for African Americans during times of stress (Hines & Boyd-Franklin, 1996). The church is important for African American adolescents because it is one of the few institutions that provides programming and support for various problems within the African American community (Wallace, Brown, Bachman, & Laveist, 2003). Very few studies have examined the relationship between religion and school connectedness in adolescents; however, these findings support the argument that addressing religiosity and spirituality could increase school connectedness in African Americans (Dantley, 2005).

Family involvement is directly related to school connectedness in this study, and this relationship has an indirect effect on decreasing adolescent substance use. Through family involvement among African Americans, parent-adolescent relations are closer and more intimate (Giordano, Cernkovich, & DeMaris, 1993). These positive adult relationships are more important for promoting school connectedness in African American adolescents (Woolley & Bowen, 2007). In addition, African American parents who detach themselves after disaffected behavior can exacerbate delinquent behavior and contribute to negative educational outcomes (Connell, Spencer, & Aber, 1994). While many of the African American students in this sample come from single parent homes (68.9%), these findings indicate that those who are involved with family, regardless of structure, are more likely to be connected with their schools.

African Americans who reported greater community safety were more likely to be connected to school. African Americans are more likely to live in unsafe neighborhoods with a lack of community support (Woolley & Bowen, 2007). African Americans who

live in unsafe communities have poorer educational opportunities compared to their White counterparts; however, when community safety is present, it has a greater enhancing effect on school engagement (Ogbu & Simons, 1998).

Protective Factors for Different Types of Substance Use

Separate models were run for different types of substance use to determine the influence of contextual factors on tobacco, alcohol, and marijuana use. As predicted, there were differences in the protective effects of contextual factors based on type of substance used. Refusal efficacy and social norms were significant protective factors for all types of drug use; however, other contextual factors from all levels of the socio-ecological model varied by type of substance used. While school and individual constructs were strong protective factors against alcohol use, community and family protective factors had strong protective effects for marijuana and tobacco use.

School connectedness was a strong protective factor for alcohol use, but was not significantly associated with tobacco or marijuana use. These findings are inconsistent with previous research and could indicate that the culture of the studied area may promote an environment where cigarette and marijuana use are acceptable, but alcohol use is not (Chilenski & Greenberg, 2009; Mayberry, et al., 2009; Wang, et al., 2005). Possibly based on past observations, students in this area may view alcohol use as more harmful to school success than tobacco and marijuana use. The findings of this study are consistent with those of McNeely & Falci (2004) who attributed unconventional school connectedness as the reason for inconsistent findings. Unconventional school connectedness occurs when students become attached to deviant peers in the school environment. While the current study does not include peer connectedness within the

construct of school connectedness, peers and social norms may be influencing students to view some substances as more harmful to school success than others. More research should be conducted to determine why school connectedness is a strong protective factor for alcohol use, and not for marijuana and tobacco use.

Religion was a protective factor for marijuana and tobacco use, but was not significantly associated with alcohol use. Previous studies examining the effect of religion on substance use have produced inconsistent results (Benda & Corwyn, 2000; Hodge, et al., 2001; Milot & Ludden, 2008). Findings from this study are similar to those of Benda & Corwyn (2000) who determined religion was a protective factor against illegal drug use but not against alcohol use. Both the current study and Benda & Corwyn (2000) examined religion as a latent construct measured by more than one variable. Other studies have examined church attendance or importance of religion and the relationship with substance use, while the current study examined religion importance, attendance, and involvement in church-related activities. More research should be conducted to determine why religion is a strong protective factor for tobacco and marijuana use, but not for alcohol use. Rural communities are more accepting of alcohol use, but historically they have also been more accepting of tobacco use. The protective factor of religion against tobacco use could indicate a shift in cultural norms of tobacco use driven by the church.

Social support had a significant positive relationship with alcohol use but was not significantly associated with tobacco or marijuana use. These findings suggest that social support from older adults increases the risk of alcohol use in rural youth. These findings are inconsistent with previous research and may indicate that older adults, even when

providing support, are modeling norms that encourage alcohol use (Spoth, et al., 1996). Further, older adults may provide young adolescents access to socially accepted drugs in the studied area.

While school and individual factors were more protective of alcohol use, family and community factors provided more protection against tobacco and marijuana use. Community connectedness was a strong protective factor for marijuana use, but was not significantly associated with tobacco or alcohol use. These findings are inconsistent with previous research and may indicate that teens more connected to the community are more likely to use conventional and readily-available substances like alcohol and tobacco, and not illegal substances like marijuana (De Haan, et al., 2009; Mayberry, et al., 2009; Petraitis, et al., 1995). If social norms among community members point to the acceptance of alcohol and tobacco use, community connectedness may not matter to teens looking to experiment with these substances.

Limitations

The current study has some limitations. The data are cross-sectional and the relationships of the constructs in the hypothesized models do not indicate causality. The use of SEM supports the relationships for these theoretical constructs based on research literature and illustrates relationships between the constructs, but does not indicate causality between the independent and dependent variables. The model fit for the measurement model was moderate, but not ideal. Other structural models could have explained the observed covariance in these youths' school connectedness and substance use behaviors just as well, if not better than the model analyzed in the current study. This model was based on a combination of health behavior theories, so many restrictions that

could have been placed on the model were ignored based on literature review and guiding theories.

There were some issues with reliability of contextual constructs. Academic performance showed low reliability (α=.418) and was not a good fit in the measurement model. Academic performance is a known protective factor against adolescent substance use, but the scale did not perform well in this sample of students. The low reliability and internal consistency of this construct could indicate an over-inflation of grades by the respondents. In addition, scale reliability may have been decreased by respondents who indicated trying their best in school, but not receiving good academic grades. The construct of academic performance was removed from the structural models and could not be tested as a protective factor.

This study was a convenience sample conducted in three rural counties in Georgia; therefore, the results may not be applicable to adolescents living in suburban and urban settings. This study may be generalizable to other rural counties in Georgia with similar community structure and resources. This study included middle and high school youth, so it is not representative of all youth in the area. It does not include youth who have dropped out or are homeschooled. Additionally, students with learning disabilities were not included in the study, and 25% of students targeted were absent from school during survey administration or turned in an incomplete/blank survey.

Illiteracy rates for participating counties were high (National Center for Educational Statistics, 2003). Students with reading disabilities and special education classes did not participate in the survey. Missing data from illiterate students and those

with learning disabilities could lead to sampling bias. Finally, survey bias could result from students providing dishonest answers.

