ABSTRACT

The purpose of this study is to investigate the longitudinal effect of marijuana and heavy alcohol use on the productivity status of nonmetropolitan African American young adults, with the goal of assisting health care decision makers and health policy makers in the preparation of drug prevention policies that influence young adult’s health and economic outcomes. This secondary data analysis project used data from the Family and Community Health Study (FACHS). FACHS is a multisite investigation of neighborhood and family effects on health and development in African American families living in Georgia and Iowa. The effect of two drugs were assessed: 1) the effect of heavy alcohol use trajectories from adolescence to young adulthood (18-21 years of age), and 2) the effect of marijuana use when adolescents are likely to have initiated substance use (14 to 16 years of age). Productivity status was measured when the study participants were between 18 and 21 years old. Alcohol trajectories were measured using semi-parametric modeling. Multivariate logistic regression models were used to test the relation
between drug use and productivity. The results suggest two distinct heavy alcohol use trajectories representing the probability of an adolescent’s consumption of heavy alcohol use. Most of the sample (93%) was identified as having a low probability of heavy alcohol use and only 7% of the sample had a high probability of heavy alcohol consumption. Marijuana abstainers, on the other hand represented 81% of the sample and 19% had initiated of marijuana use by age 16 years of age. Bivariate analysis of the effect of marijuana use indicate that marijuana users at age 16 are 35% less likely to be productive at age 21 than those who have not initiated marijuana use (p<0.005). The multivariate logistic models suggest that early adolescence drug use (marijuana and heavy alcohol use) do not have an effect on productivity status during their early adulthood, after controlling for individual, community and family factors. This study makes important contributions to the existing literature. First by using a longitudinal design with a social-ecological framework to assess the effect of drug use on productivity status among nonmetropolitan African American youth and second, the study contributes to the debate in the econometric literature on the direction and effect of this relation. Analyzing and understanding the different drug use trajectories in relation to a productivity outcome appropriate to the developmental and productivity growth of young adults has important implications for practice, education and research in preventing drug use and in identifying its relation with micro and macro level labor market outcomes.

INDEX WORDS: Productivity, African American, young adults, marijuana use, alcohol use trajectories,
THE LONGITUDINAL EFFECT OF DRUG USE ON THE PRODUCTIVITY STATUS OF
NONMETROPOLITAN AFRICAN AMERICAN YOUNG ADULTS

by

MARIA ISABEL ROLDÓS PROSSER
B.A., Universidad San Francisco de Quito, Ecuador, 1998
M.P.A., New York University, 2004
M.A., Georgia State University, 2010

A Dissertation Submitted to the Graduate Faculty of The University of Georgia in Partial
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DOCTOR IN PUBLIC HEALTH

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ON METROPOLITAN AFRICAN AMERICAN YOUNG ADULTS

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MARIA ISABEL ROLDÓS PROSSER

Major Professor: Phaedra Corso
Committee: Pamela Orpinas
            Xiao Song
            Steven Kogan

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
May 2012
DEDICATION

This dissertation study is dedicated to my loving husband, Jose L. Velasquez and to my two children, Ana Estela and Joaquin A. You fill my heart with warmth and love.
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This project was possible thanks to the support and trust of my family. To my husband and children who are always there for me, thank you for your love, support and unconditional belief that I can accomplish anything. To my father, thank you for directing me, guiding me, and providing me with insight into my professional and personal growth. To my mother, I have been blessed to have you in my life and to have your support. To my brothers and sisters, I look forward in continuing our journey of love and friendship, and I thank you for your continued support of my work.

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the kids so that I could complete my work. I am blessed to have you in my life, and I can only hope to have the opportunity to do the same for you.

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CHAPTER 1
INTRODUCTION

The purpose of this study is to investigate the longitudinal effect of marijuana and alcohol use on the productivity status of nonmetropolitan African American young adults, with the goal of assisting health care decision makers and health policy makers in the preparation of drug prevention policies that influence young adult’s health and economic outcomes. National drug use prevention policies often fall into two categories: those that seek to reduce the availability of drugs and those that seek to prevent drug use. Prevention is sought mainly through strategies that impose criminal penalties for drug possession and sales and those that prevent or delay initiation of youth drug use (Hallfors, 2009). Not surprisingly, the National Institute of Drug Abuse (NIDA) has focused on interventions that mitigate drug use initiation and address risk factors, such as deviant peers, drug availability, poor mental health, and social ecological factors such as neighborhood’s lack of cohesion (Hser, Longshore, Brecht, & Anglin, 2005; National Institute on Drug Abuse, 2004a).

Health care decision makers, on the other hand, are faced with challenges in the distribution of financial resources and use vertical equity strategies to target those who are at higher risk and with poorer health and invest in the health programs that improve the health and economic benefit the most.

Studies of adolescent substance use onset suggest that alcohol initiation begins early in life, with almost 20% of adolescents having used by age 10, over 50% by age 14, and peak of use is at 18 years old (Chen & Kandel, 1995). For marijuana, the rate of initiation
begins to climb at age 13 and also reaches a peak of use at age 18. Marijuana shows the highest residual rate of initiation at ages 23 and 24 (Kandel & Logan, 1984; Yamaguchi & Kandel, 1984a, 1984b). This general trend has been confirmed in more recent studies that explore initiation of drug use and the association with mental health illnesses (Large, Sharma, Compton, Slade, & Nielssen, 2011; Trenz et al., 2012). Although onset studies of drug use initiation provide important information of drug use and the natural history of the use alcohol and other illegal drugs in a general population, they do not identify subgroups that differ across time. Longitudinal continuities in the development of behavior have been referred to as trajectories (Toumbourou, Williams, Snow, & White, 2003). Identifying subgroups and the ecological characteristics of those that show different patterns of drug use from adolescence to post-high school life allows the design and implementation of successful public health strategies for this target group.

The health benefits from drug use prevention are well documented by research in psychology, sociology, and health promotion and behavior, but very little is known about the economic impact of drug abuse prevention. One of the expected economic benefits of drug use prevention for adolescents is the increased potential for higher earnings and labor productivity as adults. However, past research on the effects of drug use on adolescents and young adults has been inconsistent and reveals a number of conceptual and methodological challenges. First, previous research has defined productivity narrowly, solely in terms of earnings. Theory developments in labor economics strongly suggest that the education young adults receive after high school is an important predictor of their productivity level and economic success when combined with their employment status. Second, past studies have neglected to account for social ecological factors experienced by youth, which may be
confounded with drug use and estimates of productivity. Lastly, past studies rarely have considered the effect of drug use on productivity status among African American youth and young adults from nonmetropolitan communities.

In the remainder of this chapter, section one defines the problem of drug use in the United States and, specifically, for nonmetropolitan youth. Section two delineates the purpose of the study and the research hypotheses. Finally, section three describes how drug use trajectories and economic evaluations of drug use prevention programs can be applied to develop drug use prevention policies and improve health care decision making.

1.1 Statement of the Problem

The abuse of and dependence on licit and illicit substances are widespread among the general population and are associated with substantial societal, personal, and economic costs (Compton, Thomas, Conway, & Colliver, 2005). The abuse of licit and illicit drugs, such as marijuana and alcohol, is addressed by national and local policies, regulations, and statues. The enforcement of these norms are applied based on the determination of abuse or dependence. The occasional use of these substances is generally overlooked and rarely sanctioned. Marijuana and alcohol dependence and abuse are established by criteria from the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; 4th ed.). The DSM-IV defines dependence when an individual persists in use of alcohol or other drugs despite problems related to use of the substance. Substance dependence may be diagnosed when compulsive and repetitive use results in tolerance to the effect of the drug and when withdrawal symptoms are reduced or stopped (American Psychiatric Association, 1994). According to the DSM-IV criteria for drug and alcohol dependence, at least three out of the seven following criteria must be manifest during a 12-month period. These criteria are: “1)
experience of tolerance, 2) experience of withdrawal symptoms, 3) use of larger amounts or for longer periods than intended, 4) a persistent desire or unsuccessful efforts to cut down, 5) amount of time spent obtaining or recovering from the use of alcohol or drugs, 6) reduction of social, occupational and recreational activities because of drug or alcohol use, and 7) continued use of drugs and alcohol despite the knowledge of alcohol and drug-related harms” (American Psychiatric Association, 1994)

National epidemiologic studies of the prevalence of drug use dependence indicate that 51% of the population used at least one illegal drug at some point in their lives, and 15.4% did so in the past 12 months (Warner, Kessler, Hughes, Anthony, & Nelson, 1995). Estimates from 2007 are similar to those obtained in the 1991 National Household Survey of Drug Abuse, where among respondents in the age range of 15 to 54 years lifetime prevalence of drug use dependence was 45.2% and 12-month prevalence was 16.7% (United States Department of Health and Human Services & National Institutes of Health. National Institute on Drug Abuse, 2008). The National Co-morbidity Survey, a nationally representative mental health survey of adults in the United States of diagnostic and prevalence of DSM-III disorders, suggests a lifetime prevalence of alcohol dependence of 13.2% for the entire population, with 7.5% for females, 19.6% for males, and 14.5% for young adults between 18 and 29 years of age. In addition, this national survey reported a lifetime prevalence of drug dependence of 8.1% for the entire population, with 4.8% for females and 11.6% for males (Warner et al., 1995).

While drug abuse and drug dependence persist as major public health problems, they have long been thought to be primarily metropolitan problems. The empirical literature on nonmetropolitan drug and alcohol use and treatment has been largely descriptive and has
focused on the limited access to preventive services in nonmetropolitan communities (Leukefeld, Clayton, & Myers, 1992). The 2010 national rates of alcohol and marijuana among adolescents were 6.1% for high school seniors, 3.3% for tenth graders, and 1.2% for eighth graders, which was an increase from the 2009 rates of 5.2%, 2.8%, and 1.0%, respectively (Substance Abuse and Mental Health Services Administration, 2010). In nonmetropolitan areas, the overall 2010 rates of adolescence drug use were 7.9% in urbanized counties and 7.3% in less urbanized counties. Among all adolescents surveyed in less urbanized counties of nonmetropolitan areas, the rate of drug use increased from 5.6% in 2008 to 7.3% in 2009. Some of the reported reasons are: increased availability of drugs and economic deterioration of their communities (Substance Abuse and Mental Health Services Administration, 2010). In addition, one 15-year longitudinal study of trends among metropolitan and nonmetropolitan youth samples suggests that metropolitan and nonmetropolitan youth use drugs at similar rates with one notable difference: Nonmetropolitan adolescents have higher rates of binge drinking and 30-day smoking prevalence rate (Cronk & Sarvela, 1997).

Adolescent drug use poses a major threat to the health and well-being of an adolescent. Some of the consequences of adolescent drug use are: 1) poor psychological and social adjustment (Albrecht, Amey, & Miller, 1996), 2) involvement with the criminal justice system (Catalano & Hawkins, 1996), 3) transmission of HIV/AIDS and other sexually transmitted diseases (Cavazos-Rehg et al., 2007), 4) higher likelihood to suffer from intentional and unintentional injuries (Swahn, Simon, Hammig, & Guerrero, 2004), and 5) higher likelihood of future drug abuse problems (Clark, 2004). Therefore,
adolescents engaged in drug use face great challenges to develop into socially productive individuals.

1.2 Purpose of the Study

The goal of this research is to assist public health practitioners and policy makers design local policies and prevention programs to mitigate the health and economic effects of alcohol and marijuana use. To do so, the goal of this project is to identify the potential heavy drug use trajectories to design and implement public health strategies for the most vulnerable and will examine the net longitudinal effect of drug use on the productivity status of nonmetropolitan African American young adults.

The effect of two drugs was assessed: 1) the effect of different patterns of heavy alcohol use from adolescence to post-high school life (18-21 years of age), and 2) the effect of marijuana use when adolescents are likely to have initiated substance use (14 to 16 years of age). Productivity status was determined when the study participants are between 18 and 21 years old.

The following four hypotheses guided the methodological design of this study:

1. African American adolescents will follow different developmental trajectories of heavy alcohol use from early adolescence to young adulthood.

2. African American youth with different trajectories of heavy alcohol use from early adolescence to young adulthood will have distinct productivity outcomes in their early adulthood (age 18 to 21 years), after controlling for individual, family, peer, and community effects.
3. Marijuana use between the ages of 14 and 16 years old will negatively affect the future productivity status of nonmetropolitan African American young adults (age 18 to 21), after controlling for individual, family, peer, and community variables.

4. Heavy alcohol and marijuana use between the ages of 14 and 16 years old will negatively affect the future productivity status of nonmetropolitan African American young adults (age 18 to 21), after controlling for individual, family, peer, and community variables.

1.3 Significance of the Study

Adolescent drug use prevention is a national priority. This study has the potential to contribute to the health care decision making process for the prevention and treatment of drug use. The National Institute of Drug Abuse’s (NIDA) Blue Ribbon Panel on Health Services Research in 2004 highlighted the need to produce more evidence on the effect of drugs for understudied and vulnerable populations, such as nonmetropolitan African American adolescents and their families (National Institute on Drug Abuse, 2004b). NIDA placed a high priority on the economic analyses of drug use prevention. Despite this policy focus, few such studies have been conducted (French & Drummond, 2005; National Institute on Drug Abuse, 2004b).

Based on the results of this study, I will make recommendations regarding: (a) the use of economic analyses in the development of future health policies, (b) the measurement of drug use prevention on productivity gains, and (c) the application of drug use trajectories to target adolescents at higher risk.
CHAPTER 2
LITERATURE REVIEW

The purpose of this study is to investigate the longitudinal effect of drug use on the productivity level of African American nonmetropolitan youth. This chapter reviews the relevant literature from the fields of public health, social sciences, and economics. The chapter is divided into four sections. Section one defines drug use and drug dependence; section two summarizes the protective and risk factors associated with adolescent drug use; section three describes national epidemiological trends of adolescent drug use and the prevalence of drug use in nonmetropolitan communities; and finally, section four discusses the drug effects on productivity outcomes and how it has been applied in African American communities.

2.1 Definition of illicit and legal drug use, dependence and abuse.

Drug use persists as a major public health problem. Most individuals who experiment with drugs during their youth eventually desist, while a small number of youth become problematic or dependent drug users in adulthood (Chen, Kandel, & Davies, 1997). For those severe and dependent users, drug use persists over a significant period of their lives (Hser, Anglin, Grella, Longshore, & Prendergast, 1997).

