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**A Comparison of Illicit and Licit Substances as Primary Substances of Abuse at  
Admission to Substance Abuse Treatment Centers in Georgia, 2009-2012**

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B.S. Health Promotion and Behavior, The University of Georgia

A Thesis Submitted to the Graduate Faculty of Georgia State University in Partial

Fulfillment of the Requirements for the Degree

MASTER OF PUBLIC HEALTH

ATLANTA, GEORGIA 30303

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**APPROVAL PAGE**

A Comparison of Illicit and Licit Substances as Primary Substances of Abuse at

Admission to Substance Abuse Treatment Centers in Georgia, 2009-2012

Stephanie Hsu

Approved:

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Date:

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## **Abstract**

### *Objectives.*

We examined the patterns of association that exist between socio-demographic variables and the risk of having an illicit substance as a primary substance of abuse.

### *Methods.*

A cross-sectional study on secondary data from the Treatment Episode Data Set (TEDS) observed socio-demographic patterns among those over 18 years old admitted for substance abuse treatment in Georgia during 2009-2012.

### *Results.*

The distribution of licit substance users and illicit substance users was significantly different along all socio-demographic variables. Risk of admission for an illicit substance was highest among those unemployed, living independently, and who did not graduate from high school.

### *Conclusion.*

The findings of this study show that admission for treatment of an illicit substance are congruent with what was previously known about groups with the highest risk. However other findings about gender differences, age, and independent living promote changes in prevention and directions for further research.



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## CHAPTER I: INTRODUCTION

### Introduction

The categorization of a substance as licit or illicit differs by country. According to the United Nations Office on Drugs and Crime, what makes a substance “illicit” most likely is due to its lack of medicinal use and illegal production, trafficking, or abuse (“Information about drugs,” 2015). In 2014, the National Institute on Drug Abuse published that rates of certain illicit drugs, such as cocaine and hallucinogens, have been dropping over time, while others such as marijuana and prescription psychotherapeutics have increased (“Nationwide Trends,” 2014). More recently, prescription drug abuse has become a prominent public health problem that will be addressed on multiple levels (“Prescription Drug Abuse,” n.d.). The four major areas of action in the Prescription Drug Abuse Prevention plan are education, monitoring, proper medication disposal, and enforcement. Beyond the legality of a substance, a substance can fall into 7 different categories (“The 7 Drug Categories,” 2015). These categories are based on the substance’s effects on brain functionality and cognition. The effects of substance use and

abuse can occur chemically and physically in various systems and organs of the body. Dopamine is the main neurotransmitter associated with addiction (Moeller et al., 2012). An increase in dopamine activates the pleasure and rewards centers in the brain. Substance use also causes oxidative stress inside the cells of the body and alters the structure of the mitochondria and even mitochondrial DNA (Cunha-Oliveira et al., 2013).

Results of surveys, such as the National Survey on Drug Use and Health (NSDUH), show that substance use differs by demographic characteristics (Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality, 2014b). Rates of substance use differ by gender, race, and age. An increasing number of older adults are entering treatment facilities for substance abuse (Duncan, Nicholson, White, Bradley, & Bonaguro, 2010; Lofwall, Schuster, & Strain, 2008). While a number of studies have been published observing associations in the Treatment Episode Data Set (TEDS), there have been none that compare demographic and socio-economic differences for illicit substance admission and licit substance admission.

### Purpose of Study

In the pathway of prevention, substance abuse treatment falls under tertiary prevention. Persons under tertiary prevention have already abused prescription drugs. Tertiary prevention is to reduce the risk behavior and improve quality of life. A treatment episode is defined by the Substance Abuse and Mental Health Services Administration

(SAMHSA) as the period of time in between the beginning of treatment and the termination of that treatment (SAMHSA, 2014). Services rendered for treatment episodic patients include detoxification, residential care, and outpatient care. While treatment for substance abuse has been shown to improve patient outcomes and increase recovery, the extent of that recovery is unknown. Additionally, substance abuse treatment can be costly and expensive depending on the intensity of treatment required (“Treatments for Substance Use Disorders,” n.d.). Prevention programs are at least twice as cost effective compared to treatment programs (“Prevention of Substance Abuse and Mental Illness,” n.d.). The aim of prevention programs is to reduce substance abuse in the whole population; however the best way to do that is by targeting specific populations. Mixed prevention interventions can also be used to impact substance abuse problems in communities with social problems. This study seeks to observe whether a difference exists in the association between social determinants and primary substance of abuse. Gaining a better understanding of the differences between illicit and licit substance abuse treatment can help to direct future prevention programs and research.

### Theory

The basis of the Integrated Theory of Health Behavior is that an individual’s social environment/influences, personal knowledge, and personal skills influence his/her self-efficacy and ultimately health outcome (Ryan, 2009). This is true in the general population, but also among drug users (Galea & Vlahov, 2002). Social determinants of

health are nonmedical factors that affect health, including health knowledge, attitudes, belief, or behaviors (Braveman, Egerter, & Williams, 2011). The social determinants of health include social connectedness, income, culture, employment/working conditions, built environment, health/social services, early childhood development, housing, ethnicity, physical environment, gender, and education (“Social Determinants of Health | NACCHO Aboriginal Health News Alerts,” n.d.). These determinants play a role in influencing self-efficacy, which in turn can affect the recovery of someone who is recovering from drug use. The Treatment Episode Data Set includes some components of social determinants of health. Demographic data captured include age, gender, and race/ethnicity. Other indicators that are captured are living arrangement—if the individual lives independently, dependently, or is homeless—educational attainment before admission, and employment status—if the individual is employed full-time, part time, unemployed, or not in the workforce. Treatment facilities are tertiary prevention. They are the immediate intervention in response to substance abuse problem. But the question exists, what if it could be proven that social determinants predict illicit or licit drug abuse? If social determinants such as the above mentioned are related to self-efficacy and ultimately health outcomes—and found to differ between licit and illicit treatment admissions—then the opportunity exists to improve screening measures and better understand what puts a person at risk.