As with most survey data, the results of this study rely on self-report. Survey bias could have resulted from participants providing dishonest answers. Students may have over-reported or under-reported drug use behaviors based on what they thought researchers/teachers wanted to find. This problem was addressed by the use of anonymous surveys and repeated instructions reminding participants of anonymity.

Implications for Future Research

Adolescent substance use and school connectedness are complex behaviors with many significant predictors and associations. This study supports numerous others that recommend multi-level interventions based on the social ecological framework to address adolescent substance use (Branstrom, et al., 2008; Connell, et al., 2010; Kliewer & Murrelle, 2007; Mayberry, et al., 2009). Contextual factors from the individual, family/peer, school, and community level have differing effects based on type of drug use, race, gender, and age. Interventions and programs aimed at multiple levels of the social ecological framework could influence youth from a variety of sources and have greater impact on behavior (Reininger et al., 2005). Future research should continue to explore contextual factors from multiple levels of the social ecological framework and their association with school connectedness and rural adolescent substance use.

The current study raised several questions that deserve attention by future researchers. Among these are questions related to the role that school connectedness plays in adolescents' lives and the influence it has on preventing substance use. Previous studies link many of the contextual factors of the social ecological framework directly to

prevention of substance use; however, this study found that constructs from the individual, family/peer, school, and community level were all mediated by school connectedness. Future research should further examine the indirect relationship of self-control and substance use, social norms and substance use, social support and substance use, family involvement and substance use, teacher support and substance use, and community connectedness and substance use to determine why school connectedness is mediating these relationships. It would be beneficial to conduct a qualitative study to ask adolescents about these associations.

Future research should also examine why age, gender, and race show different moderating effects for school connectedness and substance use. In particular, most contextual factors known to promote school connectedness decreased in this study as students got older; therefore, other unexamined variables were influencing the higher rate of school connectedness for older youth in this rural area. Family and community contextual factors were more important for African Americans; therefore, future research should be conducted to examine additional constructs from the family and community level that influence African American's school conntectdness and substance use.

Interesting findings arose regarding protective factors for different types of substance use. Future research should be conducted to determine why social support from older adults would have a significant positive relationship with rural adolescent alcohol use. Surveying teachers/administrators from the school, parents, church leaders, and community members might provide a better understanding of the relationships between contextual factors and alcohol, tobacco, and marijuana use.

Models used in the current study only accounted for a moderate amount of variance in the outcome variables. More exploration is needed utilizing the ecological framework and other health behavior theories to examine the relationship between contextual factors, school connectedness, and rural adolescent substance use. Future studies should be prospective or include a longitudinal design to support findings as well as investigate additional predictors of school connectedness and rural adolescent substance use.

Implications for Practitioners

The practical implications of the current study provide important information when developing programs to promote school connectedness and decrease substance use among rural adolescents. This study points out the importance of addressing all levels of the social ecological framework to influence rural adolescent substance use. In particular, constructs from health promotion theories should guide interventions aimed at decreasing or preventing rural adolescent substance use. Two constructs from the Theory of Planned Behavior, refusal efficacy and social norms, were the strongest protective factors against all types of substance use. Further, all levels of Jessor's Problem Behavior Theory and the social ecological framework had a direct or indirect effect on rural adolescent substance use; therefore, future anti-drug programs should not only have a multi-level approach that includes individual, family/peer, school, and community factors, but constructs within each level of the model should be guided by health promotion theory.

School administrators and teachers should address factors that promote school connectedness in rural adolescents. School connectedness was the third strongest protective factor for all substance use and mediated the relationship between many

contextual factors and substance use. Self-control, social support, family involvement, teacher support, and community connectedness all had a significant positive relationship with school connectedness. Anti-drug programs should work with families, teachers, and community leaders to influence factors increasing school connectedness in adolescents, and ultimately preventing rural adolescent substance use.

This study provides important information about specific populations and substance use. The important role that race and gender have in adolescents' substance use should be accounted for in intervention programming. Anti-drug interventions targeted towards boys should address social norms and teach refusal skills. Boys should learn the importance of self-control and receive social support from older mentors to increase school connectedness, while family members should be encouraged to spend time with girls.

Anti-drug programs targeting African Americans should encourage teacher support and teach refusal skills. Community safety is a strong predictor of substance use in African American adolescents; therefore, interventions should involve community members, centers, and stakeholders to promote a safer neighborhood. Further, community connectedness increases school connectedness in African American adolescents. Interventions should encourage youth to become involved in positive community activities, which increase a sense of pride and belonging to the neighborhood. Finally, anti-drug interventions targeted at African American adolescents should involve family members. Encouraging family members to be involved in their child's life and talking to them about deviant behaviors could significantly decrease adolescent substance use.

Conclusions

This study is among the first to examine the relationships between school connectedness and rural adolescent drug use within a system of interrelationships guided by multiple health behavior theories. The results of this study indicate that contextual factors from the individual, family/peer, school, and community level all directly or indirectly influence rural adolescent drug use, but individual and school variables play the largest role in preventing rural adolescent substance use. In particular, the constructs of refusal efficacy and social norms were found to be significant protective factors for all types of substance use.

School connectedness was a significant mediator between contextual factors from all levels of the social ecological framework and rural adolescent substance use. The influence of contextual factors on school connectedness and substance use differed by age, race, and gender. The social ecological model and other health promotion theories used within this study can guide practice and research aimed at increasing school connectedness and decreasing rural adolescent substance use. Specifically, programs aimed at the individual and school context have the greatest potential to impact rural adolescent behavior.

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APPENDICES

APPENDIX A: Measures/Construct Scales

Independent Variables of Interest

Context	Construct	Questionnaire Item
Individual	Self-Control (α=0.761)	7 Items I ignore other children when they tease or call me names I disagree with adults without fighting or arguing I avoid doing things that may get me into trouble I do nice things for my parents I end fights with my parents calmly I accept punishments from adults without getting mad I control my temper when people are angry with me Response options: (1) never (2) once in a while"(3) sometimes (4) frequently (5) always -Higher scores indicate greater self-control
	Religion (α=0.749)	3 items -How often do you attend religious services? Response Options: (1) never (2) Once a month or less (3) once a week (4) more than once a week -How important is religion in your life? (1) not important (2) slightly important (3) neither important nor unimportant (4) somewhat important (5) very important -I participate in church related activities, organizations, sports, or special programs Response options: (1) never (2) once or twice a year (3) monthly (4) weekly - Higher scores indicate greater religious involvement
	Refusal Self-Efficacy (α=0.881)	4 Items -How sure are you that you can refuse if a friend or family member offers you alcohol and you do not want it? Response options: (1) not sure at all (2) not very sure (3) pretty sure (4) definitely sure -How sure are you that you can refuse if a friend or family member offers you a cigarette and you do not want it? Response options: (1) not sure at all (2) not very sure (3) pretty sure (4) definitely sure -How sure are you that you can refuse if a friend or family member offers you marijuana and you do not want it?