Drug abuse is generally defined as the habitual use of a drug with the intention to alter one’s mood, emotion or state of consciousness (Koob & Moal, 1997), while drug use dependence and drug abuse is generally determined by the criteria of the Diagnostic and
Statistical Manual of Mental Disorders (DSM-IV, 4th Ed) for Drug Dependence and Drug Abuse (American Psychiatric Association, 1994). Drug dependence or abuse diagnoses, according to current DSM-IV diagnostic criteria, are based on clusters of behaviors and physiological effects occurring within a specific time frame. The diagnosis of dependence always takes precedence over that of abuse, and therefore a diagnosis of abuse is made only if DSM-IV criteria for dependence have never been met (American Psychiatric Association, 1994). A diagnosis of drug use dependence is when the individual meets three or more criteria in a period of 12 months, while abuse is classified as one or more in a 12-month period. Table 2.1 defines drug use dependence and abuse using DSM-IV diagnostic criteria.

<table>
<thead>
<tr>
<th>Dependence</th>
<th>Abuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>(3 or more in a 12-month period)</td>
<td>(1 or more in a 12-month period)</td>
</tr>
<tr>
<td>Symptoms must never have met criteria for drug dependence for this class of drug.</td>
<td>Recurrent use resulting in failure to fulfill major role obligation at work, home or school</td>
</tr>
<tr>
<td>Tolerance (marked increase in amount; marked decrease in effect)</td>
<td>Recurrent use in physically hazardous situations</td>
</tr>
<tr>
<td>Characteristic withdrawal symptoms; drug taken to relieve withdrawal</td>
<td>Recurrent drug related legal problems</td>
</tr>
<tr>
<td>Drug taken in larger amount and for longer period than intended</td>
<td>Continued use despite persistent or recurrent social or interpersonal problems caused or exacerbated by drug</td>
</tr>
<tr>
<td>Persistent desire or repeated unsuccessful attempt to quit</td>
<td></td>
</tr>
<tr>
<td>Much time/activity to obtain, use, recover</td>
<td></td>
</tr>
<tr>
<td>Important social, occupational, or recreational activities given up or reduced</td>
<td></td>
</tr>
<tr>
<td>Use continues despite knowledge of adverse consequences (e.g., failure to fulfill role obligation, use when physically hazardous)</td>
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(American Psychiatric Association, 1994)
2.2 Risk and Protective Factors for Adolescent Drug Use

This section describes the risk and protective factors that affect young people’s drug use behavior by using the following four broad domains: (i) personal characteristics and attitudes of the young person, (ii) family and parenting characteristics (iii) peer group behavior and influences, and (iv) characteristics of the neighborhood in which the young person resides.

The decision to engage in drug use is largely influenced by the adolescent’s socio-demographic characteristics (Petraitis, Flay, & Miller, 1995). Numerous reviews of risk factors associated with adolescent drug use highlight the influence of demographic differences such as gender and age (Hawkins, Catalano, & Miller, 1992). Males, for example, generally report higher rates of alcohol and illicit drug use than females. Gender differences in the temporal developmental stages of licit (legal) and illicit drug use from adolescence through young adulthood are also known. For men, alcohol use often precedes the use of marijuana; alcohol and marijuana use precede other illicit drugs; and alcohol, cigarettes, and marijuana use precede the use of prescribed psychoactive drugs. For women, the pattern of progression is one in which either alcohol or cigarette use precedes marijuana; alcohol, cigarettes, and marijuana use precede other illicit drugs; or alcohol and cigarettes or marijuana precede prescribed psychoactive drugs (Yamaguchi & Kandel, 1984a). More recent national epidemiological studies suggest that gender differences have decreased over time among youth entering high school (Wallace et al., 2003). Other factors include adolescent depressive symptoms and behavior problems. Adolescents diagnosed with depressive symptoms have demonstrated a consistent positive and prospective relationship
to initiation and future frequency of drug use (Haase & Pratschke, 2010). Involvement in delinquent or antisocial behavior increases the likelihood of drug use during adolescent years (Connell, Gilreath, Aklin, & Brex, 2010), while those who report a positive engagement with their educational center or school are less likely to engage in drug use than those with lesser commitment (Bryant, Schulenberg, Bachman, O'Malley, & Johnston, 2000). Religion involvement and frequency of churchgoing are protective factors to adolescent drug use, especially for African American youth (Connell et al., 2010).

The social influences of the family are among the most frequently studied risk or protective factors associated with adolescent drug use (Petraitis et al., 1995; Simons et al., 2006). Supervision has been shown to reduce the association with negative peer influences, levels of aggression, delinquency, and indirectly reduce the likelihood of adolescent drug use (Brody et al., 1994). Parental monitoring and supervision are important contextual influences on initiation and drug use frequency (Hawkins et al., 1992) and may also mediate the influence of deviant adolescents peer associates (Connell et al., 2010).

Peer interactions and perceptions of peer behaviors and attitudes play an important role in shaping adolescent drug use attitudes and behaviors (Petraitis et al., 1995). Peer’s perceptions of drug use are among the most robust risk factors for initiation of drug use and engagement of antisocial behaviors (Connell et al., 2010; D'Amico, Ellickson, Collins, Martino, & Klein, 2005). Marijuana availability combined with peer use predicts substance initiation for White, African American and Asian American youth (Gillmore et al., 1990).

Contextual environment factors influence adolescent attitudes and drug use behavior. Many theoretical perspectives emphasize the role of adolescent perceptions of disorganization within their community as a risk factor for engaging in drug use (Bond,
Toumbourou, Thomas, Catalano, & Patton, 2005). Perceived racial discrimination also suggests drug use among parents and adolescents. In parents, discrimination is mediated with distress, while among adolescents, the relationship is mediated through risky behaviors and willingness to use (Gibbons, Gerrard, Cleveland, Wills, & Brody, 2004).

2.3 National epidemiologic studies of adolescent drug use in non-metropolitan communities

National epidemiologic studies of 1993 of the prevalence of drug use dependence indicate that 51% of the population used at least one illegal drug at some point in their lives, and 15.4% did so in the past 12 months (Warner et al., 1995). Estimates from 2007 are similar to those obtained in the 1991 National Household Survey of Drug Abuse, where among respondents in the age range of 15 to 54 years lifetime prevalence of drug use dependence was 45.2% and 12-month prevalence was 16.7% (United States Department of Health and Human Services & National Institutes of Health. National Institute on Drug Abuse, 2008). The National Co-morbidity Survey, a nationally representative mental health survey of adults in the United States of diagnostic and prevalence of DSM-III disorders, suggests a lifetime prevalence of alcohol dependence of 13.2% for the entire population, with 7.5% for females, 19.6% for males, and 14.5% for young adults between 18 and 29 years of age. In addition, this national survey reported a lifetime prevalence of drug dependence of 8.1% for the entire population, with 4.8% for females and 11.6% for males (Warner et al., 1995).

National researchers and policymakers concerned with the special health needs of rural populations have produced a number of reports and publications that examined the state and prevalence of rural drug use, and defined the qualities of rural life that give it a
special importance in the study of drug use and abuse. In 2004, the National Survey on Drug Use and Health (NSDUH) found that young persons aged 12 to 20 who lived in rural areas reported a similar level of alcohol use in the past month compared with those who lived in non rural areas (29% in both rural and non rural areas). Underage persons in rural areas reported a slightly higher rate of binge alcohol use than those in non rural areas (21% compared to 19%), although this difference was not statistically significant (National Institute on Drug Abuse, 2004a). The National Institute of Drug Abuse (NIDA) published the monograph *Rural Drug Abuse: State of Knowledge and Issues*, which contained a collection of scholarly research and discussion dealing with a variety of drug abuse topics including: drug use among African-American youth; drug abuse among migrant farm workers; health consequences; and intervention, prevention, and treatment strategies (National Institute of Drug Abuse, 1997). In this monograph, Conger and colleagues pose theoretical questions about the role of social structures and processes that influence risky behaviors among rural youth. The author contends that studying the effect of social control in rural areas is unique by stating, that rural communities pose an opportunity to study social processes in that they are not immediately adjacent to other social units and researchers can study how adults come together to jointly influence the development of their children(National Institute of Drug Abuse, 1997). In addition, rural places offered a research setting in which the multiple facets of social, economic, psychological, historical, and cultural experiences could be studied in relatively pure form in terms of how they relate to the risk for alcohol, drug, and tobacco abuse.

A few years later, *No Place to Hide: Drug Abuse in Mid-Size Cities and Rural America* (2000), a study commissioned by the U.S. Conference of Mayors, reported that
rural teens were using alcohol and illicit drugs at higher rates than urban teens, and that illicit drug use rates for young adults and adults were comparable across rural and urban settings. Cronk and Sarvela (1997) used the Monitoring the Future study data, collected from 1976 through 1992, to determine urban-rural differences in 30-day prevalence rates for alcohol, tobacco, marijuana, LSD, cocaine, and inhalant use by high school seniors. The authors found that prevalence rates for alcohol, marijuana, and LSD have declined during the period of the Monitor the Future Study (15 years) in both urban and rural areas. In general, the findings in this study suggested two notable types of trends in the differences between urban and rural high school students. First, for the two licit drugs considered (alcohol and cigarettes), rural students tended to have similar or higher use prevalence than urban students throughout the whole time period. The most relevant contrast was for binge drinking and 30-day smoking prevalence. In addition, among the illicit drugs considered, rates of lifetime marijuana use and daily marijuana use showed the greatest declines. However, these results were insignificant for all intervals, except for interval 1989-1992 (Cronk & Sarvela, 1997).

The empirical evaluation of the causes of adolescent drug use have primarily relied on urban or suburban samples of adolescents, and just a few used rural adolescent samples. Donnermeyer (1992) and Leukefeld et al. (1992). The first study used a small sample of 197 rural and small-town youth to suggest that the age of an individual’s first use of alcohol predicted that individual’s current use of alcohol. The same pattern occurred for marijuana and hard drugs. This research concluded that the risk factors for rural adolescent drug and alcohol use were similar to those identified for non rural and nationally representative samples (e.g., age, gender, ethnicity, academic performance, attachment to school, religion,
quality of relationship with parents, parental monitoring, and peer use). Leukefeld et al. (1992) used the 1985 National Household Survey on Drug Abuse to suggest that problems with transportation, availability of services, and rural-urban differences in help-seeking behavior might have implications for the treatment of alcohol and drug use for rural adolescents. Edwards (1994) and Scaramella and Keyes (2001) agreed that the empirical evidence indicated that rural and urban drug use rates was converging; that both community size and specific community characteristics, family, peers, and school and culture heritage seemed to demonstrate protective influences on adolescent drug use.

Drug progression is different between racial/ethnic groups as well (Mackesy-Amiti, Fendrich, & Goldstein, 1997). In Yamaguchi and Kandel’s 1996 study African Americans were less likely to use other illicit drugs before marijuana compared to non-African Americans, while in Brook et al. (1992) showed that African-American and Puerto Rican adolescents progress from alcohol use (beer/wine) to cigarettes or hard liquor, followed by marijuana, and then other illicit drugs.

Long term patterns of drug use among African-American cohorts have rarely been studied, and if then, with urban samples. Using longitudinal data, Doherty et al. (2008) studied a community cohort of African American inner-city males and females followed from first grade through mid-adulthood. A total of 1,242 African-American first graders residing in Chicago in 1966 were followed up until the participants were 43 years. These authors identified the drug use patterns through mid-adulthood, including lifetime prevalence, age of onset and termination, and sequencing of drugs. Overall, among the general trends of use the authors found considerable amount of abstention with over 40% of the participants never using illicit drugs by mid-adulthood, and over 70% never using
cocaine, and over 90% never using heroin (Doherty, Green, Reisinger, & Ensminger, 2008). The ages of onset among the sample studied in this research confirms Kandel and Yamaguchi’s (1984) gateway hypothesis. Consistent with previous research, the age associated with the highest risk of initiating tobacco use, alcohol use and marijuana use was 17 years of age for marijuana, 18 years for tobacco, and 19 years for alcohol use. Perhaps, one of the most important contributions of this research is the finding that African American inner-city hard drug users have later onset ages than their White counterparts. In this sample, 29% of the heroin users and over 12% of the cocaine users initiated use at age 30 or older, whereas the White population virtually had no onset of use after age 29 (Doherty et al., 2008).

### 2.4 The drug use effect on productivity outcomes

Drug use has important implications for productivity. Estimates of (lifetime or annual) productivity losses due to drug use range from $9 billion (Rice, Kelman, & Miller, 1991) to $37 billion (Harwood, 1984.), with the most recent estimates placing the figure at about $23 billion (National Institute on Drug Abuse, 2004b). Generally, the term *productivity* refers to labor productivity, measured as earnings or wages, employment status, or hours of labor (Fitzmaurice, Laird, & Ware, 2004). Estimates of the economic burden of drug use typically include assumptions and estimations related to lower earnings, lower levels of educational attainment, reduced total work experiences, and poorer performance on the job. Productivity specified in this way is referred to as the Human Capital (HC) approach. In the HC approach, an individual's worth is measured by the discounted value of the individual's future stream of productivity as measured by wages (French & Drummond, 2005; Kaufman & Hotchkiss, 2006). The wages accrued under these suppositions are
grounded in the human capital theory of accumulation of education. Stasz (2001) describes the human capital theory and highlights that education, the skill levels, and problem solving abilities are the characteristics to enable an individual to be productive worker in today's society (Stasz, 2001). The theory contends that investment in education will improve the quality of workers and, consequently, increase the wealth of the community. The HC theory was first utilized to assess economic burden by such leading health economists as Jacob Mincer (1974), Gary Becker (1962), and applied to health outcomes and substance use by Rice and colleagues (Becker, 1962; Mincer, 1974b; Rice et al., 1991). However, the HC approach has often failed to show that more education results in higher earnings in communities have a low quality of schooling or below standard performance schools, high unemployment rates, and social inequalities such as racial discrimination.