### Research Questions

The overall aim of this study is to examine the patterns that may exist between socio-demographic characteristics and substance abuse treatment admission. Specifically, the answers to following questions will be determined: is there an association between demographic factors and type of primary substance of abuse, whether it is licit or illicit? Is there an association between socioeconomic factors, such as education attainment, employment status, and living arrangement, and type of substance of abuse?

## **CHAPTER II**

### Literature Review

#### Substance Abuse

##### Licit and Illicit Substances

Substances are categorized by their effects on the brain and cognitive perception however the category that a substance falls in does not dictate its status as a licit or illicit substance. The differentiation between licit and illicit has changed over time and varies from country to country. The United Nations Office of Drugs and Crime states that it does not recognize a distinction between licit and illicit substances. For the sake of definition an illicit substance can be described as “drugs which are under international control but which are produced, trafficked, and/or used illicitly”(“Information about

drugs,” 2015). Though governmental policies have been enacted to control the use of addictive substances, rates of use continue to rise (Kushner, 2006). In the United States, the policies used to control the use of addictive substances, excluding alcohol and tobacco, are differentiated by schedules. There are five schedules of substances that are ranked primarily by their potential for abuse among other key criteria (United States Drug Enforcement Administration, 2015). Schedule I substances are considered to have high potential for abuse and not acceptable for medical use. Schedule II through V substances decrease in their potential for abuse and are all medicinal in nature.

The term “illicit” can refer to how a substance is manufactured, formulated, distributed, acquired, or consumed (Christian G. Daughton, 2011). Illicit substances are most often categorized as so because they have no medicinal use. These substances can include active ingredients that have been banned under international convention but there is no definition that fully encompasses the scope of this term. The substances categorized as illicit also vary from country to country. And approaches used to classify substances as illicit are being scrutinized for their basis in evidence. The importance of the distinction between licit and illicit drugs is being researched. For the purpose of this study, illicit substances include those that are medicinal and can be obtained through prescription, however what makes them illicit is the way in which they are misused or abused.

### Substance Categories

There are 7 categories of substances most commonly used, and each has an effect on a person’s cognition and motor function in different ways (“The 7 Drug Categories,”



2015). Central nervous system (CNS) depressants include both licit and illicit substances. Examples of CNS depressants are alcohol, anti-anxiety drugs such as tranquilizers, and Rohypnol (“The 7 Drug Categories,” 2015). CNS depressants work by reducing the activity in the brain. Another category is CNS stimulants (“Central Nervous System Agents,” 2004). CNS stimulants increase alertness, agitation, or excitement. Examples of stimulants are cocaine, amphetamines, and methamphetamines.

Hallucinogens are drugs that are capable of causing a person to see illusions, have hallucinations, have paranoia, or have altered mood (“Central Nervous System Agents,” 2004). Examples include LSD and ecstasy. Dissociative anesthetics are the fourth type of substance. Dissociative anesthetics are used to inhibit sensations, particularly the sensation of pain. A common form of dissociative anesthetics is PCP. Another substance that relieves pain is narcotic analgesics. Analgesics relieve pain by increasing euphoria and changing a person’s mood. Unlike anesthetics, analgesics do not induce a loss of sensation. Common analgesics are opium, heroin, morphine, and Vicodin.

Inhalants are the sixth category of substance. This category is very different from the other categories because common household items can be used to induce psychological effects in addition to anesthetic gases. The last category includes marijuana and all synthetic forms of cannabis. Marijuana is a sedative but also has hallucinogenic properties. When used it can impair motor coordination, modify time and space perception (“Information about drugs,” 2015).

### Biological effects

Substance abuse manifests in biological effects. Addiction in the body manifests as an altered dopamine neurotransmission (Moeller et al., 2012). Dopamine is a neurotransmitter that assists in the control of the pleasure centers and reward centers in the brain (“What is Dopamine?,” 2015). This neurotransmitter is located in the brain and is also associated with regulating movement and emotional response (“Dopamine,” 2015). In addition to altering the dopamine response in the brain, substance abuse can cause other biological changes depending on the type of substance.

On the cellular level, an organelle in the cell that is often affected by substance abuse is the mitochondria. Oxidative stress represents a disturbance in oxidant-antioxidant balance leading to potential damage. Oxidative stress caused by substance use can result in decreased mitochondrial membrane potential, decreased number of mitochondrial DNA copies, and even alteration in the structure of mitochondria (Cunha-Oliveira et al., 2013; Manzo-Avalos & Saavedra-Molina, 2010). Another effect of substance abuse on cells is cell death. This is seen particularly in the use of cocaine (das Graças Alonso de Oliveira et al., 2014).

Amphetamine increases dopamine levels in the body by signaling the release of the neurotransmitter from cells (Covey, Juliano, & Garris, 2013). Substances like amphetamine require surface proteins in order to signal release of dopamine, however ethanol penetrates through the cell membrane readily. Oxidation of ethanol occurs in the hepatocytes of the liver cell and because of the oxidation process, the chemical balance in the cell is affected. Metabolism of ethanol affects the smooth endoplasmic reticulum, an organelle responsible for ridding the cell of toxic compounds. Heroin is known to cause

hypertrophy and hyperplasia of the smooth endoplasmic reticulum (Ilic, Karadzic, Kostic-Banovic, Stojanovic, & Antovic, 2010).

Substances can be used for many reasons even medicinally. However, substance misuse and abuse can lead to substance use disorders and biological repercussions. An example of a substance used therapeutically that can also be misused is amphetamine. Therapeutically this substance has often been used to treat narcolepsy, ADHD, obesity, and traumatic brain injury (Covey et al., 2013). But it also has addictive properties and can cause alterations in the mental state. Narcotic analgesics are another category of substances often used medicinally having addictive qualities (Dart et al., 2015).