		Response options: (1) not sure at all (2) not very sure (3) pretty sure (4) definitely sure -How sure are you that you can refuse if a friend or family member offers you an illegal drug (such as meth, crack, LSD, or ecstasy) and you do not want it? Response options: (1) not sure at all (2) not very sure (3) pretty sure (4) definitely sure -Higher scores indicate greater refusal efficacy.
Peer/Familial	Social Support (α=0.852)	6 Items I get along well with adults There are adults I can talk to when I have problems I talk to adults about what I am thinking or feeling I talk to adults about what I am doing I like being with adults It is possible to have fun with adults Response options: (1) strongly disagree (2) disagree (3) not sure (4) agree (5) strongly agree -Higher scores indicate greater social support
	Family Involvement (α=0.874)	7 Items I help with family fun activities I like to get involved with family activities I go out with other family members to movies or other things I help with chores at home My parents have time to listen to me My parents and I do things together at home I have friendly talks with my parents Response options: (1) never (2) once in a while (3) sometimes (4) frequently (5) always -Higher scores indicate greater family involvement
	Social Norms (α=0.862)	5 Items (1 deleted for internal consistency) - Which statement below about student use of marijuana (weed) do you expect to be the <u>most common attitude among students in your grade?</u> Response options: (1) Marijuana use is never a good thing to do (2) Occasional marijuana use is ok, but not daily use (3) Daily marijuana use is ok if that's what the individual wants to do - Which statement below about student use of illegal drugs (meth, crack, LSD, Ecstasy) do you expect to be the <u>most common attitude among students in your grade?</u> Response options: (1) Illegal drug use is never a good thing to do (2) Occasional illegal drug use is ok, but not

		daily use (3) Daily illegal drug use is ok if that's what the individual wants to do - Which statement below about student use of tobacco (including cigarettes, cigars, and chewing tobacco) do you expect to be the <u>most common attitude among students in your grade</u>? Response options: (1) Tobacco use is never a good thing to do (2) Occasional tobacco use is ok, but not daily use (3) Daily tobacco use is ok if that's what the individual wants to do -Which statement below about drinking alcoholic beverages do you expect to be the <u>most common attitude among students in your grade?</u> Response options: (1) Drinking is never a good thing to do for anyone at any age (2) Occasional drinking at my age is ok as long as it doesn't interfere with school work or other responsibilities (3) Occasional drinking at my age is ok even if it does interfere with school work and other responsibilities (4) Frequent drinking at my age is ok if that's what the individual wants to do. -How often do you think students at your school typically use alcohol and other drugs? (deleted for reliability) Response options: (9) daily, (8) nearly every day, (7) 2–3 times per week, (6) 1 time per week, (5) 2–3 times per month, (4) 1 time per month, (3) 3–6 times per year, (2) 1–2 times per year, and (1) never -Higher scores indicate social norms supporting alcohol and drug use
School	Academic Performance (α=0.418)	3 Items (Construct thrown out of model because of bad fit) -Which of the following best describes your average grade in school this year? Response options: (9) D or below (8) C- (7) C (6) C+ (5) B- (4) B (3) B+ (2) A- (1) A - Thinking back over the past year in school, how often did you fail to complete or turn in your assignments? (Deleted) Response options: (1) never (2) seldom (3) sometimes (4) often (5) almost always -How often do you try to do your best work in school? Response options: (1) never (2) seldom (3) sometimes (4) often (5) almost always (Item reverse scored) -Lower scores indicate higher academic performance

	Teacher Support (α=0.909)	6 Items My teacher cares about how much I learn My teacher likes to see my work My teacher likes to help me learn My teacher wants me to do my best in schoolwork My teacher thinks it is important to be my friend My teacher likes me as much as he/she likes other students Response options: (1) strongly disagree (2) disagree (3) not sure (4) agree (5) strongly agree -Higher scores indicate higher teacher support
Community	Community Connectedness (α=0.669)	4 Items Youth in my community have a voice I feel connected to my community I am not interested in what goes on in my community *(reverse scored) I do not feel like I have a good impact on my community* Response options: (1) strongly disagree (2) disagree (3) not sure (4) agree (5) strongly agree -Higher scores indicate higher community connectedness
	Community Safety (α=0.700)	7 items (1 deleted for internal consistency) There are places in my neighborhood community where I do not feel safe (reverse scored)* People help each other in my neighborhood community Drug dealing is a problem in my neighborhood community (reversed scored)* A lot of things get stolen in my neighborhood community (reversed scored)* (Deleted) People care about how my neighborhood community looks My neighborhood community is well lighted for afternoon and evening activities People in my neighborhood community use drugs (reverse scored)* Response options: (1) strongly disagree (2) disagree (3) not sure (4) agree (5) strongly agree -Higher scores indicate higher community safety