Classical econometric research uses the human capital and relies on wages, employment status, and hours of work as the main outcomes measures to approximate labor productivity. Most of the research on the drug use effects on labor market outcomes for youth has focused on the drug-use-wage relationship, but with mixed results. The negative physical and psychological effects of drug use might suggest a similarly negative human capital relationship. However, empirical econometric research has not always found this negative relationship; in fact, many researchers have found a positive relationship (Chatterji & DeSimone, 2006; Gill & Michaels, 1992; Kaestner, 1994; Kandel, Chen, & Gill, 1995; Register & Williams, 1992). Gill and Michaels (1992) used the National Longitudinal Survey of Youth (NLSY) and found that, after accounting for selection bias, drug users received higher wages than non-drug users. Selection bias in this study referred to controlling for unobservable or confounding effects on wages and the decision to use drugs.
simultaneously. Kaestner (1994) compared the same longitudinal survey to his previous 1991 cross-sectional estimates of the relationship between wages and drug use, and estimated new longitudinal effects. These results suggested a large, significant, and positive relationship between illicit drug use and wages in the cross-sectional study. The longitudinal prediction intended to correct for the unobserved characteristics unmeasured by the cross-sectional estimates. The results were also mixed. The estimated wage effect of both marijuana and cocaine use were negative only for men. Among women, the effect of cocaine use remained positive, where cocaine use was related to higher wages (Kaestner, 1994). Kandel, Chen, and Gill (1995) introduced a life-span perspective of wages by investigating the effect of drug use and wages at various stages of the lifecycle. Their results suggested that, by age 35, there are no cumulative effects of the use of illicit drugs on earnings. The effect of early adolescent use was positive through the youth’s 20s, but became negative by the mid-30s (Kandel et al., 1995). Chatterji and DeSimone (2006) empirically explored the effects of drinking as a teenager on labor markets in one’s early adulthood by examining the National Education Longitudinal Study (NELS), by following eighth graders in 1988 for 12 years. She found that adolescent drinking was unrelated to wages for adolescent females, but the relationship was positive for adolescent males, even after controlling for educational attainment, family and job characteristics, and adult drinking behavior (Chatterji & DeSimone, 2006).

The number of studies that have explored the effect of drug use on productivity outcomes for African Americans is scare. To understand how drug use affects young African American youth, one must understand the unique circumstances African American youth face in finding employment, maintaining employment, and increasing their wages as
their experience in the job accumulates. Freeman and colleagues’ (1986) seminal work surveyed a random sample of youth from low-income, predominantly African-American areas in three cities (Boston, Chicago, and Philadelphia), creating the Inner-City African-American youth survey. Table 2.2 presents the authors’ main hypotheses and findings

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Main findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamics of unemployment</td>
<td>• African American youth are out of work for very long periods of time and once unemployed they have great difficulty securing another job.</td>
</tr>
<tr>
<td></td>
<td>• African American youth’s short-term jobs are followed by long spells of being out of work.</td>
</tr>
<tr>
<td></td>
<td>• African American youth have a slow transition between jobs due to their higher likelihood of being laid off or dismissed.</td>
</tr>
<tr>
<td>Demand for labor</td>
<td>• Proximity to work does not affect youth African American employment.</td>
</tr>
<tr>
<td></td>
<td>• African American youth are treated less courteously due to employers’ prejudices regarding speech and dress.</td>
</tr>
<tr>
<td></td>
<td>• Perceived discriminatory behavior by employers affects African American youth’s absenteeism rate, which in turn affects their employability.</td>
</tr>
<tr>
<td>Supply for labor</td>
<td>• Churchgoing is positively related with higher employment status.</td>
</tr>
<tr>
<td></td>
<td>• African American youth with strong long-term career desires are often more employable.</td>
</tr>
<tr>
<td></td>
<td>• Substitution elasticity exists between crime and employment. Those engaged in criminal activity tend to perform poorly when employed and have less chance of becoming employed.</td>
</tr>
<tr>
<td></td>
<td>• African American youth whose families receive public assistance receive lower wages and are less employed.</td>
</tr>
<tr>
<td></td>
<td>• Employment outcomes for African American youth with a female-headed household is no worse than when a man is present.</td>
</tr>
</tbody>
</table>
The authors suggest that the large racial differences in unemployment between White and African-American youth are caused by demand or supply factors. The demand factors have been generally related to discriminatory practices present in the labor market and the state of the local labor market, while the supply factors have to do with African-American youth’s low education, criminal behavior, work attitudes, family welfare status, and drug use (Freeman & Holzer, 1986). In addition to employment status, African American youth face challenges in receiving wages that correspond to their education. Cavazos-Rehg et al (2007) found that African American youth are more likely to earn minimum wages compared to White youth with equal education levels (Cavazos-Rehg et al., 2007). As noted by Kandel et al. (1994), studies may find lower productivity as a result of drug use during early adulthood, but this finding may be related to the age of the youth and the availability of job of the community.
CHAPTER 3

METHODOLOGY

This chapter describes the research methods used for this study. Section one states the research hypotheses. Section two describes the parent study. Section three describes the study design of this project. Section four describes the dependent, independent, and control variables; and section five outlines the data analysis procedures.

3.1 Research Hypotheses

The goal of this research study is to examine the net longitudinal effect of drug use on the productivity status of non metropolitan African American youth. The significance of this research lies in that this population is understudied by econometric research but that has a high priority in drug prevention policy. The following hypotheses guided this study:

1. African American adolescents will follow different developmental trajectories of heavy alcohol use from early adolescence to young adulthood.

2. African American youth with different trajectories of heavy alcohol use from early adolescence to young adulthood will have distinct productivity outcomes in their early adulthood (age 18 to 21 years), after controlling for individual, family, peer, and community effects.
3. Marijuana use between the ages of 14 and 16 years old will negatively affect the future productivity status of nonmetropolitan African American young adults (age 18 to 21), after controlling for individual, family, peer, and community variables.

4. Heavy alcohol and marijuana use between the ages of 14 and 16 years old will negatively affect the future productivity status of nonmetropolitan African American young adults (age 18 to 21), after controlling for individual, family, peer, and community variables.

3.2 The parent study: Family and Community Health Study (FACHS)

In this study, I used data from the Family and Community Health Study (FACHS) to investigate the effect of marijuana and alcohol use on the productivity status of a young adult nonmetropolitan African American sample. FACHS is a multisite investigation of neighborhood and family effects on health and development in African American families living in Georgia and Iowa. FACHS was designed to identify neighborhood and family processes that contribute to the development of school-age African American children in families living outside the city core in a wide variety of community settings (Institute for Social and Behavioral Research, 2008).

The procedures to recruit Georgia and Iowa families were identical. Each family included a child who was in fifth grade at the time of recruitment. Researchers interviewed the target child, his or her primary caregiver, and, when present in the home, a secondary caregiver. FACHS recruited families from neighborhoods that varied in demographic characteristics, specifically their racial composition and economic level. To determine economic level, FACHS used block groups to identify neighborhoods in Iowa and Georgia.
Using 1990 census data, block groups were identified in which the percentage of African American families was high enough to make recruitment economically practical (10% or higher), and in which the percent of families with children living below the poverty line ranged from 10% to 100% percent. Within these criteria, FACHS identified 259 BGs (115 in Georgia and 144 in Iowa) from which they recruited the study families (Simons et al., 2002)

In Georgia, BG locations came from south Atlanta, the Stone Mountain area, Athens, and several small towns and cities in the north central portion of the state. In Iowa, all of the block groups were located in two communities: Waterloo/Cedar Falls, with a metropolitan population of approximately 120,000, and the Des Moines metropolitan area, with a population of approximately 350,000. Families with African American children within the age criterion were identified through the public schools, which provided the names and addresses of all African American students in the fifth grade. In both Georgia and Iowa, families were randomly selected from these rosters and contacted to determine their interest in participating in the project.

I used four waves of data from FACHS for this research. Table 3.1 illustrates the year of data collection, the number of participants, the gender distribution, and age range per FACHS wave.

<table>
<thead>
<tr>
<th>Wave</th>
<th>Year of collection</th>
<th>Number of participants</th>
<th>Age range</th>
<th>Mean / Mode Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave 1</td>
<td>1997</td>
<td>417 (Men) 480 (Women)</td>
<td>9 – 10</td>
<td>10</td>
</tr>
<tr>
<td>Wave 2</td>
<td>1999</td>
<td>362 (Men) 417 (Women)</td>
<td>11 – 13</td>
<td>13</td>
</tr>
<tr>
<td>Wave 3</td>
<td>2004</td>
<td>350 (Men) 417 (Women)</td>
<td>14 – 16</td>
<td>16</td>
</tr>
<tr>
<td>Wave 4</td>
<td>2007</td>
<td>313 (Men) 401 (Women)</td>
<td>18 – 21</td>
<td>19</td>
</tr>
</tbody>
</table>
The characteristics of the participant’s caregivers published by the Institute for Social and Behavior Research in 2008 indicate that in Wave one, 84% of the participants’ primary caregivers were the biological mothers, 5% were biological fathers, 5% were grandmothers, 3% were foster or adoptive parents, 2% were other biological relatives, 1% was stepparents, and less than 1% was nonrelatives. Overall, 93% of the primary caregivers were female. Their mean age was 37 years ($SD$ 8.18 years) with a range of 23 to 80 years. The primary caregivers’ educational levels ranged from less than high school (19%) to a graduate degree (3%); the mode was a high school diploma (41%) and the mean (and median) education level of adolescents’ caregivers was a high-school diploma (Institute for Social and Behavioral Research, 2008).

Previous analyses from wave one indicated that the families that did not participate in data collection post wave one did not differ significantly from those families that continued FACHS involvement with regard to caregiver income and education or child’s age, gender, school performance, or delinquency (Simons et al., 2002). A more recent analysis indicated that individuals who did not participate in Waves 2, 3, and 4 did not differ significantly from those who participated with regard to youths’ age, sex, or participation in delinquency or primary caregivers’ education, household income, or neighborhood characteristics (Simons et al., 2011).

### 3.3 Study Design for the Present Study

For this study, I used a longitudinal design utilizing a social-ecological perspective on the risk and protective factors of drug use and productivity status. The study design is based on extensive research that supports the use of a social-ecological framework to understand adolescent drug use and the individual, family, peer, and community domains
that may influence the likelihood of drug use (Hawkins et al., 1992; Scheier, 2001). In addition, this study included labor market control factors known to affect the economic success of African American youth. These control factors included perception of discriminatory practices in the labor market, the youth’s educational engagement, criminal behavior, work attitudes, and family welfare status (Freeman & Holzer, 1986). As discussed in Chapter 2, this approach has been used infrequently in previous econometric research of the relation between drug use and productivity status (Chatterji & DeSimone, 2006).

I estimated two longitudinal effects of drug use on productivity status using the research hypotheses as a guide. The sequence of analysis was the following:

- First, I developed an outcome measure labeled as “productivity status” representing the participant’s employment and educational attainment between the ages of 18-21 years, collected in Wave four.
- Second, I explored alcohol use trajectories for a time span of 12 years (from age 9-10 to age 18-21) in hypothesis one.
- Third, I explored hypothesis two: If African American youth with different alcohol use trajectories from early adolescence to young adulthood have distinct productivity outcomes in their early adulthood (age 18 to 21 years), after controlling for individual, family, peer, and community effects. Onset studies of adolescent drug use suggest that alcohol initiation begins early in life, with close to one fifth of adolescents initiating alcohol use by age 10, over 50% reporting alcohol use by age 14 and increasing further at age 18 (Kandel & Logan, 1984).
• Fourth, I assessed the effect of marijuana use between 14 and 16 years old on productivity in hypothesis three. Previous research on the life-course of drug use suggests that initiation of marijuana begins to climb at age 13 and peaks at age 18 (Kandel & Logan, 1984). Therefore, assessing the effect of marijuana use at this time will provide insight into the effect of initiation of marijuana use on productivity status as a young adult.

• Last, I explored hypothesis four using all the variables in this research project in a multivariate logistic regression. The effect of heavy alcohol use trajectories and the marijuana use variable were tested in a single model to explore the relation between the two drug use variables and the productivity outcome variable.
3.4 Measures selection

This section describes the variables used in the estimation of the longitudinal effect of African American adolescent drug use on early adulthood productivity status. First, the outcome variable are described and justified, followed by the description of the variables used to test each hypothesis. In the last section, I describe the control variables used in both hypotheses using the social-ecological domains of individual, family, peer, and community. These categories describe the social-ecological influences on drug abuse patterns among nonmetropolitan high school students (Connell et al., 2010). The variables included in the analyses are represented by figure 3.2 and a detailed description of the questions in each scale is available in Appendix A of this dissertation.
Figure 3.2: Relation of control variables with dependent and drug use independent variables

**CONTROL VARIABLES**

**INDIERENT**

**DEPENDENT VARIABLE**

- **Individual Domain**
  1. SES
  2. Academic engagement
  3. Perceptions of academic and employment success
  4. Religion importance
  5. Religion involvement
  6. Gender

- **Family Domain**
  7. Parental Monitoring

- **Peer Domain**
  8. Association with deviant peers

- **Community Domain**
  9. Community Crime
  10. Perception of racial discrimination

**Drug Use**
1. Marijuana Use
2. Alcohol use

**Productivity Status among African American youth (employment status + educational attainment)**
Section One: Outcome variable: Productivity status

The definition of the outcome variable is the result of a review of labor force statistics and measurements in the economics literature, and from exploratory analysis with the data from the productivity question assessed by FACHS in wave four.

Productivity has traditionally been measured by earnings, employment status, or hours of work (Kaufman & Hotchkiss, 2006). In the economics literature, education and work experience are the most common predictors of earnings and employment status (Freeman & Holzer, 1986) and the profitability of education is measured by higher wages (Psacharopoulos, 1994). Consequently, more years of education and work experience should then result in higher income (Mincer, 1974a). This contention applies mainly for mature adults with work experience. FACHS’ employment and income question assessed in Wave four when the adolescents were between the ages of 18-21 (mean, median, and mode=19) explored the employment and education status. Table 3.2 describes the response categories and frequency of these responses.

<table>
<thead>
<tr>
<th>Table 3.2: Employment and income productivity variable (n=714)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Employed by others; part-time or full-time</td>
</tr>
<tr>
<td>Self-employed farm operator</td>
</tr>
<tr>
<td>Self-employed owner of business service</td>
</tr>
<tr>
<td>Part-time student</td>
</tr>
<tr>
<td>Full-time student</td>
</tr>
<tr>
<td>Part-time student working</td>
</tr>
<tr>
<td>Full-time student working</td>
</tr>
<tr>
<td>Participating in vocational trainings</td>
</tr>
<tr>
<td>Full-time homemaker</td>
</tr>
<tr>
<td>Temporarily laid off</td>
</tr>
<tr>
<td>Unemployed</td>
</tr>
<tr>
<td>Permanently disabled</td>
</tr>
</tbody>
</table>
The definition and measurement of the labor force is defined by what is commonly known as the labor force participation rate, which measures the people in the labor force as a percentage of non institutionalized population. In 2004, the labor force participation rate was 66% (Kaufman & Hotchkiss, 2006). The traditional classification of the labor force comprises two groups: employed and the unemployed. The employed group includes anyone working for pay at least one hour a week who is not in an institution or the armed forces. Also counted as employed are two other groups of people: those who work 15 hours or more a week without pay in a family business or at home, and those who have a paying job but are not currently at work because of an illness or other personal reasons. The unemployed group is counted in the labor force because even though these people are not working, they are seeking work and are thus available as labor input for the economy (Kaufman & Hotchkiss, 2006).