Alcohol, a CNS depressant, is one of the most commonly used substances worldwide. Though it is used recreationally, it can cause cardiomyopathy, arrhythmia, stroke, high blood pressure, fatty liver, alcoholic hepatitis, fibrosis, cirrhosis of the liver, lead to pancreatitis, cancer of the mouth, esophagus, throat, liver, and even weaken the immune system (Manzo-Avalos & Saavedra-Molina, 2010; Nation Institute on Alcohol Abuse and Alcoholism, 2010).

### Previous Studies

Up until this point, there have been no studies published using the TEDS data that observe the difference between treatment admission for illicit substance abuse and licit substance abuse. A majority of studies that use data from TEDS focus on substance abuse among pregnant women (Albrecht, Lindsay, & Terplan, 2011; Lindsay, Albrecht, & STerplan, 2011; Terplan, Smith, & Glavin, 2010; Terplan, Smith, Kozloski, & Pollack, 2009, 2010). Studies of substance abuse among pregnant women range from

methamphetamine and injection drug use to court-mandated drug and alcohol treatment. Several studies focus on substance use among adolescents (Anderson, 2010; Hopfer, Mikulich, & Crowley, 2000; Saloner, Carson, & Cook, 2014). These focused on heroin use, methamphetamine, and racial/ethnic differences in treatment completion. Another demographic group of focus was older adults (Arndt, Gunter, & Acion, 2005; Arndt et al., 2005; Duncan et al., 2010). An examination of TEDS data from 1998-2006 showed that admissions among this group for substances other than alcohol have increased over time (Duncan et al., 2010).

Studies produced in other countries often compare alcohol and other substances in the general population (Walker, Venner, Hill, Meyers, & Miller, 2004). Another common subject in international literature is the role of drugs in vehicle and recreational accidents (Institóris et al., 2013; Legrand, Houwing, Hagenzieker, & Verstraete, 2012). Previous studies have been conducted in other countries, such as Greece and the United Kingdom, on socio-demographic differences among illicit and licit user (Madianos, Gefou-Madianou, Richardson, & Stefanis, 1995; Morrison & Plant, 1991; Warner et al., 1990). However there have been no studies published recently to show whether or not these percentages have changed.

## Social Determinants

### Race/Ethnicity and Substance Abuse

The current definitions of race include the broad categories of American Indian/Alaskan Native, Asian/Pacific Islander, Black or African American, and White (National Institute on Drug Abuse, 2003). Ethnicity is classified as “Hispanic”, or individuals of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin. Racial and Ethnic minorities are known to experience disparities in behavioral health issues, substance abuse not being an exception (“Racial and Ethnic Minority Populations,” n.d.).

The National Survey on Drug Use and Health (NSDUH) is a survey conducted annually on noninstitutionalized, civilian persons age 12 and older in the United States (Substance Abuse and Mental Health Services Administration, 2014). Items this survey covers include illicit drug use, alcohol use, substance use disorders, substance use treatment, reasons for not receiving treatment, mental health issues, and co-occurring substance use disorders and mental health issues. Annually, NSDUH publishes a report detailing the trends and statistics demographically. According to the NSDUH 2013 report, the trends and patterns of substance abuse differ from one racial group to another. A summary of trends in the NSDUH 2013 report is compiled in Figure 1. Illicit drug use among those of two or more races was highest at 17.4%, and lowest among Asians at 3.1%. The percent of people using illicit drugs was also high among American Indian/Alaskan natives and Hawaiian/Pacific Islanders, 12.3% and 14.0% respectively.

Figure 1.

*National Rates of Illicit Substance Users by Race 2012-2013*

Race	Percentage
American Indian (Or Alaskan Native)	12.3
Black	10.5
White	9.5
Hispanic	8.8
Asian	3.1
Two or more Races	17.4
Native Hawaiians or Other Pacific Islanders	14.0

*Note:* [Rates shown are among persons aged 12 or older.]

Gender and Substance Abuse

Patterns of substance abuse differ by gender. Previous studies on the TEDS data shows that among adults age 18 and older, men have higher rates of substance dependence compared to women (Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality, 2014a). Men are more likely to be admitted for substance abuse treatment. The NSDUH report shows that the rate of illicit drug use is higher among men than among women at 11.5% and 7.3% respectively.

The Substance Abuse and Mental Health Services Association found that alcohol abuse and dependence is higher among men than among women. In 2013, the percentage of men with alcohol dependence was 8.7% compared to 4.6% among women (Substance Abuse and Mental Health Services Administration, 2015).

### Age and Substance Abuse

In the United States, alcohol dependence or abuse is highest among those age 18-25 at 13%. Though dependence is highest at this age, the percentage falls as age increases as seen below in Figure 2. Data in the figure come from the Behavioral Health Barometer (Substance Abuse and Mental Health Services Administration, 2015). The average age of alcohol abuse onset is 22.5 years, and the average age of alcohol dependence onset is 21.9 years (Hasin DS, Stinson FS, Ogburn E, & Grant BF, 2007).

Figure 2.

#### *National Prevalence of Alcohol Dependence by Age, 2013*

Age in Years	Percentage
12-17	2.8
18-25	13.0
26-44	9.1
45-64	5.0
65 and older	2.1

*Note:* [Prevalence shown is among persons aged 12 or older.]

Illicit drug use is also seen to follow a similar trend. The highest percentage of illicit drug dependence is among those 18-25 years old at 7.4% (Substance Abuse and Mental Health Services Administration, 2015).

Figure 3.

*National Prevalence of Illicit drug dependence by Age, 2013*

Age in Years	Percentage
12-17	3.5
18-25	7.4
26-44	3.1
45-64	1.1
65 and older	0.4

*Note:* [Prevalence shown is among persons aged 12 or older.]