Dependent Variables of Interest

Construct	Questionnaire item
School Connectedness	6 Items

(α=0.823)	How often do you try to do your best in school How often do you enjoy being in school How often do you hate being in school (reverse coding)* How often do you think that homework is important How often do you think school is important for your life goals How often do you find your classes interesting Response options: (1) never (2) once in a while (3) sometimes (4) frequently (5) always -Higher scores indicate higher school connectedness
Tobacco Use (α=0.771)	4 items -Have you ever smoked cigarettes? Response options: (1) never (2) once or twice (3) occasionally but not regularly (4) regularly in the past (5) regularly now -Have you smoked cigarettes in the past 30 days? Response options: 1) not at all (2) less than one cigarette per day (3) one to five cigarettes per day (4) about one-half pack per day (5) about one pack per day (6) about one and one-half packs per day (7) two packs or more per day -Have you ever used smokeless tobacco (snuff, plug, dipping tobacco, chewing tobacco)? Response options: 1) never (2) once or twice (3) occasionally but not regularly (4) regularly in the past (5) regularly now -Have you used smokeless tobacco (snuff, plug, dipping tobacco, chewing tobacco) in the past 30 days? Response options: (1) not at all (2) once or twice (3) once or twice per week (4) three to five times per week (5) about once a day (6) more than once a day -Higher scores indicate greater tobacco use
Alcohol Use (α=0.890)	3 items -How many times have you had alcohol to drink during your lifetime? Response options: (1) 0 times (2) 1-2 (3) 3-5 (4) 6-9 (5) 10-19 (6) 20-39 (7) 40 or more -How many times have you had alcohol to drink during the past year? Response options: (1) 0 times (2) 1-2 (3) 3-5 (4) 6-9 (5) 10-19 (6) 20-39 (7) 40 or more -How many times have you had alcohol to drink during the last 30 days? Response options: (1) 0 times (2) 1-2 (3) 3-5 (4) 6-9 (5) 10-19 (6) 20-39 (7) 40 or more -Higher scores indicate greater alcohol use
Marijuana Use (α=0.919)	3 items -How many times have you used marijuana during your lifetime? Response options: (1) 0 times (2) 1-2 (3) 3-5 (4) 6-9 (5) 10-19 (6) 20-39 (7) 40 or more

	-How many times have you used marijuana during the past year? Response options: (1) 0 times (2) 1-2 (3) 3-5 (4) 6-9 (5) 10-19 (6) 20-39 (7) 40 or more -How many times have you used marijuana during the last 30 days? Response options: (1) 0 times (2) 1-2 (3) 3-5 (4) 6-9 (5) 10-19 (6) 20-39 (7) 40 or more -Higher scores indicate greater marijuana use
Illegal Drugs (α=0.924)	3 Items -How many times have you used other illegal drugs (for example, cocaine, meth, LSD, ecstasy, heroin) during your lifetime? Response options: (1) 0 times (2) 1-2 (3) 3-5 (4) 6-9 (5) 10-19 (6) 20-39 (7) 40 or more -How many times have you used other illegal drugs (for example, cocaine, meth, LSD, ecstasy, heroin) during the past year? Response options: (1) 0 times (2) 1-2 (3) 3-5 (4) 6-9 (5) 10-19 (6) 20-39 (7) 40 or more -How many times have you used other illegal drugs (for example, cocaine, meth, LSD, ecstasy, heroin) during the past 30 days? Response options: (1) 0 times (2) 1-2 (3) 3-5 (4) 6-9 (5) 10-19 (6) 20-39 (7) 40 or more -Higher scored indicate greater illegal drug use

APPENDIX B: Paper and Pencil Survey

INVESTIGATING PROTECTIVE FACTORS IN RURAL ADOLESCENTS
Conducted by: University of Georgia College of Public Health

Thank you for your participation!

Please Circle Your Answer:

1. Are you:
   - **A.** Male
   - **B.** Female

2. How old are you?
   - **A.** 11 years old or younger
   - **B.** 12 years old
   - **C.** 13 years old
   - **D.** 14 years old
   - **E.** 15 years old
   - **F.** 16 years old
   - **G.** 17 years old
   - **H.** 18 years old
   - **I.** 19 years old or older

3. What grade are you in?
   - **A.** 6th Grade
   - **B.** 7th Grade
   - **C.** 8th Grade
   - **D.** 9th Grade
   - **E.** 10th Grade
   - **F.** 11th Grade
   - **G.** 12th Grade

4. Are you Hispanic or Latino?
   - **A.** Yes
   - **B.** No

5. Which of these groups BEST describes you? **(Choose only one answer)**
   - **A.** American Indian or Alaska Native
   - **B.** Asian
   - **C.** Black or African American
   - **D.** Native Hawaiian or Other Pacific Islander
   - **E.** White
   - **F.** Other_____

6. With whom do you live?
   - **A.** Mom and Dad
   - **B.** Dad only
   - **C.** Mom only
   - **D.** Grandparents
   - **E.** Step parent and Dad
   - **F.** Step parent and Mom
   - **G.** Other_____

7. How many people live in your home? (including you) _____

8. Do you live:
   - **A.** On a farm
   - **B.** In the country, not on a farm
   - **C.** In a city, town, or suburb

9. What activities are you involved in? **(Circle all that apply)**
   - **A.** Sports
   - **B.** Church
   - **C.** Drama
   - **D.** Band
   - **E.** Other_____

Please Mark Your Answer with an X in one of the boxes:

	Never	Once in a while	Sometimes	Frequently	Always
10. How often do you wear a seat belt while riding in a car?					
11. I ignore other children when they tease or call me names.					
12. I disagree with adults without fighting or arguing.					
13. I avoid doing things that get me into trouble.					
14. I do nice things for my parents.					
15. I end fights with my parents calmly.					
16. I accept punishments from adults without getting mad.					
17. I control my temper when people are angry with me.					

Please Circle Your Answer:

18. How often do you attend religious services?
    - **A.** Never
    - **B.** Once a month or less
    - **C.** Once a week
    - **D.** More than once a week

19. How important is religion in your life?
    - **A.** Not important
    - **B.** Slightly important
    - **C.** Not sure
    - **D.** Somewhat important
    - **E.** Very important

20. I participate in church related activities, organizations, sports, or special programs:
    - **A.** Never
    - **B.** Once or twice a year
    - **C.** Monthly
    - **D.** Weekly

Please Mark Your Answer with an X in one of the boxes:

	Not sure at all	Not very sure	Pretty sure	Definitely sure
21. How sure are you that you can refuse alcohol from a friend when you do not want it?				
22. How sure are you that you can refuse a cigarette from a friend when you do not want it?				
23. How sure are you that you can refuse marijuana from a friend when you do not want it?				
24. How sure are you that you can refuse illegal drugs (such as meth, crack, LSD, or ecstasy) from a friend when you do not want it?				

Please Mark Your Answer with an X in one of the boxes:

	Never	Once in a while	Sometimes	Frequently	Always
25. I help with family fun activities.					
26. I like to get involved with family activities.					
27. I go out with other family members to movies or other things.					
28. I help with chores at home.					
29. My parents have time to listen to me.					
30. My parents and I do things together at home.					
31. I have friendly talks with my parents.					