These participation rates can also be analyzed using age participation profiles to explain important patterns or trends over the worker’s life cycle. The National Bureau of Labor Statistics indicate that between the ages of 16-17 the labor force participation rate is approximately 30% and increases to approximately to 45% for 18-19 years of age (Bureau of Labor Statistics, 2004). Both of these participation rates are significantly lower than the overall participation rate of the whole labor force 66% mentioned above. On the other hand, most college education seekers are between the ages of 18-22 years of age. Young adults in this age/earning profile make an investment decision to forgone earnings and pay direct costs of education (e.g. tuition, books) to have the monetary benefit of higher earnings after attending college (National Center for Education Statistics, 2000).
Therefore, considering the labor force definitions and measurements, I explored preliminary trends among the FACHS’s study participants to determine the best outcome measure for this study. Table 3.3 re-classified the categories of table 3.2 to reflect study participants’ employment and education categories.

Table 3.3: Education and employment status of productivity categories

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only Working</td>
<td>303</td>
<td>42.5%</td>
</tr>
<tr>
<td>Only Studying</td>
<td>119</td>
<td>17%</td>
</tr>
<tr>
<td>Studying and working</td>
<td>62</td>
<td>8.7%</td>
</tr>
<tr>
<td>Not working/not studying</td>
<td>230</td>
<td>32.0%</td>
</tr>
</tbody>
</table>

This exploratory analysis indicate that study participants are mostly employed and/or at work. Those in the working category compromise those who self-reported working part-time or full-time employed by others, self-employed, farm operator, owner of business service, participating of vocational training or internship and home-makers. Those in the education category self-reported being part-time or full time students. Studying and working are those who self-reported being part-time student working, full-time student working. Finally, those in the not working and not studying are those who self-reported being temporarily laid off, unemployed, or permanently disabled.

Therefore, for the analysis purposes, I categorized adolescents as “unproductive” and coded as 0 if they were in the not working not studying category of table 3.3, and as “productive” if they were in the other three categories. This is a conservative approach, as it assumes that those in the productive category are contributing to their own economic advancement directly and indirectly contributing to the economic growth of their
communities. On the other hand, those in the unproductive category match the classification of unemployed defined by The National Bureau of Labor Statistics.

Section Two: Independent Variables: Drug Use (Marijuana and Alcohol)

To test the research hypotheses one, two and four, I explored the longitudinal trends in the classification of alcohol use among the FACHS’ sample from age 9-11 through ages 18-21. In each wave, FACHS assessed alcohol use with the question: “During the past 12 months, how often have you had a lot to drink, that is, 3 or more drinks at one time?” Response choices were: (1) never, (2) 1-2 times, (3) about 3-11 times, (4) a few times per month, (5) about 1-2 times per week, and (6) several times per week.

Based on these items I constructed three categories of alcohol use to classify participants according to their relative level of heavy alcohol consumption at each of the four waves. Previous research indicates that adolescents go from no-use to experimentation during their youth and then desist, and only a small number become frequent alcohol users in adulthood (Chen et al., 1997). Details of this index are shown in Table 3.4

<table>
<thead>
<tr>
<th>Table 3.4: Alcohol consumption index generated from questionnaire items</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Category</strong></td>
</tr>
<tr>
<td>Non heavy drinkers</td>
</tr>
<tr>
<td><em>(low consumption)</em></td>
</tr>
<tr>
<td>Experimenting with heavy alcohol use</td>
</tr>
<tr>
<td><em>(medium consumption)</em></td>
</tr>
<tr>
<td>Regular heavy alcohol users</td>
</tr>
<tr>
<td><em>(high consumption)</em></td>
</tr>
</tbody>
</table>
To estimate alcohol trajectories using the index described above, I used semi-parametric group-based modeling (SGM). This method identifies trajectories of relatively homogeneous subgroups of individuals who are stable over time, and simultaneously estimates the parameters of the shape and number of trajectories for a range of alternative models. See section 3.5 of this chapter for more information on the estimation procedure and statistical method.

To measure marihuana use and test hypotheses three and four, I used a survey question administered during wave 3 that asked: “During the past 12 months, how often have you used marijuana in order to get high?” Response categories were: (0) *never*, (1) *1-2 times*, (2) *about 3-11 times*, (3) *about 1-2 times a month*, (4) *about 3-4 times a month*, and (5) *more than once a week*. For the analysis, I dichotomized marijuana use into “marijuana abstainers” (coded as 0) representing those self-reporting no marijuana use in the year prior to the study and “marijuana users” (coded as 1). Table 3.5 illustrates these two categories of marijuana use, and the frequency of marijuana use reported. Marijuana trajectories were not explored given that the dataset did not have 2 or more data points to estimate trajectories.

| Table 3.5: FACHS participants report of dichotomized marijuana use in wave 3 (n=767) |
|---------------------------------|-----|---|
| Marijuana use at age 16         | N   | %  |
| Users                           | 623 | 81%|
| Abstainers                      | 144 | 19%|

*Section Three: Control variables*

I used three criteria to select control variables for this study: (1) the empirical literature suggests a potential confounding effect to the relation between drug use and
productivity status and the proposed control variables; (2) scales for the control variables identified in the literature were collected in Wave 1 through 3; and (3) the internal consistency of the scale, measured by Cronbach’s alpha, was greater than 0.65. To uphold the social-ecological perspective in this study, I classified the potential control variables into domains of individual, family, peer, and community factors. These factors have consistently been shown to affect adolescent initiation and frequency of drug use and the productivity potential of African American young adults (Connell et al., 2010; Freeman & Holzer, 1986). Table 3.6 provides the descriptive information for each control variable used in the final model. Appendix A details each question in every scale.

| Table 3.6 Descriptive information of control variables. |
|---------------------------------|-----|-----|-----|-----|-----|
| (1) Socio-Economic status       | -0.1| 1.6 | -6.5:7.23 | - | - | - |
| (2) Academic engagement         | 40.8| 5.3 | 13-52     | 13 | 1-4 | 0.69 |
| (3) Employment and academic success | 35.4| 4.0 | 8-40      | 8  | 1-5 | 0.79 |
| (4) Religion importance         | 3.3 | 0.7 | 1-4       | 1  | 1-4 | - |
| (5) Religion involvement        | 8.5 | 3.7 | 4-20      | 4  | 1-5 | 0.78 |
| (6) Gender                      |     |     |           |    |     |     |
| (7) Parenting monitoring        | 16.1| 3.2 | 5-20      | 5  | 1-4 | 0.78 |
| (8) Affiliation with deviant peers | 25.8| 5.0 | 24-72     | 24 | 1-3 | 0.88 |
| (9) Community Crime             | 11.7| 3.8 | 8-24      | 8  | 1-3 | 0.82 |
| (10) Perceived discrimination   | 22.3| 7.4 | 13-49     | 13 | 1-4 | 0.90 |

I selected six variables from FACHS to represent the individual domain: socio economic status, academic engagement, perceptions to employment and academic success, religious importance, religion involvement, and gender.

(1) Socio-economic status: This is a continuous variable created by the Center for Family Research (CFR) at the University of Georgia that ranges from -6.5 to 7.23. This
range spreads from a negative to a positive number due to that values were centered in zero to normalize the distribution of the data. Two aspects of the participant’s family constructed this variable: reported family annual income and parental education. Both aspects were collected by the family’s caregivers at the time of data collection. Missing data imputation was done for annual income based on the caregiver’s report by researchers from CFR. Low values suggest a lower socio-economic status than does with higher values which will then suggest a higher level of socio economic status.

(2) Academic engagement: Two scales captured study participants’ academic engagement: academic orientation (5 items) and educational perceptions of their own school performance (8 items). These scales have been previously combined by researchers from the Institute for Social and Behavioral Research at the University of Iowa (Institute for Social and Behavioral Research, 2008). Response categories were: 1 = strongly agree, 2 = agree, 3 = disagree, and 4 = strongly disagree. To compute the overall scale, I summed responses to the 13 items. Based on the number of questions and the possible score options, the potential scores ranged from 13-52. Low scores suggest low academic engagement and low perception of educational performance, while high scores indicate better academic engagement and perception of educational performance.

(3) Importance of employment and academic success: This scale contains eight questions with the following response categories: 1 = extremely important, 2 = very important, 3 = somewhat important, 4 = not very important, and 5 = not at all important. For the analysis, I summed responses to create a continuous variable with scores ranging from 8-40. Low scores indicate a high rating on the importance of having occupational plans, securing a
stable job, and having a stable home and family; high scores indicate a lower level of
ingimportance to these factors.

(4) Religious importance: Religious importance to the adolescent was assessed with
the following question: “In general, how important are religious or spiritual beliefs in your
day-to-day life?” Response categories are: 1=very important, 2=fairly important, 3=not too
important, and 4= not at all important. For the analysis, this variable was treated as
continuous, not categorical, and therefore summed the responses.

(5) Religion involvement: Religion involvement was assessed using four questions.
The response categories were: 1=never, 2=1-2 times, 3=3-4 times, 4=more than once a
week, and 5=daily. To calculate the scale, responses were summed to create a continuous
variable with scores ranging from 4-20. Lower scores suggest low frequency and
involvement in church-related activities, while higher scores indicate more involvement
with their church’s or religion’s activities.

(6) Gender: Males were coded as one and females as zero.

(7) Parenting monitoring: Parental monitoring was assessed using five questions
with answers ranging from 1 to 4, where 1=always, 2=often, 3=sometimes, and 4=never.
For the analysis, I summed responses to create a continuous variable with scores ranging
from 5-20. Low scores indicate high parent involvement and monitoring of adolescent’s
activities, and high scores indicate low monitoring from parents.

(8) Deviant peer influence: Association with deviant peers was assessed using a
FACHS friends’ deviant behavior questionnaire. It contains 24 questions with the following
response categories: 1=none of them, 2=some of them, and 3=all of them. For the analysis, I summed responses to create a continuous variable. Scores ranged from 24-72, where low scores indicate a lower number of close friends engaged in deviant or delinquent behaviors and high scores indicate a higher number of close friends engaged in deviant behaviors.

(9) Community criminal activity: Community crime was assessed using the community social disorder questionnaire from FACHS. It contains eight questions the following response categories: 1=often, 2=sometimes, and 3=never. For the analysis, I summed responses to create a continuous variable. Scores ranged from 8-24. Low scores indicate low criminal activity in their community in the last six months such as fights, robberies, sexual assaults, and other community disorder factors, while high scores indicate high level of criminal activity in their community.

(10) Perceived discrimination: Adolescent’s perception of racial discrimination was assessed using 13 questions. The response categories were: 1=never, 2=once or twice, 3=a few times, and 4=frequently. For the analysis, I summed responses to create a continuous variable. Scores ranged from 13-49, where low scores indicate low frequency of experience of discrimination in their community and high scores indicate frequent encounters with discriminatory practices in their community.

3.5 Data Analysis

The data analysis followed a five-step process. First, I developed a productivity outcome measure appropriate for young adults. In the second and third step, I used semi-parametric group-based modeling to identify trajectories of alcohol use and tested hypothesis one with these trajectories in hypothesis two. In the forth step, I tested
hypothesis three using multivariate logistic regression analysis to estimate the effect of marijuana use at age 14 on their productivity status in early adulthood, and other control variables. Finally, in the fifth step I tested if African American youth that use alcohol and marijuana between the ages of 14 and 16 years old will negatively affect the future productivity status of nonmetropolitan African American young adults (age 18 to 21), after controlling for individual, family, peer, and community variables.

3.5.1 Estimation of a productivity outcome

Section 3.4 and Tables 3.2 and 3.3 describe the estimation of the productivity outcome variable.

3.5.2 Estimation of alcohol use trajectories.

I estimated alcohol use trajectories using semi-parametric group-based modeling (SGM). SGM identifies trajectories of relatively homogeneous subgroups of individuals who are stable over time, and simultaneously estimates the parameters of the shape and number of trajectories for a range of alternative models (Toumbourou et al., 2003). SGM models were initially designed to analyze trajectories in the development of delinquent and criminal behavior (Jones, Nagin, & Roeder, 2001) and have been used to examine adolescent alcohol use trajectories in the United States and internationally (Hill, White, Chung, Hawkins, & Catalano, 2000; Toumbourou et al., 2003).

SGM has several useful features. First, it identifies population heterogeneity of the behavior over time by assuming that the population is composed of a mixture of distinct groups defined by their developmental trajectories. Second, SGM can test whether the developmental trajectories predicted by a priori conceptualizations actually are present in the sample data. Third, SGM takes advantage of the time-ordered nature of the data, and is
specifically designed to examine longitudinal (repeated measures) data. Finally, this method includes all participants who have at least two trajectory data points (not necessarily contiguous) to determine parameter estimates and standard errors (Jones & Nagin, 2007).

Using the software module Proc Traj, operated by SAS and developed by Jones, Nagin & Roeder (2001), I used a (LOGIT) model. The time-stable covariate effect on group membership is modeled with a generalized logit function ($\theta_1$ and $\lambda_0$ are taken to be zero for identifiability) in formula 1 (Jones et al., 2001).

$$
Pr (C_i = k \mid Z_i = z_i) = \frac{\text{sum of } \exp (\theta + \lambda z_i)}{\Sigma^k \exp (\theta + \lambda z_i)} \quad (1)
$$

The risk factors affect the likelihood of a particular data trajectory, but is assumed that nothing more can be learned about the data from the risk factors ($Z$), given group ($C$). Thus, we assume the risk factors for subject $i$, $Z_i = (Z_{i1} \ldots Z_{iR})$, and the data trajectory for the subject consisting of the repeated measurements over $T$ measurement periods $Y_i = (Y_{i1} \ldots Y_{it})$ are independent given the group, $C_i$, given that there $k$ groups.

The decision about the number of groups to retain is based on the Bayesian Information Criterion (BIC). The BIC approximates the log factor of the Bayesian Factor so that the change in BIC between two models being compared is approximately equal to $-2$ times the log of the likelihood of the $j + 1$ group minus the log of the likelihood of the $j$ group model. While not considered the only test statistic for model fit, the BIC value is considered a good indication of the most parsimonious model and optimal number of groups (Jones & Nagin, 2007).
The final model selection was based on two criteria:

1. a minimum six-point reduction in absolute Bayesian information criterion (BIC) measuring optimal improvements and parsimony (Raftery, 1995), and
2. a minimum 5% proportion in each trajectory group (Toumbourou et al., 2003).