Education Attainment and Substance Abuse

Education attainment has been studied as an outcome of drug use. Lower education attainment is associated with substance abuse (Grant et al., 2012). NSDUH has shown that illicit drug use among those who did not graduate from high school was 11.8%, those who did graduate from high school was 9.9%, those with some college was 10.8%, and those who did graduate from college was 6.7% .

The study by Grant shows that this is indeed the case for licit substances, such as alcohol and nicotine. Another study also examined problems related to alcohol use, particularly alcohol dependence, among those who did not attain education past high school (Cleveland, Mallett, White, Turrisi, & Favero, 2013). Those who did not attain education past high school were found to be at greater risk for alcohol dependence. However, the correlation between illicit substance use and education attainment is unknown. In general, the rates of illicit drug use are greater among those with lower levels of education attainment. Data from NSDUH depicts this relationship, shown in the figure below.



Figure 4.

*Rates of Illicit Drug Use by Educational Attainment*

Educational Status	Percentage
Did not complete high school	11.8
High school graduates	9.9
Some college education	10.8
College graduates	6.7

*Note:* [Rates shown are among adults 18 years old or older.]

Employment Status and Substance Abuse

Unemployment is a risk factor for substance abuse (Henkel, 2011). The National Survey on Drug Use and Health showed that higher rates of illicit substance use and licit substance use were significantly higher among those who were unemployed than employed (Compton, Gfroerer, Conway, & Finger, 2014). Among those who were unemployed, the rate of illicit drug use was 18.2% compared to those who were employed full-time, 9.1%, and those who were employed part-time 13.7%. The NSDUH includes a category known as “other” that encompasses students, persons caring for children or keeping house, retired or disabled, or otherwise not in the workforce. The rate of illicit drug use in the “other” category is 6.6%.

Workplace substance abuse policies and programs are associated with a reduction in reported drug misuse among young adults (Miller et al., 2015). This in part could be a reason why those employed full time have lower rates of substance use compared to those unemployed.

## Substance Abuse Prevention

Substance abuse prevention continues to be on the forefront of public health in the United States, and rightly so. In 2007, an article was published that showed US citizens consumed 80% of opioids produced globally, 99% of the supply hydrocodone, and two-thirds of illicit substances (Manchikanti, 2007). Prescription opioids, when used in a manner that is not the intended purpose or when used by a person other than who received the prescription, are illegal. Such programs, such as the prescription drug monitoring program have been established to prevent prescription opioid abuse (Chakravarthy, Shah, & Lotfipour, 2012). However, a problem that occurs with this type of legislation is that it may not decrease the consumption of opioids but shift which ones are being prescribed (Huecker & Shoff, 2014). Making prescription opioids less attainable may also cause abusers to turn to other drugs, such as heroin.

Another illicit substance that has been rising in popularity and prevalence is marijuana. The legality of this substance was established because of its perceived harm and health risk. Legislation has changed in several states allowing for a mixture of recreational and medicinal use of the substance (“State Marijuana Laws Map,” n.d.). The legalization of marijuana has sparked much debate. Some speculate that by legalizing marijuana, even for medicinal use, may cause people to assume incorrect knowledge about the risks of using this substance. Experts worry that legalization could lead to an increase in incidence and prevalence of marijuana related harm(Temple, 2015). Marijuana prevalence is highest among those age 18-25, followed by youth 12-18. Research points to the need for interventions early on in life, as those who consume

substances early on in life have higher risk of substance related problems later on in life (Ali et al., 2015; Benningfield, Riggs, & Stephan, 2015; Manchikanti & Singh, 2008; Temple, 2015).

The National Institute on Alcohol Abuse and Alcoholism released a short report on alcohol abuse prevention methods in the United States (Nation Institute on Alcohol Abuse and Alcoholism, 2011). Prevention starts early among school-age children and prevention programs for youth. Other approaches include targeting college drinking. For able-bodied adults, there are workplace prevention programs that offer support through employee assistance and lifestyle campaigns.

## CHAPTER III

### Methods

#### Data Collection

##### Data Source

This analysis uses secondary data stored and distributed by the Substance Abuse and Mental Health Services Association. Participant data is extracted from substance abuse treatment facilities in the United States that treat patients for substance abuse. In the state of Georgia, TEDS data comes from any providers who receive funding through the Department of Behavioral Health and Developmental Disabilities (DBHDD) either state contracted (via State Funds or Block Grant) or Medicare/Medicaid. These include nonprofit and for profit providers. Other facilities include certified substance abuse

agencies/Mental Health Department/Department of Public Health/Health Department, Certified Opioid Treatment Programs, Community-based correctional programs, Hospitals/VA hospitals/state hospitals, state-licensed independent practitioners, state/correctional DUI/DWI providers, and state divisional service centers.

### Administration

Data is collected via a survey, administered by an interviewer at admission to the treatment facility. Because this survey is a necessary component of the intake process, all people admitted to participating treatment facilities are required to complete the survey. Data collected at substance abuse treatment facilities may be stored in different formats but when submitted to the Treatment Episode Data Set, it is reformatted and standardized.

### Target Population

Persons in the study are chosen to represent adults in Georgia who abuse illicit or legal substances. Adults will be defined as those 18 years and older who are not pregnant. Illicit drug use includes marijuana, cocaine, heroin, hallucinogens, inhalants, and prescription-type psychotherapeutics used non-medically. Legal drug use includes alcohol and over-the-counter medication. The target population includes all those in Georgia who were admitted to a treatment facility that submitted data to the Treatment Episode Data Set during the years 2009 to 2012.