Please Mark Your Answer with an X in one of the boxes:

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
32. I get along well with adults.					
33. There are adults I can talk to when I have problems.					
34. I talk to adults about what I am thinking or feeling.					
35. I talk to adults about what I am doing.					
36. I like being with adults.					
37. It is possible to have fun with adults.					

Please Circle Your Answer:

38. Which statement below about student use of marijuana (weed) do you expect to be the most common attitude among students in your grade?
    - **A.** Marijuana use is never a good thing to do
    - **B.** Occasional marijuana use is ok, but not daily use
    - **C.** Daily marijuana use is ok if that's what the individual wants to do

39. Which statement below about student use of illegal drugs (meth, crack, LSD, Ecstasy) do you expect to be the most common attitude among students in your grade?
    - **A.** Illegal drugs use is never a good thing to do
    - **B.** Occasional illegal drug use is ok, but not daily use
    - **C.** Daily Illegal drug use is ok if that's what the individual wants to do

40. Which statement below about student use of tobacco (including cigarettes, cigars, and chewing tobacco) do you expect to be the most common attitude among students in your grade?
    - **A.** Tobacco use is never a good thing to do
    - **B.** Occasional tobacco use is ok, but not daily use
    - **C.** Daily tobacco use is ok if that's what the individual wants to do

41. Which statement below about drinking alcoholic beverages do you expect to be the most common attitude among students in your grade?
    - **A.** Drinking is never a good thing to do for anyone at any age
    - **B.** Occasional drinking at my age is ok as long as it doesn't interfere with work or other responsibilities
    - **C.** Occasional drinking at my age is ok even if it does interfere with school work and other responsibilities
    - **D.** Frequent drinking at my age is ok if that's what the individual wants to do

42. How often do you think students at your school typically use alcohol and other drugs?
    - **A.** Daily
    - **B.** Nearly every day
    - **C.** 2–3 times per week
    - **D.** 1 time per week
    - **E.** 2–3 times per month
    - **F.** 1 time per month
    - **G.** 3–6 times per year
    - **H.** 1–2 times per year
    - **I.** Never

Thanks for your participation so far, please continue to the next page.

Please Circle Your Answer:

43. Which of the following best describes your average grade in school this year?
    - **A.** D or below
    - **B.** C-
    - **C.** C
    - **D.** C+
    - **E.** B-
    - **F.** B
    - **G.** B+
    - **H.** A-
    - **I.** A

44. Thinking back over the past year in school, how often did you fail to complete or turn in your assignments?
    - **A.** Never
    - **B.** Seldom
    - **C.** Sometimes
    - **D.** Often
    - **E.** Almost always

45. How often do you try to do your best work in school?
    - **A.** Never
    - **B.** Seldom
    - **C.** Sometimes
    - **D.** Often
    - **E.** Almost always

46. Have you ever smoked cigarettes?
    - **A.** Never
    - **B.** Once or twice
    - **C.** Occasionally but not regularly
    - **D.** Regularly in the past
    - **E.** Regularly now

47. Have you smoked cigarettes in the past 30 days?
    - **A.** Not at all
    - **B.** Less than one cigarette per day
    - **C.** One to five cigarettes per day
    - **D.** About one-half pack per day
    - **E.** About one pack per day
    - **F.** About one and one-half packs per day
    - **G.** Two packs or more a day

48. Have you ever used smokeless tobacco (snuff, plug, dipping tobacco, chewing tobacco)?
    - **A.** Never
    - **B.** Once or twice
    - **C.** Occasionally but not regularly
    - **D.** Regularly in the past
    - **E.** Regularly now

49. Have you used smokeless tobacco (snuff, plug, dipping tobacco, chewing tobacco) in the past 30 days?
    - **A.** Not at all
    - **B.** Once or twice
    - **C.** Once or twice per week
    - **D.** Three to five times per week
    - **E.** About once a day
    - **F.** More than once a day

50. How many times have you had alcohol to drink during your lifetime?
    - **A.** 0 times
    - **B.** 1-2 times
    - **C.** 3-5 times
    - **D.** 6-9 times
    - **E.** 10-19 times
    - **F.** 20-39 times
    - **G.** 40 or more times

51. How many times have you had alcohol to drink during the past year?
    - **A.** 0 times
    - **B.** 1-2 times
    - **C.** 3-5 times
    - **D.** 6-9 times
    - **E.** 10-19 times
    - **F.** 20-39 times
    - **G.** 40 or more times

52. How many times have you had alcohol to drink during the last 30 days?
    - **A.** 0 times
    - **B.** 1-2 times
    - **C.** 3-5 times
    - **D.** 6-9 times
    - **E.** 10-19 times
    - **F.** 20-39 times
    - **G.** 40 or more times

53. How many times have you used marijuana during your lifetime?
    - **A.** 0 times
    - **B.** 1-2 times
    - **C.** 3-5 times
    - **D.** 6-9 times
    - **E.** 10-19 times
    - **F.** 20-39 times
    - **G.** 40 or more times

54. How many times have you used marijuana during the past year?
    - **A.** 0 times
    - **B.** 1-2 times
    - **C.** 3-5 times
    - **D.** 6-9 times
    - **E.** 10-19 times
    - **F.** 20-39 times
    - **G.** 40 or more times

55. How many times have you used marijuana during the last 30 days?
    - **A.** 0 times
    - **B.** 1-2 times
    - **C.** 3-5 times
    - **D.** 6-9 times
    - **E.** 10-19 times
    - **F.** 20-39 times
    - **G.** 40 or more times

56. How many times have you used other illegal drugs (cocaine, meth, LSD, ecstasy, heroin) during your lifetime?
    - **A.** 0 times
    - **B.** 1-2 times
    - **C.** 3-5 times
    - **D.** 6-9 times
    - **E.** 10-19 times
    - **F.** 20-39 times
    - **G.** 40 or more times

57. How many times have you used other illegal drugs (cocaine, meth, LSD, ecstasy, heroin) during the past year?
    - **A.** 0 times
    - **B.** 1-2 times
    - **C.** 3-5 times
    - **D.** 6-9 times
    - **E.** 10-19 times
    - **F.** 20-39 times
    - **G.** 40 or more times

58. How many times have you used other illegal drugs (cocaine, meth, LSD, ecstasy, heroin) during the past 30 days?
    - **A.** 0 times
    - **B.** 1-2 times
    - **C.** 3-5 times
    - **D.** 6-9 times
    - **E.** 10-19 times
    - **F.** 20-39 times
    - **G.** 40 or more times

Please Mark Your Answer with an X in one of the boxes:

	Never	Once in a while	Sometimes	Frequently	Always
59. How often do you try to do your best in school?					
60. How often do you enjoy being in school?					
61. How often do you hate being in school?					
62. How often do you think that homework is important?					
63. How often do you think school is important for your life goals?					
64. How often do you find your classes interesting?					