3.5.3 Multivariate logistic regression: Alcohol trajectories

Following the identification of the alcohol trajectories I conducted a multiple logistic regression to determine the relation between alcohol use trajectories and an individual’s productivity status. I estimated unadjusted and adjusted logistic regressions. Unadjusted estimates included only the alcohol trajectories (formula 2), while the adjusted estimates included the alcohol trajectories and the control variables to address their possible confounding effect (formula 3). I used stepwise forward selection at a significance level of 0.05 to select the variables in the model. Forward selection begins with the null model with only the intercept, then adds variables sequentially, at each step adding the variable that promises to make the biggest additional contribution to the model (Vittinghoff, Glidden, Shiboski, & McCulloch, 2005).

\[
P(\text{productivity}) = \frac{e^{a + \alpha A_{w1-4}}}{1 + e^{a + \alpha A_{w1-4}}}
\]

\(a = \) constant
\(A_{w1-4} = \) dichotomous variable of alcohol use probability trajectories
\[ P(\text{productivity}) = \frac{e^{a+\alpha A_{w1-4}+\alpha SES(w3)+\alpha AE(w3)+\alpha EP(w3)+\alpha G(w1-4)+\alpha PM(w3)+\alpha DP(w3)+\alpha CC(w3)+\alpha PD(w3)}}{1 + e^{a+\alpha A_{w1-4}+\alpha SES(w3)+\alpha AE(w3)+\alpha EP(w3)+\alpha G(w1-4)+\alpha PM(w3)+\alpha DP(w3)+\alpha CC(w3)+\alpha PD(w3)}} \]

\( a = \text{constant} \)  
\( A_{w1-4} = \text{dichotomous variable of alcohol use probability trajectories} \)  
\( SES_{w3} = \text{socio-economic status point estimate at } w3 \)  
\( AE_{w3} = \text{academic engagement point estimate at } w3 \)  
\( EP_{w3} = \text{employment perceptions point estimate at } w3 \)  
\( G_{w1-4} = \text{gender (w1-4)} \)  
\( PM_{w3} = \text{parent’s monitoring point estimate at } w3 \)  
\( DP_{w3} = \text{deviant peers point estimate at } w3 \)  
\( CC_{w3} = \text{community crime point estimate at } w3 \)  
\( PD_{w3} = \text{perceived discrimination point estimate at } w3 \)  

3.5.4 Multivariate logistic regression of marijuana use

I conducted a multiple logistic regression analysis to determine the relation between marijuana use and an individual’s productivity status. I estimated unadjusted and adjusted logistic regressions. Unadjusted estimates included only the marijuana use variable (formula 4), while the adjusted estimates included the marijuana use variable and control variables to address their possible confounding effect (formula 5). As with the previous analysis, I used stepwise forward selection at a significance level of 0.05 during the logistic data analysis.

\[ P(\text{productivity}) = \frac{e^{a+\alpha M_{w1-4}}}{1 + e^{a+\alpha M_{w1-4}}} \]

\( a = \text{constant} \)  
\( A_{w1-4} = \text{dichotomous variable of alcohol use probability trajectories} \)
$P(\text{productivity}) = \frac{e^{\alpha + \alpha M_{w3}+\alpha A_{w1-4}}}{1+e^{\alpha + \alpha M_{w3}+\alpha A_{w1-4}}}$

a= constant
M_{w3}= dichotomous variable of marijuana use
A_{w1-4}= dichotomous variable of alcohol use probability trajectories

3.5.4 Full model – Marijuana and alcohol use multivariate logistic regression

I conducted a multiple logistic regression analysis to determine the relation between marijuana and alcohol use trajectories on an individual’s productivity status together. First, I established an unadjusted logistic prediction of drug use on productivity status without the control variables. Then, I added the sets of control variables described above. Unadjusted logistic estimate between productivity status and marijuana and alcohol use is described by the following equation:

$P(\text{productivity}) = \frac{e^{\alpha + \alpha M_{w3}+\alpha A_{w1-4}}}{1+e^{\alpha + \alpha M_{w3}+\alpha A_{w1-4}}}$

a= constant
M_{w3}= dichotomous variable of marijuana use
A_{w1-4}= dichotomous variable of alcohol use probability trajectories
The adjusted logistic estimate includes the two drug use variables described in equation (6), and adds the control variables. I used stepwise forward selection at a significance level of 0.05. Forward selection begins with the null model with only the intercept, then adds variables sequentially, at each step adding the variable that promises to make the biggest additional contribution to the model. The final model used is represented by formula (7).

\[
P(\text{productivity}) = \frac{e^{a + \alpha M_3 + \alpha A_1 - 4 + \alpha SES_3 + \alpha AE_3 + \alpha EP_3 + \alpha G_1 - 4 + \alpha PM_3 + \alpha DP_3}}{1 + e^{a + \alpha M_3 + \alpha A_1 - 4 + \alpha SES_3 + \alpha AE_3 + \alpha EP_3 + \alpha G_1 - 4 + \alpha PM_3 + \alpha DP_3}}
\]

\(a=\text{constant}\)
\(M_3=\text{dichotomous variable of marijuana use}\)
\(A_1=\text{dichotomous variable of alcohol use probability trajectories}\)
\(SES_3=\text{socio-economic status point estimate at } w3\)
\(AE_3=\text{academic engagement point estimate at } w3\)
\(EP_3=\text{employment perceptions point estimate at } w3\)
\(G_1=\text{gender (w1-4)}\)
\(PM_3=\text{parent’s monitoring point estimate at } w3\)
\(DP_3=\text{deviant peers point estimate at } w3\)
\(CC_3=\text{community crime point estimate at } w3\)
\(PD_3=\text{perceived discrimination point estimate at } w3\)
CHAPTER 4

RESULTS

In this study, I evaluated the effect of drug use on the productivity status of African American young adults. At present, little is known about the longitudinal effect of drug use on this population’s productivity taking into account the confounding effect of family, peers and community levels factors. I assessed marijuana use at approximately 16 years of age and alcohol use longitudinally through probability trajectories of alcohol use from adolescence through young adult years. I categorized productivity status as productive and unproductive at approximately 19 years of age.

The results are organized into four sections. Section one describes the alcohol trajectories identified and the results of testing hypotheses one. Section two, uses the results from hypothesis one and uses multivariate logistic regression to test hypothesis two. Section three describes the results from testing hypothesis three. The last section describes the results of the multivariate logistic regression of productivity status and the effect of drug use for alcohol and marijuana use together after controlling for family and community level factors represented by hypothesis four.
4.1 Hypothesis one: Estimation of alcohol use trajectories

Table 4.1 summarizes the cross-sectional prevalence of heavy alcohol use at each wave of data collection by gender.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Wave 1</th>
<th>Wave 2</th>
<th>Wave 3</th>
<th>Wave 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Non drinkers (low)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>408</td>
<td>366</td>
<td>282</td>
<td>252</td>
</tr>
<tr>
<td>Male</td>
<td>331</td>
<td>318</td>
<td>338</td>
<td>183</td>
</tr>
<tr>
<td>Experimenting with alcohol (medium)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>12</td>
<td>19</td>
<td>61</td>
<td>98</td>
</tr>
<tr>
<td>Male</td>
<td>8</td>
<td>8</td>
<td>54</td>
<td>70</td>
</tr>
<tr>
<td>Drinking regularly (high)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0</td>
<td>0</td>
<td>18</td>
<td>30</td>
</tr>
<tr>
<td>Male</td>
<td>1</td>
<td>1</td>
<td>14</td>
<td>42</td>
</tr>
</tbody>
</table>

No significant differences were found between study participants’ alcohol use between Wave one and Wave two ($\chi^2=11.38; p=0.72$, df=2), but significant changes were observed between Wave two and Wave three ($\chi^2=85.80; p<0.001$, df=2) and between wave three and four ($\chi^2=107.70; p<0.001$, df=2). The greatest increase in alcohol use was reported during this last period. From Wave three to Wave four, a 27% decrease was observed in the non-drinker proportion of study participants. No significant gender differences were observed in alcohol consumption across waves.

Following this descriptive investigation of heavy alcohol drinking changes between successive study waves, I identified subgroups within the sample according to their general pattern of movement between drinking categories across the four survey waves. These subgroups, or trajectories, were estimated using SAS Proc Traj procedure (Jones et al., 2001). [See section 3.5.1 of the methods chapter more details on these methods]. Table 4.2 presents the model results.
<table>
<thead>
<tr>
<th>Number of trajectories in the model</th>
<th>BIC  (^1)</th>
<th>(\Delta) BIC (^2)</th>
<th>% Membership (^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-1081.25</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>2</td>
<td>\textbf{-1076.16}</td>
<td>\textbf{10.18}</td>
<td>7.30%</td>
</tr>
<tr>
<td>3</td>
<td>-1089.91</td>
<td>-27.50</td>
<td>17.50%</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>\textit{Singular convergence} (^4)</td>
</tr>
</tbody>
</table>

\(^1\) Bayesian information criterion.  
\(^2\) Changes in BIC between successive model iterations.  
\(^3\) Proportion of sample occurring in the \textit{smallest} trajectory group

Based on the criteria for model selection described previously (a minimum six-point reduction in absolute Bayesian information criterion (BIC) and a minimum 5\% proportion in each trajectory group), I found two optimally modeled groups. Group one describes the majority of the sample (92.6\%) and has a low probability of heavy alcohol use. Members of group one have on average a 10\% probability of alcohol use by age 15 and 20\% use by age 19. Group two represents 7.4\% of the sample and has a high probability of heavy alcohol use. More specifically, members of Group two have a 90\% or greater probability of heavy alcohol use by age 15, and 100\% use by age 19. The groups did not differ by gender \(\chi^2=0.02; \ p=0.88, \ df=1\).

Figure 4.1 illustrates the alcohol trajectories for the two groups modeled. The y-axis corresponds to the probability of heavy alcohol use based on an increasing alcohol pattern during the period of analysis, and the x-axis corresponds to the sample’s average age in each data collection point. To achieve model parsimony, time was centered in zero to represent the different time points and the distance between the data collection dates.
4.2 Hypothesis two: The longitudinal effect of high alcohol use on productivity

To compare the control variables by alcohol trajectories I categorized the individual, family, peer and community continuous variables into two categories. The first category describes those in the 50% highest percentile and the remaining in the lowest percentile, and then I cross-tabulated these categories with the alcohol trajectories (see table 4.3 for the results of this analysis).
Table 4.3: Demographic characterization by group membership

<table>
<thead>
<tr>
<th></th>
<th>(Group 1) Low probability of heavy alcohol use trajectory</th>
<th>(Group 2) High probability of heavy alcohol use trajectory</th>
<th>$\chi^2$</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Productive</td>
<td>442 (68%)</td>
<td>42 (63.6%)</td>
<td>0.60</td>
<td>0.449</td>
</tr>
<tr>
<td>Unproductive</td>
<td>206 (32%)</td>
<td>24 (36.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socioeconomic status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest percentile</td>
<td>503 (61.2%)</td>
<td>28 (41.7%)</td>
<td>0.20</td>
<td>0.630</td>
</tr>
<tr>
<td>Highest percentile</td>
<td>319 (38.8%)</td>
<td>39 (58.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic engagement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest percentile</td>
<td>319 (38.8%)</td>
<td>46 (68.6%)</td>
<td>22.8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Highest percentile</td>
<td>503 (61.2%)</td>
<td>21 (31.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment and academic success</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest percentile</td>
<td>319 (38.8%)</td>
<td>46 (68.6%)</td>
<td>22.8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Highest percentile</td>
<td>503 (61.2%)</td>
<td>21 (31.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Religion importance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest percentile</td>
<td>74 (9%)</td>
<td>15 (22.3%)</td>
<td>12.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Highest percentile</td>
<td>748 (91%)</td>
<td>52 (77.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental monitoring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest percentile</td>
<td>301 (36.6%)</td>
<td>52 (77.7%)</td>
<td>43.4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Highest percentile</td>
<td>521 (63.4%)</td>
<td>15 (22.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affiliation with deviant peers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest percentile</td>
<td>371 (45.2%)</td>
<td>10 (15%)</td>
<td>23.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Highest percentile</td>
<td>451 (54.8%)</td>
<td>57 (85%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community crime</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest percentile</td>
<td>342 (41.6%)</td>
<td>19 (28.3%)</td>
<td>4.50</td>
<td>0.034</td>
</tr>
<tr>
<td>Highest percentile</td>
<td>480 (58.4%)</td>
<td>48 (71.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived discrimination</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest percentile</td>
<td>327 (40%)</td>
<td>15 (22.4%)</td>
<td>7.91</td>
<td>0.005</td>
</tr>
<tr>
<td>Highest percentile</td>
<td>495 (60%)</td>
<td>52 (77.6%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In table 4.3, I categorized the highest and lowest percentile in function of group membership to heavy alcohol use trajectories. In other words, in this table I present the distribution of the study participants as a function of the number and proportion of participants in each trajectory. As expected, the proportion of participants is heavily skewed
toward Group one, given that 93% of the sample was in group one. In summary student participants were between 85 and 95% in group one as a function of the control variables.

In addition, in Table 4.3 I tested for significant differences between the percentile categories and group membership of heavy alcohol use trajectories. In this analysis, I find that adolescents in the low probability of heavy alcohol use trajectory (group one) were significantly different from those in group two in their academic engagement, religion importance, employment and academic success perceptions, parental monitoring, affiliation with deviant peers, community crime and perceived discrimination. A review of the standardized residuals to determine what categories (cells) were major contributors to the statistical difference indicates that the cells under Group one in each of the control variables crosstab were the major contributor to the significant chi-square test statistic. No significance differences were found for productivity status, socio-economic status and community crime.
In hypothesis two, I tested whether those in the high probability of alcohol use trajectory from early adolescence through their early adulthood were less likely to be productive. An unadjusted and adjusted logistic prediction indicates no significant effect. The odds ratio of the variable of interest (productivity status) did not change significantly in the unadjusted and adjusted model, suggesting no confounding effect of the control variables. The only control variable with a significance of \( p<0.005 \) was socio-economic status. Table 4.4 shows the results of the bivariate and multivariate logistic regression.

Therefore, I reject the hypothesis and conclude that those with a high probability of alcohol use trajectory were equally likely to be productive than those in a low probability of alcohol use trajectory.