## Variables

### Demographic variables

Variables included in this study were AGE(age), GENDER (gender), RACE (race). Age was an ordinal variable, but for this analysis it was treated as a continuous variable that was coded into the following groups: 4) 18-20, 5) 21-24, 6)25-29, 7)30-34, 8)35-39, 9)40-44, 10)45-49, 11)50-54, 12) 55+. Gender for male was coded as 1) Male, and 2) Female.

The variable RACE had 4 categories: 1) Black or African-American, 2) White, 3) Asian or Pacific Islander, 4) Other. Black or African American includes people whose origins are from any of the black racial groups of Africa. White includes origins in any of the original people of Europe, North Africa, or the Middle East. Asian origin is any of the original people of the Far East, the Indian subcontinent, or Southeast Asia including but not limited to Cambodia, China, India, Japan, Korea, Malaysia, the Philippine Islands, Thailand, and Vietnam. The origins of native Hawaiians or other Pacific Islanders includes any of the original people of Hawaii, Guam, Samoa, or other Pacific Islands. The Other category was comprised of American Indian/Alaskan Natives, other single race, and people of two or more races. For this analysis, “Hispanic” is included as an ethnicity and had 2 categories: 0) not of Hispanic origin and 1) of Hispanic origin not otherwise specified.

### Dependent Variables

For this analysis, the dependent variable, or outcome variable, was primary substance at time of admission. Substance at time of admission was obtained from the TEDS data set from 2009-2012. Primary, secondary, and tertiary substances reported are those that led to the treatment episode. The original survey item was “Primary Drug Problem”. The drug codes a participant could choose from included none, alcohol, cocaine/crack, marijuana/hashish (includes THC and any other cannabis or other sativa preparations), heroin, non-prescription methadone, other opiates and synthetics (including codeine, Dilaudid, morphine, Demerol, opium, and other drugs with morphine-like effects), PCP (phencyclidine), other hallucinogens (including LSD, DMT, STP, mescaline, psilocybin, peyote, etc.), methamphetamine, other amphetamines (Benedrine, Dexedrine, Preludin, Ritalin, and other amines and related drugs), other stimulants, Benzodiazepine (includes Diazepam, Flurazepam, Chlordiazepoxide, etc.), other tranquilizers, Barbituates (includes Phenobarbital, Seconal, Nerabital, etc.), other sedatives or hypnotics (chloral hydrate, Placidyl, Doridan, etc.), inhalants (including ether, glue, chloroform, nitrous oxide, gasoline, paint thinner, etc.), over-the-counter (including aspirin, cough syrup, Sominex, and other legally obtained, nonprescription medication), and Other. Observations missing this variable were not included in the analysis. Those who indicated no primary substance of abuse were coded as 0. Licit substances were coded as 1 and included alcohol and over the counter medications. Illicit substances were coded as 2 and included cocaine, marijuana, heroin, methadone, opiates, PCP, hallucinogens, methamphetamine, amphetamines, stimulants, benzodiazepines, non-

benzodiazepine hypnotics, tranquilizers, and inhalants. These are based on currently defined illicit substances in the United States.

### Independent Variables

Based on the research questions, the independent variables were the socio-economic factors. Employment is the first independent variable included in this analysis. EMPLOY categories included 1) full time, 2) part time, 3) unemployed, and 4) not in labor force. These were attained from the survey item “Employment Status”. Full-time persons include those who work 35+ hours a week, including the Armed Forces. Part-time status is less than 35 hours a week. Unemployed includes those who have looked for work in the past 30 days, or were laid off from work. In the original admission survey, participants were asked what was the highest grade achieved. The variable EDUC was categorized as “8 years or less” “9-11 years”, “12 years”, “13-15 years”, and “16 or more years”. Lastly, living arrangement is included as an independent variable. The categories for the variable LIVARAG were 1) homeless, 2) dependent, and 3) independent. Participant data was obtained from the survey item “Living arrangements”. Persons who were homeless either lived at a shelter or had no fixed address. Dependent living included dependent children—those under 18 years old living with parents—and adults living in a supervised setting such as a residential institution or group home. Independent living includes anyone living alone or with others, and adult children—those over 18 years old living with parents—without supervision.



### Statistical Procedures

Data was provided by SAMHSA for the years of study. All statistical procedures were conducted using Statistical Analysis Software (SAS) 9.4. A permanent dataset with only data from the state of Georgia in the years 2009-2012 for those who were not pregnant was created using SAS software. This program was also used to calculate the descriptive statistics and run univariate analysis to derive the prevalence of illicit substance use in the population. Relative risk was assessed between the socio-economic variables of employment status, living arrangement, and education, and the primary substance of abuse at admission. Stratified analysis of risk was conducted based on recommendations from the literature.

## CHAPTER IV

### Results

#### Descriptive Statistics

The total number of clients in this analysis was 155,812 from the years 2009-2012 in the state of Georgia. 7.22% of those who were admitted did not give a response for the question “primary substance of abuse”, answered “none”, or answered “other”. Those who were missing the outcome variable were considered non-respondents. They had the same median age as those who had the outcome variable. There were more females than males among non-respondents. Racially, more Black/African-Americans were non-respondents. Because the primary substance of abuse could not be determined for non-respondents, these observations were not included in analysis.

92.78% did respond to this question and chose either a licit or illicit substance. A comparison responders versus non-responders showed no difference in age range, though a Wilcoxon Rank Sum test showed significant differences. The age distribution can be seen in Figure 5 of Appendix B “Age Distribution of the Sample”.