Please Mark Your Answer with an X in one of the boxes:

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
65. My teacher cares about how much I learn.					
66. My teacher likes to see my work.					
67. My teacher likes to help me learn.					
68. My teacher wants me to do my best in schoolwork.					
69. My teacher thinks it is important to be my friend.					
70. My teacher likes me as much as he/she likes other students.					
71. Youth in my community have a voice.					
72. I feel connected to my community.					
73. I am not interested in what goes on in my community.					
74. I do not feel like I have a good impact on my community.					
75. There are places in my neighborhood community where I do not feel safe.					
76. People help each other in my neighborhood community.					
77. Drug dealing is a problem in my neighborhood community.					
78. A lot of things get stolen in my neighborhood community.					
79. People care about how my neighborhood community looks.					
80. My neighborhood community is well lighted for afternoon and evening activities.					
81. People in my neighborhood community use drugs.					

Please Circle Your Answer:

82. During the past 30 days, how often were you bullied on school property?

- **A.** I was not bullied
- **B.** 1 time
- **C.** 2 times
- **D.** 3 times
- **E.** About once a week
- **F.** Several times per week

83. If you did experience bullying within the last 30 days, what type of bullying did you experience? (**circle all that apply**)

- **A.** I was not bullied
- **B.** Verbal (name calling, teasing, made fun of)
- **C.** Threats (threat to being hit, to be injured)
- **D.** Electronic (bullied through e-mail, chat rooms, instant messaging, websites, or texting)
- **E.** Physical (pushed, shoved, hit, scratched, slapped)
- **F.** Relational (having nasty rumors passed, being left out on purpose)

84. During the past 30 days, how often did you bully someone on school property?

- **A.** I did not bully anyone
- **B.** 1 time
- **C.** 2 times
- **D.** 3 times
- **E.** About once a week
- **F.** Several times per week

85. If you did bully another student in the past 30 days, what type of bullying was it? (**circle all that apply**)

- **A.** I did not bully another student
- **B.** Verbal (name calling, teasing, making fun of)
- **C.** Threats (threatening to hit, to be injured)
- **D.** Electronic (bullying through e-mail, chat rooms, instant messaging, websites, or texting)
- **E.** Physical (pushing, shoving, hitting, scratching, slapping)
- **F.** Relational (spreading hurtful rumors, leaving someone out on purpose)

86. In the past 30 days, did you witness someone bullying another student?

- **A.** No I did not witness any bullying
- **B.** Yes and I ignored it
- **C.** Yes and I joined in the bullying
- **D.** Yes and I laughed at the victim
- **E.** Yes and I told the bully to stop
- **F.** Yes and I told an adult about the bullying
- **G.** Other:_____

APPENDIX C: Parental Informational Letter and Opt-Out Form

UNIVERSITY OF GEORGIA
INVESTIGATING PROTECTIVE FACTORS IN RURAL ADOLESCENTS

Researcher's Statement
I am asking your son/daughter to take part in a research study. Your child's principal has already given his/her consent that this study take place among the students at the school. You and your child can choose to opt out of this study by filling out the form provided and sending it back to the school. Before you decide to allow your child to participate in this study, it is important that you understand why the research is being done and what it will involve. This form is designed to give you and your child the information about the study so you can decide whether your child will be in the study or not. Please take the time to read the following information carefully. Please ask the researcher if there is anything that is not clear or if you need more information. When all your questions have been answered, you can decide if you want your child to opt out of the study. A copy of this form will be given to you.

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Purpose of the Study
This study will survey middle and high school students about their lives at home, school and in their community. The main purpose is to find out what factors influence youths to use alcohol, tobacco and drugs, and what factors protect youths from such use. It is important to identify the protective and positive factors in the lives of youths, so these can be highlighted and reinforced. This study will focus on rural youths because there are good opportunities to positively influence the lives of middle and high school students in these tight-knit communities. Research shows that more impact can be made through school and community programs in rural areas.

Study Procedures

If you agree to let your child participate, he/she will be asked to Participate in a one-time 35-minute paper-and-pencil survey during health/PE class. Students from all schools will complete the survey during one class period. Teachers will read a script with instructions for students before the survey is administered, which should take approximately 3-5 minutes. Students will answer questions about illegal activity/drug use, bullying, and seat belt behaviors. Some of these questions might cause slight discomforts. Below are examples of questions on the survey:

1. I avoid doing things that get me into trouble:
   A. Never
   B. Once in a while
   C. Sometimes
   D. Frequently
   E. Always

2. I feel connected to my community:
   A. Strongly disagree
   B. Disagree
   C. Not sure
   D. Agree
   E. Strongly agree

3. How many times have you had alcohol to drink during the past year?
   A. 0 times
   B. 1-2 times
   C. 3-5 times
   D. 6-9 times
   E. 10-19 times
   F. 20-39 times
   G. 40 or more times

If you would like to obtain a copy of the complete survey, you can contact the Co-Principal Investigator at cproctor@uga.edu or 706-583-8184.

Risks and discomforts

There are no foreseeable risks associated with this study. The survey is completely anonymous and cannot be linked to individual participants. Some of the survey questions might be viewed as mildly intrusive (i.e drug use, religion). To minimize potential risk, participants will be notified that they are not obligated to participate in the study. Teachers will not be able to see student's answers while they are taking the survey, and students will turn their survey into an anonymous box in the classroom. Participants will be told in advance that questions will be asked about their personal drug use.

Benefits

This survey will provide individuals with an opportunity to reflect on their personal behavior. Data collection from this survey will be provided to participating schools. Information gathered from this study will identify protective factors promoting positive behaviors. This information could provide the community and schools with valuable tools

to support positive behaviors and prevent adolescents from participating in alcohol and other drug use.

Privacy/Confidentiality
Data for this study will be collected anonymously. There will be no way to identify your child's answers on this survey.