<table>
<thead>
<tr>
<th>Table 4.4: Unadjusted and adjusted logistic productivity prediction on the effect of alcohol use trajectories</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Unadjusted</strong></td>
</tr>
<tr>
<td><strong>Adjusted</strong></td>
</tr>
<tr>
<td>Unadjusted</td>
</tr>
<tr>
<td>Alcohol_traj</td>
</tr>
<tr>
<td>Community crime</td>
</tr>
<tr>
<td>Aff. w/deviant peers</td>
</tr>
<tr>
<td>Parental monitoring</td>
</tr>
<tr>
<td>Academic engagement</td>
</tr>
<tr>
<td>Religion importance</td>
</tr>
<tr>
<td>Religion involvement</td>
</tr>
<tr>
<td>SES</td>
</tr>
<tr>
<td>Perceived discrimination</td>
</tr>
</tbody>
</table>

* \( p<0.001 \)
** \( p<0.005 \)
### 4.3 Hypothesis three: The longitudinal effect of marijuana use on productivity

In hypothesis two I tested if those using marijuana at ages 14 to 16 are less likely to be productive than those who have not initiated any marijuana use. Table 3.5 of the previous chapter details the marijuana use categories tested. In Table 4.5, I categorized the highest and lowest percentile of each control variable in function of the two groups of marijuana use (users/abstainers). The distribution of the study participants in this table is shown in function of the number and proportion of participants in category of marijuana user.

<table>
<thead>
<tr>
<th></th>
<th>Marijuana users</th>
<th>Marijuana abstainers</th>
<th>$x^2$ (df=1)</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Productivity status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Productive</td>
<td>72 (60%)</td>
<td>386 (69.5%)</td>
<td>4.12</td>
<td>0.004</td>
</tr>
<tr>
<td>Unproductive</td>
<td>48 (40%)</td>
<td>169 (30.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Socio-Economic status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest quintile</td>
<td>56 (39%)</td>
<td>283 (45.5%)</td>
<td>2.02</td>
<td>0.155</td>
</tr>
<tr>
<td>Highest quintile</td>
<td>88 (61%)</td>
<td>340 (54.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Academic engagement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest quintile</td>
<td>91 (63%)</td>
<td>274 (44%)</td>
<td>17.31</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Highest quintile</td>
<td>53 (37%)</td>
<td>349 (56%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Employment and academic success</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest quintile</td>
<td>41 (28.5%)</td>
<td>60 (9.6%)</td>
<td>36.31</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Highest quintile</td>
<td>103 (71.5%)</td>
<td>563 (90.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Religion importance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest quintile</td>
<td>26 (18%)</td>
<td>63 (10.1%)</td>
<td>7.19</td>
<td>0.007</td>
</tr>
<tr>
<td>Highest quintile</td>
<td>118 (82%)</td>
<td>560 (89.9%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Parental monitoring</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest quintile</td>
<td>101 (70%)</td>
<td>252 (40.4%)</td>
<td>41.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Highest quintile</td>
<td>43 (30%)</td>
<td>371 (59.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Affiliation with deviant peers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest quintile</td>
<td>14 (9.7%)</td>
<td>367 (59%)</td>
<td>113.19</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Highest quintile</td>
<td>130 (90.3%)</td>
<td>256 (41%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Community crime</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest quintile</td>
<td>39 (27%)</td>
<td>322 (51.6%)</td>
<td>28.41</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Highest quintile</td>
<td>105 (73%)</td>
<td>301 (48.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Perceived discrimination</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest quintile</td>
<td>33 (23%)</td>
<td>309 (49.5%)</td>
<td>33.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Highest quintile</td>
<td>111 (77%)</td>
<td>314 (50.5%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In addition, I tested for significant differences between the control percentile categories and the marijuana use categories. In this analysis, I find that marijuana users were significantly different from those self identified as marijuana abstainers in their academic engagement, employment and academic success perceptions, parental monitoring, affiliation with deviant peers, community crime and perceived discrimination at <0.001 and statistically different in terms of their productivity status at a <0.005. No significance differences were found for socio-economic status and religion importance. A review of the standardized residuals to determine what categories (cells) were major contributors to the statistical difference indicates that those in the highest percentile among marijuana abstainers in the academic engagement, perceptions of employment and economic success and parental monitoring categories were the major contributors to the statistical significance difference. On the other hand, those in the lowest percentile among marijuana abstainers for affiliation for deviant peers, community crime and perceived discrimination were the major contributors to the statistical significance difference. No significance differences were found for productivity status, socio-economic status and community crime.

In hypothesis three, I tested for unadjusted and adjusted estimates of the effect of marijuana use on productivity status. The results of these estimates indicate that marijuana users at age 16 are 35% less likely to be productive at age 21 than those who have not initiated marijuana use (p<0.005), in the unadjusted model. However, the adjusted logistic prediction indicates no significant effect. The odds ratio of the variable of interest (productivity status) did not change significantly in the unadjusted and adjusted model, suggesting no confounding effect of the control variables. Table 4.6 shows the results of the bivariate and multivariate logistic regression.
For the two variables with a significance level of p<0.05, I explored if marijuana users versus abstainers are significantly different by categories of socio economic status and academic engagement. The results of that analysis indicate no statistically significant differences between marijuana users versus abstainers by categories of socio economic status ($x^2 = 2.02, p=0.122, df=1$), but I found a statistically significant differences between marijuana users versus abstainers by categories of academic engagement ($x^2 = 17.31, p<0.001, df=1$).

Therefore, I reject the hypothesis and conclude that those who initiated marijuana use between the ages of 14 and 16 were equally likely to be productive at age 21 than those who had abstained from marijuana use.
4.4 Hypothesis four: Multiple logistic prediction of the effect of alcohol use trajectories and marijuana use on the productivity status for African American young adults.

Before conducting the logistic prediction in hypothesis four, I explored the distribution of marijuana users and abstainers and of those in the high and low probability trajectories of alcohol use in the productivity status categories in table 3.3 and the productivity outcome variable (productive/unproductive). In table 4.7, illustrate the distribution of the study participants in terms of their productive status outcome variable and the drug use variables.

<table>
<thead>
<tr>
<th>Group 1 (Low prob)**</th>
<th>Group 2 (High prob)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productive</td>
<td>Unproductive</td>
</tr>
<tr>
<td>Marijuana Abstainers*</td>
<td>57%</td>
</tr>
<tr>
<td>Marijuana Users*</td>
<td>10.7%</td>
</tr>
<tr>
<td>386</td>
<td>72</td>
</tr>
<tr>
<td>442</td>
<td>42</td>
</tr>
<tr>
<td>61.9%</td>
<td>28.9%</td>
</tr>
<tr>
<td>5.9%</td>
<td>3.4%</td>
</tr>
</tbody>
</table>

* Note that the number of participants in the cross tabulation is 675
** Note that the number of participants in cross tabulation is 714

This analysis indicates that one third of unproductive young adults self-report never using marijuana (abstainers), and that among productive young adults 57% are marijuana abstainers and close to 11% report using marijuana in the last 12 months. Similarly, 62% of young adults in the productive category are in the low probability of heavy alcohol use trajectory and only 6% of them are in the high probability of heavy alcohol use trajectory. Conversely, among those in the unproductive category, close to 29% are in the low probability of heavy alcohol use trajectory and only 3.4% are in the high probability of heavy alcohol use trajectory.
In addition, I explored the drug use variables and the categories of table 3.3. With this cross tabulation, I wanted to understand the difference in the proportion of participants in each of the productive categories as a function of the drug use variables. These results are presented in table 4.8.

<table>
<thead>
<tr>
<th>Table 4.8: Productivity categories in function of drug use variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Working</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Studying</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Studying and working</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Not working/studying</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

* Note that the number of participants in the cross tabulation is 675
** Note that the number of participants in cross tabulation is 714

In this analysis indicates that among the 303 young adults working, 70% are marijuana abstainers and 91.4% are in the low probability of heavy alcohol use trajectory. Among those in the studying category 77.3% are in the abstainer’s category, while this percentage falls to 72.5% for those in the studying and working category and to the lowest proportion of 63.1% for those who report not working or studying. In fact, those in the not working/not studying category have the highest proportion of participation in the marijuana users category (37%), and a 10.6% of proportion participation in the high probability of heavy alcohol use category.

Following this analysis, I explored the correlation between the variables to examine the relation between the control variables, the drug use variables and the productivity outcome variable. The results suggest a medium-to-low correlation between the variables. Alcohol trajectories were significantly correlated with deviant peers (r=0.234), and parental
monitoring (r=0.233) at p<0.01, and marijuana use has a positive correlation with affiliation with deviant peers (r=0.428), perceptions of community crime (r=0.212), perceived discrimination (r=0.222) and academic engagement (r=-0.267), and a negative significant correlation with parental monitoring (r=-0.287) at p<0.01. I expected to find that the variables of academic engagement and productivity status highly correlated, given that this control variable is measuring the youth’s predisposition to advance in his or her career. However, the correlation coefficient between these two variables is low with an r=0.077. Table 4.9 presents the correlation coefficients between all the variables in the model.
Table 4.9: Correlation table between drug use and independent control variables

<table>
<thead>
<tr>
<th></th>
<th>PS</th>
<th>AT</th>
<th>MU</th>
<th>G</th>
<th>CC</th>
<th>PD</th>
<th>AD</th>
<th>PM</th>
<th>AE</th>
<th>RIM</th>
<th>RIV</th>
<th>SES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Productivity status (PS)</strong></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Alcohol trajectories (AT)</strong></td>
<td>-0.117</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Marijuana Use (MU)</strong></td>
<td>-0.080*</td>
<td>0.38*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gender (G)</strong></td>
<td>-0.039</td>
<td>-0.005</td>
<td>-0.031</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Community Crime (CC)</strong></td>
<td>-0.002</td>
<td>0.074**</td>
<td>0.212*</td>
<td>0.058</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Perceived Discrimination (PD)</strong></td>
<td>0.050</td>
<td>0.081</td>
<td>0.222*</td>
<td>-0.027</td>
<td>0.215*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Affiliation w/deviant peers (AD)</strong></td>
<td>0.017</td>
<td>0.234*</td>
<td>0.428*</td>
<td>-0.020</td>
<td>0.285*</td>
<td>0.326*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Parental monitoring (PM)</strong></td>
<td>0.012</td>
<td>-0.233*</td>
<td>-0.287*</td>
<td>-0.152*</td>
<td>-0.207*</td>
<td>-0.081**</td>
<td>-0.339*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Academic engagement (AE)</strong></td>
<td>0.077</td>
<td>-0.172*</td>
<td>-0.267*</td>
<td>-0.149*</td>
<td>-0.134*</td>
<td>-0.140**</td>
<td>-0.276*</td>
<td>0.362*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Religion importance (RIM)</strong></td>
<td>0.037</td>
<td>-0.088</td>
<td>-0.157*</td>
<td>-0.119**</td>
<td>-0.023</td>
<td>-0.005</td>
<td>-0.190*</td>
<td>-0.244*</td>
<td>0.268*</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Religion involvement (RIV)</strong></td>
<td>-0.029</td>
<td>-0.117**</td>
<td>-0.157*</td>
<td>-0.084</td>
<td>-0.037</td>
<td>0.010</td>
<td>-0.208*</td>
<td>0.179*</td>
<td>0.217*</td>
<td>0.341*</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>SES</strong></td>
<td>0.081</td>
<td>0.068</td>
<td>0.086</td>
<td>-0.012</td>
<td>-0.119</td>
<td>0.077</td>
<td>0.05</td>
<td>-0.0744</td>
<td>-0.022</td>
<td>0.053</td>
<td>0.045</td>
<td>1</td>
</tr>
</tbody>
</table>

* p<0.001
**p<0.005
I first estimated an unadjusted logistic prediction of the effect of drug use on productivity status without the control variables. This analysis indicate that those who reported using marijuana at age 16, were 35% less likely to be productive between the ages of 19-21 years of age (OR: 0.65; SE=.13; CI: 0.43; 0.98). Heavy alcohol probability trajectories were not statistically significant. Results of the unadjusted logistic regression model are presented in table 4.10.

| Table 4.10: Unadjusted logistic productivity prediction |
|-----------------|-----------------|------|-----|-----------------|-----------------|
|                 | OR          | St. Error | Z    | P>|z|   | 95% confidence interval |
| Marijuana use in wave 3 | 0.656       | 0.136     | -2.02 | 0.043 | -0.436 - 0.987       |
| Heavy alcohol trajectories (high/low) | 1.0277      | 0.308     | 0.09  | 0.929 | 0.570 - 1.849       |

In the second step of the multivariate logistic analysis, I used step forward selection to include the control variables. Table 4.11 presents the results of the full model. The results indicate that after controlling for the individual, family, per, and community variables, neither drug use independent variables were significant predictors of productivity as defined in this study. Socio-economic status was significant at p<0.005, however the odds ratio of the unadjusted and adjusted models did not change significantly for either of the drug use variables (OR_{marijuana}=0.65 compared OR_{marijuana}=0.63 respectively and OR_{alcohol}=1.02 compared to OR_{alcohol}=0.988).
| Variable                               | OR   | St. Error | Z     | P>|z|   | 95% confidence interval |
|----------------------------------------|------|-----------|-------|-------|-------------------------|
| Marijuana use (wave3)                  | 0.636| 0.187     | -1.53 | 0.126 | 0.356 1.134             |
| Alcohol trajectories                   | 0.988| 0.349     | -0.03 | 0.974 | 0.494 1.976             |
| Male                                   | 0.971| 0.184     | -0.15 | 0.881 | 0.669 1.411             |
| Community Crime                        | 1.008| 0.029     | 0.29  | 0.770 | 0.952 1.068             |
| Perceived discrimination               | 1.014| 0.014     | 1.03  | 0.304 | 0.986 1.040             |
| Affiliation w/deviant peers            | 1.024| 0.023     | 0.96  | 0.336 | 0.977 1.069             |
| Parent monitoring                      | 0.972| 0.033     | -0.79 | 0.430 | 0.908 1.041             |
| Religion importance                    | 0.977| 0.146     | -0.165| 0.876 | 0.737 1.294             |
| Religion involvement                   | 0.973| 0.026     | -0.99 | 0.322 | 0.924 1.024             |
| Employment perceptions                 | 1.046| 0.026     | 1.40  | 0.163 | 0.985 1.089             |
| SES                                    | 1.112| 0.063     | 1.96  | 0.050 | 0.999 1.245             |
| Academic engagement                    | 0.362| 0.167     | 2.17  | 0.03**| 0.003 0.069             |
| constant                               | -0.745| 0.684     | -1.09 | 0.276 | -2.08 0.596             |

**p<0.005

As noted above, a confounding effect was expected between academic advancement and employment perceptions on the outcome variable, as different components of the outcome variable can be related to what is measured in these control variables. Therefore, I tested the full model without these two variables and found no confounding effect. These variables did not impact the odds ratio, nor did it change the significance of the other control variables. Table 4.12 presents the results of this analysis.
Table 4.12: Adjusted multivariate logistic estimate of marijuana and heavy alcohol use on productivity status

|                              | OR   | st.err | Z     | P>|z|  | 95% CI |
|------------------------------|------|--------|-------|-----|--------|
| Marijuana use                | 0.63 | 0.18   | -1.5  | 0.12| 0.35   | 1.13   |
| Heavy alcohol use traj       | 0.99 | 0.35   | -0.02 | 0.98| 0.49   | 1.98   |
| Community crime              | 1    | 0.029  | 0.27  | 0.785| 0.95   | 1.068  |
| Aff. w/deviant peers         | 1.02 | 0.023  | 1.2   | 0.229| 0.97   | 1.07   |
| Parental monitoring          | 0.97 | 0.033  | -0.66 | 0.508| 0.91   | 1.04   |
| Religion importance          | 0.98 | 0.14   | -0.15 | 0.88 | 0.73   | 1.29   |
| Religion involvement         | 0.97 | 0.025  | -0.97 | 0.33 | 0.92   | 1.02   |
| SES                          | 1.11 | 0.063  | 1.96  | 0.05 | 0.99   | 1.24   |
| Perceived discrimination     | 1.01 | 0.14   | 0.92  | 0.36 | 0.98   | 1.06   |
CHAPTER 5

DISCUSSION

The purpose of this research was to examine the net longitudinal effect of drug use on the productivity status of a non-metropolitan African American sample to help decision-makers better target drug prevention policies at the community level. Four research hypotheses guided this research project: (1) African American adolescents will follow different developmental trajectories of heavy alcohol use from early adolescence to young adulthood; (2) African American youth with different trajectories of heavy alcohol use from early adolescence to young adulthood will have distinct productivity outcomes in their early adulthood (age 18 to 21 years), after controlling for individual, family, peer, and community effects; (3) Marijuana use between the ages of 14 and 16 years old will negatively affect the future productivity status of nonmetropolitan African American young adults (age 18 to 21), after controlling for individual, family, peer, and community variables; and (4) Heavy alcohol and marijuana use between the ages of 14 and 16 years old will negatively affect the future productivity status of nonmetropolitan African American young adults (age 18 to 21), after controlling for individual, family, peer, and community variables.