Table 1.  
*Demographic Characteristics of Respondents and Non-Respondents*

CHARACTERISTIC		Respondent	Non-respondent
Total N (%)		144563 (92.78)	11249(7.22)
Age Group, (IQR)		8 (6,10)	8 (6,10)
Gender	Male (%)	85456 (59.11)	5344 (47.51)
	Female (%)	59107 (40.89)	5905 (52.49)
Race	Black (%)	55276 (38.50)	4118 (36.99)
	White (%)	84558 (58.90)	6600 (59.28)
	Asian (%)	427 (0.30)	70 (0.63)
	Other (%)	310 (2.31)	345 (3.10)
	Missing	992	116
Ethnicity	Not Hispanic Origin (%)	140634 (98.01)	10833 (97.35)
	Hispanic Origin (%)	2857 (1.99)	295 (2.65)

*Note:* [Age is an ordinal variable but is treated as continuous. The age category 8 corresponds to the age range 35-39. The age category 6 corresponds to 25-29, and 10 corresponds to 45-49.]

The total included 155,812 observations from 2009-2012. The distribution of the demographic characteristics of age, gender, and race are included in Table 2. Age is

normally distributed over the whole sample, with the lowest percentage being in the 18-20 years old category and the 55+ years old category. There are more males in this study than females, with a percentage difference of 16.56%. Whites make up a clear majority of this sample with 58.51%.

Table 2.

*Overall Profile of Sample and Summary of Drug Use by Type*

CHARACTERISTIC		N (Percentage)
Age Group	18-20	8398 (5.39)
	21-24	16614 (10.66)
	25-29	23036 (14.78)
	30-34	21404 (13.74)
	35-39	18169 (11.66)
	40-44	19558 (12.55)
	45-49	20906 (13.42)
	50-54	15969 (10.25)
	55+	11758 (7.55)
Gender	Male	90800 (58.28)
	Female	65012 (41.72)
Race	Black or African American	59394 (38.39)
	White	91158 (58.92)
	Asian	497 (0.32)
	Other	3655 (2.36)
	Missing	1108
Ethnicity	Hispanic	3152 (2.04)
	Non-Hispanic	151467 (97.96)
	Missing	1193
Drug type	Illicit	74445 (47.78)
	Licit	70014 (44.93)
	Neither	11353 (7.29)

*Note:* [All participants included in the analysis were over the age of 18, not pregnant at time of admission, and were not missing employment status, living arrangement, or educational attainment.]

Table 3.

*Overall Frequency of Primary Substances of Abuse*

Primary substance		N (Percentage)
Illicit	Cocaine/Crack	20394 (13.10)
	Marijuana	26605 (17.09)
	Heroin	2155 (1.38)
	Non-Prescription Methadone	1297 (0.83)
	Other Opiates	104492 (6.71)
	PCP	14 (0.01)
	Other hallucinogens	138 (0.09)
	Methamphetamine	7804 (5.01)
	Other Amphetamines	1128 (0.72)
	Other Stimulants	155 (0.10)
	Benzodiazapines	3447 (2.21)
	Tranquilizers	64 (0.04)
	Barbituates	17 (0.01)
	Other Hypnotics or Sedatives	695 (0.45)
	Inhalants	90 (0.06)
Licit	Alcohol	70,000 (44.96)
	Over the counter drugs	14 (0.01)

*Note:*[The substances were not originally coded as “illicit” or “licit” in this data set. Substances were coded as such based on

Results of the first table show that 74445 of the participants admitted to substance abuse treatment facilities were admitted for an illicit substance. 35.74% of those individuals were admitted for marijuana/hashish, 27.39% were admitted for crack, 14.03% were admitted for other opiates, and 10.48% were admitted for methamphetamine. Among the 70014 participants admitted for a licit substance 70,000 (99.98%) were admitted for alcohol.

The following table details the differences between those who indicated a licit or illicit substance as their primary substance of abuse at admission. The two groups differed significantly by age. The median age category was significantly lower for illicit substance abuse compared to licit. The results of the Wilcoxon rank sum test are depicted

under Appendix B in Figure 6 “*Distribution of Age by Substance Type*”. Both groups had higher ratios of male to female, however the licit group was made of 65.08% males compared to the illicit group with 51.50%. A chi-square test of independence was performed and found the relation between gender and type of drug use to be significant,  $X^2(1, N=144,563) = 2003.90, p < 0.0001$ .

Table 4.

*Demographic Characteristic by Drug Type*

CHARACTERISTIC		Illicit	Licit
Age Group, median (IQR)		7 (6,9)	9 (7,10)
Gender	Male (%)	39825 (51.50)	45585 (65.11)
	Female (%)	34620 (46.50)	24429 (34.89)
Race	Black (%)	27557 (37.27)	27703 (39.84)
	White (%)	44655 (60.40)	39818 (57.27)
	Asian (%)	182 (0.25)	244 (0.35)
	Other (%)	1543 (2.09)	1767 (2.54)
	Missing	508	483
Ethnicity	Hispanic (%)	1258 (1.70)	1597 (2.30)
	Non-Hispanic (%)	72582 (98.30)	67951 (97.70)
	Missing	605	466

*Note:* [Age is an ordinal variable that is being treated as a continuous variable. The age category 6 corresponds to 25-29, category 7 corresponds to 30-34, 9 corresponds to 40-44, and 10 corresponds to 45-49.]

Frequency statistics were used to compare substance prevalence by independent variable. The distribution of types of employment is similar for those who were admitted for illicit substance abuse and licit substance abuse. The percentage of licit users who were homeless was 14.30%, 4.83% higher than those admitted for illicit substance abuse. Conversely, the percentage of those who live independently was higher among those

admitted for illicit substance abuse compared to licit abuse. More persons admitted for licit substance abuse had an education attainment 12 years or greater, 66.83%, compared to those admitted for illicit substance abuse, 59.15%. The percentage of persons who only graduated from high school was similar in both groups.

Table 5.