Taking part is voluntary
Your child's participation will involve allowing the researchers to use the information/data that were collected through your child's participation in Investigating Protective Factors in Rural Adolescents. Participation in this study involves completing a 35 minute paper-and-pencil survey.
Your child's participation, of course, is voluntary but would be greatly appreciated. You may choose that your child not participate or to withdraw your consent at anytime without penalty or loss of benefits to which you/they are otherwise entitled. Participation in this survey will not affect your child's grades or relationship with the school. If you do not agree to the use of your child's information/data for this research project, please simply sign on the line below.
The results of the research study may be published, but your child's name or any identifying information will not be used. In fact, the published results will be presented in summary form only. Researchers at the University of Georgia and participating schools will have access to summaries of the data.
The researcher conducting this study is Chrissy Proctor. If you have questions, you are encouraged to contact her at 706-614-4523, cproctor@uga.edu.
Questions or concerns about your rights as a research participant should be directed to The Chairperson, University of Georgia Institutional Review Board, 629 Boyd GSRC, Athens, Georgia 30602-7411; telephone (706) 542-3199; email address irb@uga.edu.

If you do not wish for your child to participate in the study described above, please print your name, sign, and return the form to your child's school. Do not sign the form or return it if you are willing for child to participate. You may change your mind at any time and decide later that you do not want your child to participate in the study. If you do this, simply sign and return the form. The due date to return this form is November 1st 2013.
* I do not want my child to participate in this research study.

_____
Child's Printed Name

_____
Your Printed Name

_____ _____
Signature of Participant Date

APPENDIX D: Teacher Instructions for Administering Survey

UNIVERSITY OF GEORGIA
Teacher Instruction for Recruitment of Research
INVESTIGATING PROTECTIVE FACTORS IN RURAL ADOLESCENTS

Before the survey:

1. Teachers will receive the paper and pencil surveys from their principal/school superintendent.
2. Teachers will receive an envelope for survey collection. Please place this envelope somewhere in your classroom. This envelope will be used to collect surveys and assure anonymity of participants.
3. Familiarize yourself with these instructions and procedures before the survey is distributed.

During the survey:

1. Do not answer any questions about the survey.
2. Do not collect any of the surveys personally.
3. Please read the following to your students:
4.

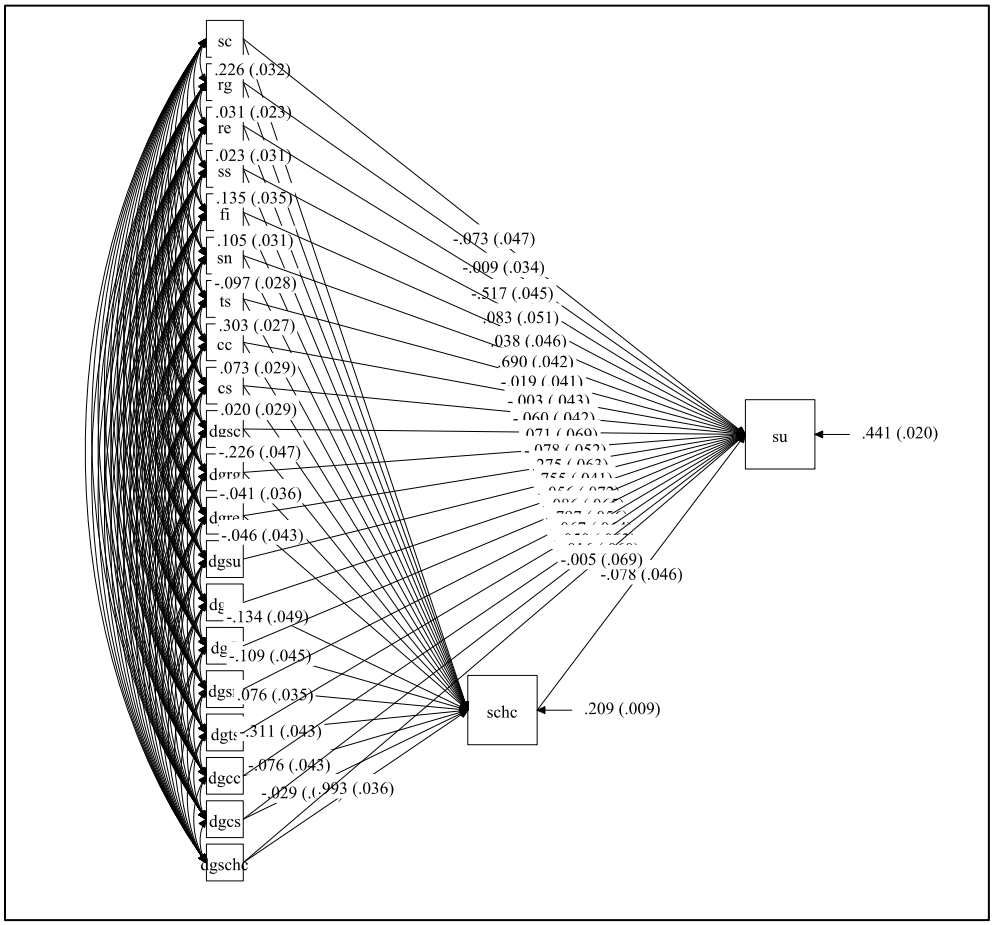
A researcher from the University of Georgia is asking you to participate in this survey. This study is about good factors in your life that promote positive behavior and keep students from using alcohol and other drugs. This survey will take you about 35 minutes to complete. You do not have to take this survey, and there will be no consequences for not taking it. Participation in this survey will not affect your class grade or standing. Your school and I (your teacher) do not care if you take or do not take this survey. You are going to be asked questions about your lives at home, at school and in your community. Please answer honestly. This survey includes questions about illegal activities/drug use, which may make you feel uncomfortable. This survey is anonymous, which means that no one will know who took the survey, and nothing will be linked to you. Please do not write your name or anything that can identify you anywhere on the survey. Please keep your eyes on your own papers. Do not show the survey to me. When finished with the survey, place it in this envelope (show envelope to students).