To verify the hypotheses described above, I first created a productivity outcome measure specific for young adults, to later measure the effect of alcohol and marijuana on this outcome measure. The main independent variables were treated in two ways: I applied semi-parametric group-based modeling (SGM) to identify low- and high-probability trajectories of heavy alcohol
use and I dichotomized marijuana use into categories of marijuana users and marijuana abstainers. These independent variables then were used in a multivariate logistic regression to estimate their effect on the sample’s productivity status.

5.1 Marijuana use effect on productivity status

In hypothesis two I tested if those using marijuana at ages 14 to 16 are less likely to be productive than those who have not initiated any marijuana use. Table 3.5 of the previous chapter details the marijuana use categories tested. The marijuana use reported by this sample is consistent with previous drug use initiation and progression rates found by life-course research studies. Previous findings by Yamaguchi and Kandel (1984) suggested the rate of marijuana initiation begins at 13 years old and by age 18, 20% of adolescents had initiated marijuana use while approximately 80% reported no use. In this study, I found that study participants categorized as marijuana abstainers between the ages of 18 and 21 represented 81% of the sample. This finding is also consistent with evidence from previous studies of the long-term patterns of marijuana use of African-American cohorts. Overall, African American youth have long periods of drug use abstention and close to 40% of them never use illegal drugs (Doherty et al., 2008).

Further, the findings from this study indicate that early adolescence marijuana use has an effect on productivity status in a bivariate analysis. These results indicate that marijuana users at age 16 are 35% less likely to be productive at age 21 than those who have not initiated marijuana use (p<0.005). This relation is also evident in the 2 x 2 analysis of the proportions marijuana users and abstainers in function of the outcome variable and their different components. Table 4.8 from the results chapter (also below) describes that close to 30% of marijuana users are
working, and a similar proportion are studying and working. In contrast, only 63% of marijuana abstainers are not working nor studying or unproductive.

| Table 4.8: Productivity categories in function of drug use variables |
|-----------------|-----------------|-----------------|-----------------|-----------------|
|                 | N       | Marijuana Abstainers | Marijuana Users |
| Working         | 303     | 214 (70.6%)          | 89 (29.4%)      | 277 (91.4%)     | 26 (8.6%)       |
| Studying        | 119     | 92 (77.3%)           | 27 (22.7%)      | 112 (94.1%)     | 7 (5.9%)        |
| Studying and working | 62     | 45 (72.5%)           | 17 (27.5%)      | 53 (85.4%)      | 9 (14.6%)       |
| Not working/studying | 230   | 145 (63%)            | 85 (37%)        | 206 (89.5%)     | 24 (10.6%)      |

Because the effect of marijuana use in the bivariate analysis was not found in the multivariate regression when all the control variables were included, the bivariate results may be the results of a confounding between the independent and dependent variables. However, this result should not be discounted, and may in fact suggest that delaying marijuana use to at least 16 years of age has important implications on the future economic and educational success of study participants in this sample. Natural history or life course studies of marijuana use suggest that the peak of marijuana use is during early 20s and that initiation of use rarely occurs after 24 years of age (Chen & Kandel, 1995). Therefore, these results suggest that delaying initiation and better yet developing programs that promote abstention increases the likelihood of being productive later in life.

The multivariate logistic analysis explored the effect of early adolescence marijuana drug use on productivity status during their early adulthood after controlling for individual, family and community factors did not have a significant effect. Although no effect was found, I explored the association between the independent control variables and the two groups of marijuana use.
In this analysis, I found that marijuana users were significantly different from those self identified as marijuana abstainers in their academic engagement, employment and academic success perceptions, parental monitoring, affiliation with deviant peers, community crime and perceived discrimination at <0.001 and statistically different in terms of their productivity status at a <0.005. No significance differences were found for socio-economic status and religion importance. Socio-economic status consistently has been associated with substance use in previous research (Hawkins et al., 1992; Petraitis et al., 1995), however in this research, users and abstainers were not significantly different when compared to low and high levels of socio economic status. This result may be explained by the categorization of the socio economic continuous variable into a binary variable of highest and lowest percentile.

The results of the multivariate logistic analysis did not find a significant effect of marijuana use on productivity status. Kandel et al 1995 longitudinal analysis suggested that there is no cumulative effect of drug use on wages until age 35, and that the effect of early adolescence use is positive through an individual’s 20s (Kandel et al., 1995). According to Kandel et al.’s assumptions, the effect of drug use is optimally measured if the study participants are followed through their adult years. This study did not find a positive effect, but instead found a non-significant effect of marijuana use. The main difference with Kandel’s findings is on the type of outcome variable. Kandel and colleagues’ used a continuous variable to represent study participant’s earnings and this study used a binary outcome variable to represent productivity status. The outcome variable of this study has a wider conceptualization of what means to be productive during early adulthood, while Kandel used the traditional measure of productivity status, earnings. This study would need study participant’s report of earnings to compare with Kandel’s findings . There are two main ways to quantify the earning, income and
wealth differences. One way is to compare people’s lifetime statistics with their yearly earnings (Díaz-Giménez, Quadrini, & Ríos-Rull, 1997). This would require following a sample of households through their entire life cycle. Unfortunately, we do not have a long enough panel data to do that. This indicated that more data beyond wave 4 of FACHS may give different results.

5.2 The relation between heavy alcohol use trajectories and productivity status

In this study, I found two distinct heavy alcohol use trajectories. Most of the sample (93%) was identified as having a low probability of heavy alcohol use and only 7% of the sample had a high probability of heavy alcohol use.

Findings from this study show that participants in the lower trajectory did not escalate in their drinking to potentially harmful amounts. These stable trajectory patterns of infrequent heavy alcohol use were common for males and females in this sample. Kandel et al (1984) found that alcohol initiation begins early in life with almost 20% having used alcohol by age 10, over 50% by age 14, and higher percentages by age 18 (Kandel & Logan, 1984). This pattern of initiation and later alcohol use was not found in this study, however. In this study, close to 97% of study participants between the ages of 9 and 11, did not report heavy drinking, and by ages 15 near to 80% of study participants still report no heavy drinking. Differences in the results between both studies lie in at least the following aspects of Kandel’s study: did not measure heavy drinking as determined by this study; looked at an urban sample in New York City between 1980-1981; used a retrospective method of life-tables to record initiation of use and focused on proportion and age of youth initiation and did not record frequency of use or dose in each use.
A possible explanation for this delay of heavy alcohol use onset may be related to the legal age for alcohol use (21 years of age). Current national guidelines for alcohol use in the United States focus on limiting the amount of alcohol consumed before the age of 21. Further applied health policy research is needed to determine if the level of alcohol abstinence in these non-metropolitan African American communities is related to community-level policy enforcement of the legal drinking age.

In contrast, the high probability trajectory is composed of a small group of adolescents. This group has a 20% probability of heavy alcohol use by age 14, and a 100% probability by age 17. These two groups had significant differences between the groups in their self-reported academic engagement, religion importance, employment and academic success perceptions, parental monitoring, affiliation with deviant peers, community crime and perceived discrimination. Previous studies have consistently shown that exposure to peer pressure, drug availability, psychological problems, and life stress increases the likelihood of drug use initiation (Hser et al., 2005). The standardized residuals of the comparison of the control variables categorization and the two heavy alcohol use trajectories indicate that the categories (cells) with the highest proportion of participants were the major contributors to the statistical difference in each of the chi-square test statistic as shown in table 4.3. For example those in the highest percentile of the academic engagement control variable were in the low probability of heavy alcohol use trajectory with 95.9% of the study participants in this category. Therefore this category is the major contributor to the significant difference between those in the high and low probability of heavy alcohol use trajectory and the control variable.

No significance differences were found for productivity status and socio-economic status. As stated above, socio-economic status consistently has been associated with substance use in
previous research (Hawkins et al., 1992; Petraitis et al., 1995), however in this research, those in
the high and low probability of heavy alcohol use trajectories were not significantly different.
This result may be explained by the categorization of the socio economic continuous variable
into a binary variable of highest and lowest percentile.

Those in the high probability of heavy alcohol use trajectory have a sharp increase in the
probability of heavy alcohol use between 14 and 17 years of age. The knowledge of the
characteristics of these adolescents is an important opportunity to target education, alcohol use
prevention and the identification of antisocial behaviors during that short period of time.
Targeting high-risk adolescents is consistent with social development models that hypothesize
that early antisocial behavior may interfere with the development of pro-social protective factors
in the next life stage (Catalano & Hawkins, 1996).

5.3 Measurement of productivity status

The outcome variable of this study is a combination of education and working status,
which challenges the human capital approach on how to measure productivity status. Stasz
(2001) defines the human capital approach as use of education accumulation, skill levels, and
problem solving abilities that will enable an individual to be productive worker in today’s
society(Stasz, 2001). In this study, I combined a traditional predictor of employment status,
educational level, with employment status. With this outcome, I found that 68% of young adults
were productive and 32% were unproductive. The question used to create the productivity
outcome variable was collected in wave 4 only, and therefore its categories reflect the answers of
study participants this wave. FACHS’s dropout rate from wave one to wave four is close to
20%. I did not have data to test if those that responded the productivity question in wave 4 differ
significantly from those who did not participate in wave one, two or three.
According to labor market analyses young workers experience highest unemployment rates compared to other age groups. Since the start of the recession in December 2007, young adults have attained the highest unemployment rate on record (since 1948). The unemployment rate for 16-24 year-old workers peaked in September 2009 at 19.2%—passing the peak rate of 19.0% from November 1982—(Edwards & Hertel-Fernández, 2010). Young men between the ages of 16-24 years of age have an unemployment rate of 22.5% and young women of 15%.

There are disparities between the unemployment rates between White, African-American and Hispanic young workers. African American 16-24 year-old workers have the highest rates of unemployment in the labor market. In 2010 African American young workers had a 32.5% rate of unemployment, followed by 24.2% for Hispanic workers, and 15.2% for White workers (Edwards & Hertel-Fernández, 2010). As noted earlier, the traditional causes of unemployment for African American youth may be related to discriminatory practices present in the labor market and the state of the local labor market and their economic opportunities (Holzer, 1986). These rates reflect young adults unique position in the labor market, for example: they are not as settled into an employer or career as older workers are, young workers have longer periods of unemployment, and young adults during this period of their lives are expected to seek further educational training (Edwards & Hertel-Fernández, 2010; Sum et al., 2003).

In this study, the combination of educational attainment status with employment status is a developmentally appropriate outcome of productivity for young adults between the ages of 18-21 years of age. This conceptualization argues that enrolled students can and do participate in the labor force. Education in early adulthood is productive in that it is a marker for future productivity of the person to society. More education leads to more income, and more productivity potential (Blundell, Dearden, Meghir, & Sianesi, 1999). During the recession, 45%
of 16 to 24 year olds that were enrolled in high school or college either had a job or were actively looking for work (Edwards & Hertel-Fernández, 2010).

5.4 Applications to policy analysis

The results of this research project have implications in two spheres: first, on how economic burden estimates measure productivity losses due to drug use and in economic gains as a result of drug use prevention and their utility to improve health care decision making, and second on how to use high risk trajectories of drug use to target prevention or treatment as a drug prevention policy.

Economic burden estimates use losses in earnings and lower job performance overwhelmingly as their metric of estimation. In the United States, previous economic burden estimates of lifetime productivity losses due to drug use suggest losses that range from 9 billion dollars (Rice et al., 1991) to 23 billion dollar (National Institute on Drug Abuse, 2004b). These calculations may be underestimating the effect of drug use if they include adolescents and young adults, as their productivity statuses are not adequately represented by earnings. In addition, the unemployment rate of this specific population may be under- or over-represented given their total share of the labor force. Young workers comprise a relatively small share of the total labor force with 13.5% of all workers are 16-24 years old. However, young workers account for 26.4% of unemployed workers. In other words, one in every four unemployed persons in America is under the age of 25 (Edwards & Hertel-Fernández, 2010). Sum et al. (2008) estimate that workers under age 30 account for 70% of the net reduction in employment, and that they are 2.5 times as likely to be affected by economic downturns compared to any other age group. Once
again, education attainment combined with employment status is a better outcome to represent this population’s future trajectory toward economic success (Sum, 2008).