*Illicit Substance Prevalence among Independent Variables*

CHARACTERISTIC		Illicit N= 74445 (51.53%)	Licit N= 70014 (48.47%)
Employment	Full time (%)	5310 (7.13)	5431 (7.76)
	Part time (%)	4196 (5.64)	3516 (5.02)
	Unemployed (%)	45667 (61.34)	42013 (60.01)
	Not in labor force (%)	19272 (25.89)	19054 (27.21)
Living Arrangement	Homeless (%)	7050 (9.47)	10019 (14.31)
	Dependent living (%)	3435 (4.61)	2819 (4.03)
	Independent living (%)	63960 (85.92)	57176 (81.66)
Education Attainment	8 years or less (%)	7357 (9.88)	6142 (8.77)
	9-11 years (%)	23059 (30.97)	17093 (24.41)
	12 years (%)	29731 (39.94)	28970 (41.40)
	13-15 years (%)	12444 (16.72)	14514 (20.73)
	16 or more years (%)	1854 (2.49)	3295 (4.71)

## ADVANCED ANALYSIS

The procedure PROC FREQ was used to analyze the relative risk of admission illicit substance. Those who declined to answer the survey question for primary substance of abuse were excluded. This analysis procedure was used on each level of the

independent variables. The levels were treated as separate variables and dichotomized. For example, under “employment”, the level “full time” was treated as an independent variable. Participants were either “full time”, coded as 1, or “not full time”, coded as 0. Relative risk was calculated for each level, as well as a 95% Confidence Interval (CI).

Table 6.

*Relative Risk Analysis of Admission Due to an Illicit Substance*

Participant characteristics		Relative Risk	CI (95%)
Employment	Full time	0.96	(0.94, 0.98)
	Part time	1.06	(1.04, 1.08)
	Unemployed	1.03	(1.02, 1.04)
	Not in labor force	0.97	(0.95, 0.98)
Living Arrangement	Homeless	0.78	(0.77, 0.79)
	Dependent living	1.07	(1.04, 1.09)
	Independent living	1.17	(1.16, 1.19)
Education attainment	8 years or less	1.06	(1.05, 1.08)
	9-11 years	1.17	(1.15, 1.18)
	12 years	0.97	(0.96, 0.98)
	13-15 years	0.87	(0.86, 0.89)
	16 or more years	0.69	(0.67, 0.72)

*Notes:* [Relative risk was calculated for the risk of admission for an illicit substance of abuse. All Relative Risk calculations were significant]

The results of the analysis show that the type of employment, living arrangement, and level of education attainment affect participant’s risk for having an illicit substance as a primary drug of abuse. The relative risk for those unemployed was 1.03 (1.02, 1.04) times the risk of all others. The confidence interval around the relative risk for part time employment and unemployment overlap, but this does not indicate that they are not significantly different. Full time employment and not being in the labor



force had lower risk ratios. This indicated that the risk for having an illicit substance as a primary drug of abuse was lower among those who were employed full time or not in the labor force. This analysis showed that those who lived independently had increased risk compared to all other living arrangements. Risk of admission for an illicit substance was 0.78 (0.77, 0.79) among those who were homeless. This risk indicates that those who were homeless were more likely to be admitted for a licit substance compared to an illicit substance.

For education attainment, a general trend could be seen across all levels of the variable. The more years of education, the lower the relative risk. Among those who have 16 or more years of education attainment the risk is 0.69 (0.67, 0.72) times that of any other education level.

A comparison of relative risk was done by stratifying men and women because national data has shown that gender is important when analyzing patterns in substance abuse (Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality, 2014a). Table 4 also showed a difference in distribution of gender among those admitted for illicit substance abuse was significantly different from those admitted for licit substance use. The results of this stratification can be seen in Table 7.

Table 7.

*Relative Risk of an Illicit Substance by Gender*

Participant characteristics	RR	CI (95%)	RR	CI (95%)
	Men		Women	

Employment	Full time	1.04	(1.02, 1.07)	0.88	(0.85, 0.92)
	Part time	1.11	(1.07, 1.14)	0.98	(0.95, 1.01)
	Unemployed	1.00	(0.98, 1.01)	1.06	(1.04, 1.07)
	Not in labor force	0.96	(0.95, 0.97)	0.96	(0.95, 0.98)
Living Arrangement	Homeless	0.71	(0.69, 0.73)	0.95	(0.93, 0.98)
	Dependent living	1.07	(1.03, 1.10)	1.06	(1.03, 1.10)
	Independent living	1.27	(1.24, 1.30)	1.01	(0.99, 1.03)
Education attainment	8 years or less	1.03	(1.01, 1.06)	1.11	(1.09, 1.13)
	9-11 years	1.18	(1.16, 1.20)	1.16	(1.14, 1.18)
	12 years	0.97	(0.95, 0.98)	0.99	(0.97, 1.00)
	13-15 years	0.86	(0.84, 0.88)	0.86	(0.85, 0.88)
	16 or more years	0.70	(0.66, 0.74)	0.66	(0.63, 0.70)

*Note:* [Relative risk is denoted as “RR”.]

When stratified, the risk of illicit substance use lost significance for women employed part time but was amplified among men who were employed part time 1.11 (1.07, 1.14). For both genders, the risk of illicit substance was decreased for those not in the labor force. Among men, unemployment did not increase the risk of illicit substance use 1.00 (0.98, 1.01) though it was increased in women 1.06 (1.04, 1.07).

For both genders, the risk of illicit substance among those who were homeless was lower compared to all other groups. The relative risk among women who lived independently was not found to be significant. In all categories of education the relative risk was similar for both men and women. However, relative risk was lower among men with an education level of 8 years or less 1.03 (1.01, 1.06) compared to women 1.11 (1.09, 1.13), and higher among men with an education level of 16 years or more 0.70 (0.66, 0.74).

Relative risk was analyzed for the race groups “Black” and “White” to observe if race affected risk. The results of this analysis can be seen in Table 6. Among those who are Black, the relative risk of an illicit substance was higher for those who were

employed part time compared to those who are White. For those who were Black the relative risk for those employed full time was significant 1.05 (1.00, 1.08), though the lower bound of the confidence interval was 1.00. For those who were White, the risk of admission for illicit substance use was decreased with full time employment 0.92 (0.90, 0.95). For both groups, unemployment increased the risk of admission for an illicit substance.