After the survey:

1. Teachers should take collected envelopes to the school principal.

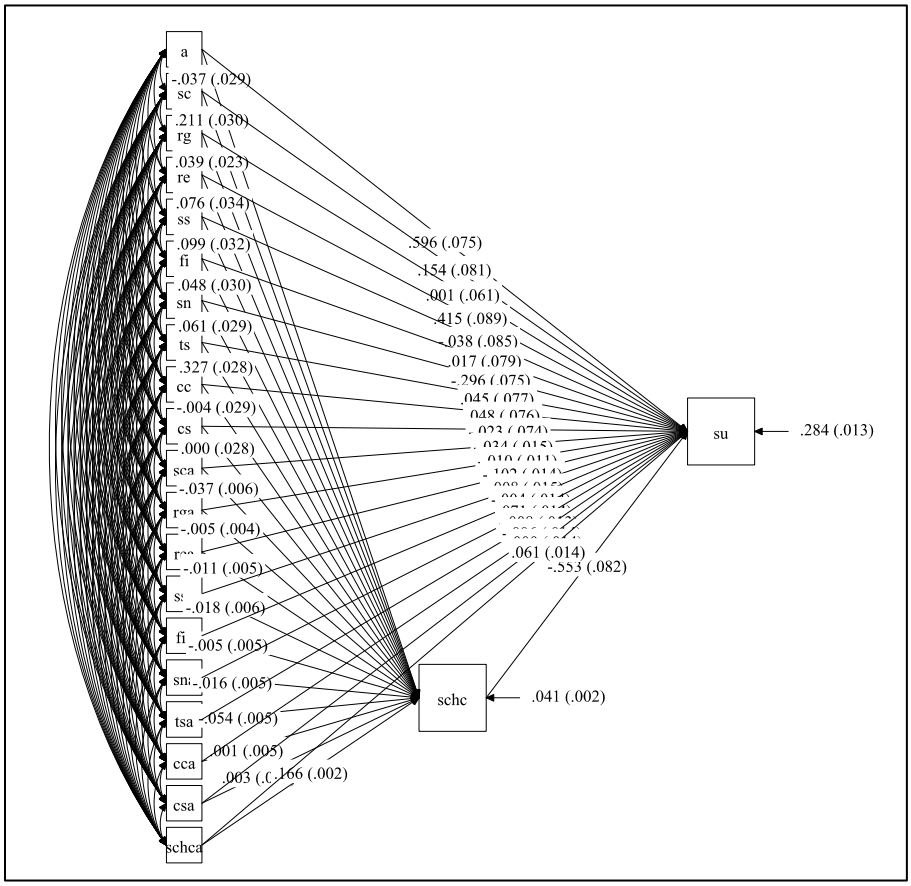
APPENDIX E: MPLUS Diagram Outputs

Mediation with Moderation of Gender



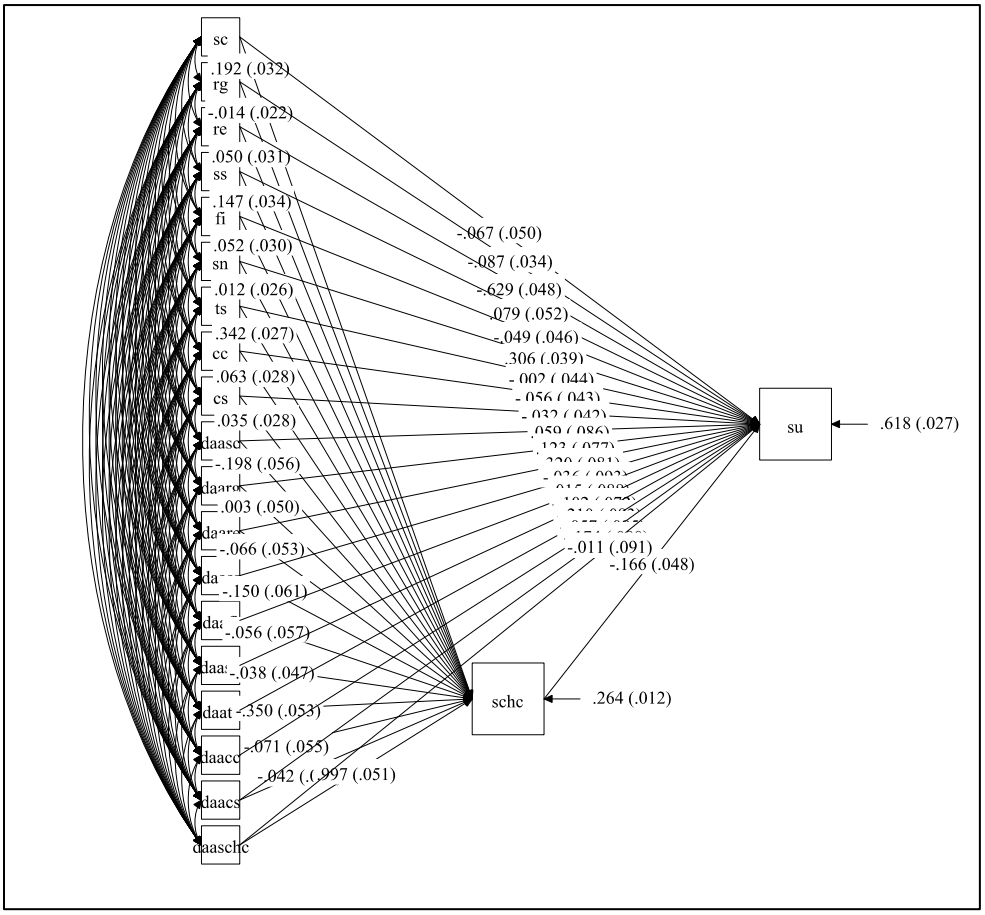
**sc = self-control, rg = religion, re = refusal efficacy, ss =social support, fi = family involvement, sn = social norms, ts = teacher support, cc = community connectedness, cs = community safety, schc = school connectedness, su = substance use , dgsc=gender* self-control, dgrg= gender*religion, dgre=gender*refusal efficacy, dgss=gender*social support, dgfi=gender*family involvement, dgsn=gender*social norm, dgts=gender*teacher support, dgcc=gender*community connectedness, dgcs= gender *community safety, dgschc=gender *school connectedness*

Mediation with Moderation of Age



**sc = self-control, rg = religion, re = refusal efficacy, ss =social support, fi = family involvement, sn = social norms, ts = teacher support, cc = community connectedness, cs = community safety, schc = school connectedness, su = substance use , sca=age* self-control,rga= age*religion, rea=age*refusal efficacy, ssa=age*social support, fia=age*family involvement, sna=age*social norm, tsa=age*teacher support, cca=age*community connectedness, csa= age *community safety, schca=age *school connectedness*

Mediation with Moderation of Race



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