Economic burden estimates, the identification, measurement and valuation of health outcomes are among the results of economic analyses. Economic analyses are becoming one of the most important contributors to assist health care decision makers and health policy makers in the preparation of drug prevention policies that influence young adult’s health and economic outcomes. As mentioned above the results of this study has the potential to contribute to elaboration of economic analyses. In general, there are three types of full economic evaluations: cost effectiveness analysis, cost utility analysis, and benefit cost analysis (Haddix, Teutsch, & Corso, 2003). These approaches for conducting economic evaluation mainly differ in how the benefits to the individual or society are measured and valued and how the scope and intent of the intervention is determined. The majority of the published drug treatment and prevention economic evaluations have been cost-effectiveness analyses (French & Drummond, 2005). In this type of economic evaluation, the effect of treatment is measured in a single natural health unit (e.g. deaths, gains in life years), and costs and other consequences are measured in monetary terms. Cost-utility evaluations, on the other hand, identify, measure, and value the health gains as an extension of life and improved quality of life and compare them to the costs in monetary terms. Most cost-utility studies use quality adjusted life years (QALYs) to measure health gain. Finally, in benefit-cost analysis (BCA), all individual benefits are measured in monetary terms. This means that all costs and consequences are measured in the same units.

The BCA method is useful when there are a wide range of diverse outcomes (both health and non-health) associated with the treatments being evaluated; however, measuring health gains in monetary terms can be problematic. For example, market estimates of the value of life are
based on foregone earnings (or wages). This method, however, undervalues some groups in society, particularly older and poorer people, as the value of their life is worth less than that of a person with higher earnings (Landefeld & Seskin, 1982). Another controversial area is how lost productivity is being measured as a consequence of drug use. One approach for measuring lost productivity is the Human Capital (HC) approach (Weisbrod, 1961). In the HC approach, an individual's worth is measured by the discounted value of the individual's future stream of productivity as measured by wages (Kaufman & Hotchkiss, 2006). Using wages as the productivity outcome becomes problematic in communities with low quality of schooling or below standard performance schools, high unemployment rates, and social inequalities, such as racial discrimination, sexism, and classism (Conger et al., 1992). On the other hand, productivity gains can also be included in BCA as a benefit. The assumption is that the absence of drug use will improve employment prospects and increase the productivity of those in work. However, determining the effect of adolescents’ drug use on their productivity status as young adults has proven difficult for economists due to major gaps in the conceptualization of productivity for adolescents who are transitioning into young adults and the social ecological circumstances of adolescent drug use have often been absent from this type of study. Thus, in studying the longitudinal effect of adolescent drug use on their future economic success, there is a need for an inclusive approach that accounts for the developmental transition from adolescence to young adulthood on their economic growth while controlling for the effect of their community, peers, and family.
The second policy application of the results of this study lie in the identification of subgroups and the ecological characteristics of those that show stable patterns of high-level drug use is an example of a vertical equity public health strategy for the prevention of drug use initiation. Health policy and health economics have concentrated largely on horizontal equity yet the practical outcomes are disappointing (Mooney, 2000). Horizontal equity strategies treats all youth the same, while vertical equity strategies target specific groups that are considered to have received unequal treatment (Mooney & Jan, 1997). Vertical equity is about positive discrimination. Positive discrimination is needed if health services are incapable of meeting the call to provide fairer health care to have some impact on the gaps in health, access, or use between the better off and those worse off in societies (Mooney, 2000). The identification of subgroups and the ecological characteristics of those who show stable patterns of high-level drug use is an example of a vertical equity public health strategy for the prevention of drug use initiation.

In addition, the results of this study can assist health policy makers develop drug use prevention policies. As noted earlier drug prevention policies often fall into two categories: those that seek to reduce the availability of drugs and those that seek to prevent drug use. Prevention is sought mainly through strategies that prevent or delay initiation of youth drug use (Hallfors, 2009). Marijuana use during adolescence has an effect on the productivity status later in their life, when individual, family and community variables are excluded. These results suggest that abstention of drug use has important implications on the economic outcomes of young adults. Improvements in economic outcomes have important policy gains as they are related to the individual economic advancement of the young adult who abstained from marijuana use, but also has important implications to the economic growth of their communities.
In this sense the modeled productivity status outcome used in this study is inviting to policy makers as the wide conceptualization allow for the political gains.

### 5.5 Limitations of the study

The results of this study must be considered in light of its limitations. First, drug use was measured using self-report, relying on the participants’ recollection of past events. However, the standard approach for assessing adolescent drug use attitudes, beliefs, expectancies, and behaviors is via self-report questionnaires (Richter & Johnson, 2001). The major advantages of self-report measures are that they are relatively easy to administer to large samples, can be administered simultaneously in several different locations, and are relatively inexpensive to produce and administer. Despite these advantages, there are a number of disadvantages to self-report measures, particularly with regard to their validity and reliability. Self-report measures allow respondents to strategically alter their true responses to present themselves in a socially desirable way (Richman, Kiesler, Weisb, & Drasgow, 1999). Second, the sample was predominantly African Americans from low income, non-metropolitan locations; therefore, the alcohol trajectories, marijuana use categories, and their associations with the dependent variable and explanatory variables may not be generalized to other segments of the population (e.g. Hispanic or Latino youth). Third, I did not have data beyond 21 years of age to better understand their productivity standing at that age. Some of the differences in earnings, income and wealth across households can be safely attributed to the differences in people’s age. Fourth, I only had two marijuana use data points. The parent study, FACHS, started to collect marijuana use in wave 3 when study participants were between 14 and 16 years of age. In order to explore SGM trajectories at least two data points are required. Further analysis is needed to explore marijuana use trajectories for this sample beyond wave 4. Lastly, this study did not impute for missing
data. In wave one the sample size was 897 study participants and in the final wave the sample size was reduced to 714 participants. Next stages of this research should consider attrition analysis and modeling of missing data to optimize semi-parametric group-based modeling of the alcohol trajectories.

These limitations point to the importance of comparing the present findings with other investigations. The study design supported the testing of the four hypotheses proposed; however, the finding of no drug use effect on young adult’s productivity status was unexpected and should be explored further. The data analysis sequence tested unadjusted and adjusted models of the research hypotheses. The adjusted models included control variables known to confound the relationship between drug use and productivity status for African American populations in a social-ecological framework. The bivariate analysis of the effect of alcohol use probability trajectories was tested in hypothesis two. The unadjusted and adjusted logistic prediction indicates no significant effect. On the other hand, in hypothesis two I tested if those using marijuana at ages 14 to 16 are less like to be productive than those who have not initiated any marijuana use. The unadjusted estimate indicate that marijuana users at age 16 are 35% less likely to be productive at age 21 than those who have not initiated marijuana use (p<0.005). However, the adjusted logistic prediction indicates no significant effect. The odds ratio of the variable of interest (productivity status) did not change significantly in the unadjusted and adjusted model, suggesting no confounding effect of the control variables, but indicates that the combination of the variables have an effect.

Despite, these limitations, this study makes important contributions to the existing literature. First, by using a longitudinal design with a social-ecological framework to assess the effect of drug use on productivity status among nonmetropolitan African American youth
contributes to the debate in the econometric literature on the direction and effect of this relation. In addition, by using alcohol trajectories to identify high-probability groups of alcohol use from adolescence to young adulthood, along with the identification of the predictors of these trajectories, research will move closer to linking findings of alcohol use etiology with more efficacious interventions.
APPENDICES
APPENDIX A

FACHS questionnaires
(1) *Socio-economic status* was computed by FACHS from reported family annual income and parental education. Missing data imputation was done for annual income.

(2) *Academic engagement* was assessed using two measures, academic orientation and educational perceptions, adapted from the Iowa Youth and Family Project (Conger, R. D. 1988). These non-standardized measures contain the following questions (answers were coded with 1=strongly agree; 2=agree; 3=disagree; and 4=strongly disagree):

- “How often have you been in trouble for skipping or not attending school?"
- “In general, you like school a lot. Do you...”
- “School bores you. Do you...”
- “You do not do well at school. Do you...”
- “You do not feel like you really belong at school. Do you...”
- “You try hard at school. Do you...”
- “Grades are very important to you. Do you...”
- “You feel very close to at least one of your teachers. Do you...”
- “You get along well with your teachers. Do you...”
- “Other students think you are a good student. Do you...”
- “You do well in school, even in hard subjects. Do you...”
- “Your teachers think you are a good student. Do you...”
- “Even when there are other interesting things to do, you keep up with your schoolwork. Do you...”
(3) Employment and academic success importance was assessed using the conventional values scale. This non-standardized measure contains the following questions (answers were coded with 1=extremely important; 2=very important; 3=somewhat important; 4=not very important; and 5=not at all important):

- “How important is it to you to achieve your occupational plans?
- “How important is it to you to have a secure income and stable job?
- “How important is it to you to have a college education?
- “How important is it to you to save money for the future?
- “How important is it to you to be a religious person?
- “How important is it to you to be successful in your work or career?
- “How important is it to you to have a good marriage?
- “How important is it to you to have children?”

(4) Religion importance was measured with the following question (answers were coded with 1=very important; 2=fairly important; 3=not too important; and 4=not at all important): “In general, how important are religious or spiritual beliefs in your day-to-day life?”
(5) *Religion involvement* was a measure developed by FACHS adapted from the work from Simon, R. L. (1995). This non-standardized scale contains the following questions regarding religion involvement during the past month (answers were coded with 1=never; 2=1-2 times; 3=3-4 times; 4=more than once a week=4; and 5=daily):

- “How often in the past month did you attend church services?”
- “How often in the past month did you attend social events at your church?”
- “How often in the past month did you go places or do things with friends from your church?”
- “How often in the past month did you attend Sunday school, a class, or discussion group on religion?”

(6) *Parenting* was assessed using the parenting monitoring scale developed by FACHS. This non-standardized measure contains the following questions (answers were coded with 1=always; 2=often; 3=sometimes; and 4=never):

- “How often do you know what [TARGET NAME] does after school?”
- “How often do you know where [TARGET NAME] is and what [HE/SHE] is doing?”
- “How often do you know how well [TARGET NAME] is doing in school?”
- “How often do you know how well [TARGET NAME] is doing in school?”
- “How often do you know if [TARGET NAME] does something wrong?”
(7) Affiliation with deviant peers was assessed using a friends’ deviant behavior measure developed by FACHS. This non-standardized measure contains the following questions (answers were coded with 1=none of them; 2=some of them; and 3=all of them):

- "During the past 12 months, how many of your close friends have run away from home?"
- “During the past 12 months, how many of your close friends have skipped school without an excuse?”
- “During the past 12 months, how many of your close friends have purposely damaged or destroyed property that did not belong to them?”
- “During the past 12 months, how many of your close friends have stolen something worth less than $25?”
- “During the past 12 months, how many of your close friends have stolen something worth less than $50?”
- “During the past 12 months, how many of your close friends have stolen something worth $25 or more?”
- “During the past 12 months, how many of your close friends have stolen something worth $50 or more?”
- “During the past 12 months, how many of your close friends have gone joyriding, that is, taken a motor vehicle such as a car or motorcycle, for a ride or drive without the owner's permission?"
- “During the past 12 months, how many of your close friends have hit someone with the idea of hurting them?”
- “During the past 12 months, how many of your close friends have gotten into fights where someone got hurt?”
- “During the past 12 months, how many of your close friends have attacked someone with a weapon or with the idea of hurting them?”
- “During the past 12 months, how many of your close friends have used a weapon, force, or strong-arm methods to get money or other things from people?”

- “During the past 12 months, how many of your close friends have used tobacco (cigarette, smokeless tobacco, etc.)?”

- “During the past 12 months, how many of your close friends have used alcohol (beer, wine, bourbon, vodka, etc.)?”

- “During the past 12 months, how many of your close friends have used illegal drugs like marijuana, hashish, LSD, cocaine, downers, or crack?”

- “During the past 12 months, how many of your close friends have used illegal drugs like marijuana, hashish, LSD, cocaine, downers, crack, Ecstasy, or methamphetamines (speed, crank, ice, crystal)?”

- “During the past 12 months, how many of your close friends have used marijuana?”

- “During the past 12 months, how many of your close friends have used prescription drugs for fun or to get high without a doctor's prescription?”

- “During the past 12 months, how many of your close friends have used inhalants such as solvents, gasoline, rush, or glue?”

- “During the past 12 months, how many of your close friends have used nonprescription drugs for fun or to get high live Vivarin, No Doz, or diet aids?”

- “During the past 12 months, how many of your close friends have gotten high using drugs kind?”

- “During the past 12 months, how many of your close friends have drunk a lot of alcohol - 3 or more drinks at one time?”

- “During the past 12 months, how many of your close friends have had sex?”

- “During the past 12 months, how many of your close friends have gotten pregnant or gotten a girl pregnant?”
(8) Community crime was assessed using the community social disorder measure adapted from the work from Sampson et al. 1997. This non-standardized measure contains the following questions (answers were coded with 1=often; 2=sometimes; and 3=never):

- “During the past six months, how often was there a fight in your neighborhood in which a weapon like a gun or knife was used? Was it...
- “During the past six months, how often was there a violent argument between neighbors? Was it...
- “During the past six months, how often was there a gang fight? Was it...
- “During the past six months, how often was there a sexual assault or rape? Was it...
- “During the past six months, how often was there a robbery or mugging? Was it...
- “During the past six months, how often was there a murder? Was it...
- “During the past six months, how often was there drinking in public in your neighborhood? Was it...
- “During the past six months, how often were there people selling or using drugs in your neighborhood? Was it...”
(9) Perceived discrimination was developed by FACHS and adapted from the work from Simon, R.L. et al. (1995). This non-standardized measure contains the following questions (answers were coded with 1=never; 2=once or twice; 3=a few times; and 4=frequently):

- “How often has someone said something insulting to you just because of your race or ethnic background?

- “How often has a store-owner, sales clerk, or person working at a place of business treated you in a disrespectful way just because of your race or ethnic background?”

- “How often have the police hassled you just because of your race or ethnic background?”

- “How often has someone ignored you or excluded you from some activity just because of your race or ethnic background?”

- “How often has someone suspected you of doing something wrong just because of your race or ethnic background?”

- “How often has someone yelled a racial slur or racial insult at you just because of your race or ethnic background?”

- “How often has someone threatened to harm you physically just because of your race or ethnic background?”

- “How often have you encountered people who are surprised that you, given your race or ethnic background, did something really well?”

- “How often have you been treated unfairly just because of your race or ethnic background?”

- “How often have you encountered people who didn't expect you to do well just because of your race or ethnic background?”
- “How often has someone discouraged you from trying to achieve an important goal just because of your race or ethnic background?”
- “How often have your close friends been treated unfairly just because of their race or ethnic background?”
- “How often have members of your family been treated unfairly just because of their race or ethnic background?”
REFERENCES


United States Department of Health and Human Services, & National Institutes of Health.