Relative risk was similar for both Black and White when assessing living arrangement. Homeless living had decreased risk of admission for an illicit substance. Among those who were Black the risk was 0.78 (0.76, 0.80), while among those who were White it was 0.79 (0.77, 0.81). Independent living had the greatest risk for both groups. Similar risk patterns were seen in education attainment for both those who were Black and those who were White. Attaining some high school had the greatest risk, while attaining more than 16 years of education had the greatest decreased risk.

Table 7.

*Relative Risk of an Illicit Substance by Race*

Participant characteristics		RR Black	CI (95%)	RR White	CI (95%)
Employment	Full time	1.05	(1.00, 1.08)	0.92	(0.90, 0.95)
	Part time	1.17	(1.12, 1.21)	1.01	(0.99, 1.04)
	Unemployed	1.05	(1.04, 1.06)	1.05	(1.03, 1.06)
	Not in labor force	0.98	(0.96, 1.00)	0.97	(0.95, 0.98)
Living Arrangement	Homeless	0.78	(0.76, 0.80)	0.79	(0.77, 0.81)
	Dependent living	1.10	(1.07, 1.14)	1.04	(1.01, 1.08)
	Independent living	1.17	(1.14, 1.20)	1.16	(1.14, 1.19)
Education attainment	8 years or less	1.04	(1.01, 1.07)	1.09	(1.06, 1.11)
	9-11 years	1.16	(1.14, 1.18)	1.17	(1.16, 1.19)

12 years	0.97	(0.95, 0.98)	0.97	(0.95, 0.98)
13-15 years	0.85	(0.83, 0.87)	0.89	(0.89, 0.91)
16 or more years	0.79	(0.74, 0.85)	0.65	(0.62, 0.68)

*Note:* [The race groups “Asian” and “Other” were not included in this analysis because the small sample sizes created very wide confidence intervals that encompassed 1.]

The upper bound of the confidence interval was 1.00 for Blacks not in the labor force 0.98 (0.96, 1.00), which indicates that the relative risk of admission for an illicit substance is not significantly different from risk of admission for a licit substance.

Among Whites, the confidence includes 1.00 for those employed part time 1.01 (0.99, 1.04). For all other levels of the independent variables, confidence intervals indicated significant associations.

## CHAPTER V

### Discussion

The preliminary findings of this study indicate that the distribution of gender and age variables was different among those who were admitted for illicit and licit substances. The percentage of men admitted for illicit substance abuse was 51.50% compared to 65.08% in licit substance abuse which was found to be significant. And the median age group among illicit users was 30-34 years compared to 40-44 years among licit users. The age difference between the two groups was anticipated.

The results of this analysis indicate that the racial distribution of those admitted for licit and illicit substance abuse are the same. The majority of those admitted for licit or illicit substance use were White. Among illicit users 60.40% were White,  $X^2(1, N=144,563)=140.67, p < 0.0001$ . However, the prevalence rates of illicit substance use in the United States indicate that among Blacks, the rates are higher than among Whites. A

reason for the lower percentage of Blacks is that they may be less likely to initiate treatment (Acevedo et al., 2012; Saloner & Lê Cook, 2013).

The relative risk analysis showed that those who work part time or are unemployed have an increased risk of admission for an illicit substance, while those who work full time or are not in the workforce have a decreased risk. In general, substance use has been associated with unemployment, therefore this finding is not unusual (Baldwin & Marcus, 2014; Compton et al., 2014). However, it was interesting that when stratified by gender the risk was not found to be significant among men though it was significant among women. The reason for this is unknown, though it is possible that stratification decreased the power of association.

Relative risk calculations show that those who live independently have the highest risk of admission for an illicit substance compared to those who live dependently or are homeless. This may be because those who live dependently often do so under supervision or within a group home due to co-occurring mental health problems. The relative risk of admission for an illicit substance was significantly decreased among those who were homeless compared to the other populations. Among those who were homeless, more people were admitted for a licit substance. A small number of those who were homeless were veterans (2.54%). Previous studies have shown that hazardous drinking is associated with homelessness (Ghose et al., 2013). Over 80% of those who are homeless have experienced lifetime alcohol and/or drug problems (Pasquette, 2011).

The relative risk assessed for different levels of education attainment indicated that those who graduated from high school, had secondary education, or had post-secondary education, had a decreased risk of admission for an illicit substance. This was

an interesting finding because even when stratified by gender or race, the same patterns in risk could be seen. As a health topic, it solidifies the fact that the completion of high school lessens the risk of substance use problems (Lee, Herrenkohl, Kosterman, Small, & Hawkins, 2013).

The social determinants of health assessed in this study—gender, age, race, employment, living arrangement, education—are associated with the primary substance of abuse. The theory of behavioral health is that social determinants of health influence a person's efficacy and health outcomes. Though the results of this study show that certain types of people are more likely to enter treatment for illicit versus, the direction of cause remains unknown. Such as, does being unemployed make a person more at risk of abusing illicit drugs? Or is it the illicit drugs that cause a person to be unemployed? This study fulfilled its intended purpose of discovering if there was a difference between those who enter treatment facilities for illicit substances and licit substances but many questions remain unanswered. The question that remains unanswered is, is there a need for the differentiation between illicit and licit substances? Further study should be conducted to understand the effects of drug policy on controlling and preventing substance abuse.

### Strengths and Limitations

The data in the Treatment Episode Data Set for the state of Georgia comes from all substance abuse treatment centers that are funded through state block grants or Medicaid. Because of this, the sample size is very large and the method by which data is collected, aggregated, and disseminated is also standardized and reliable. However limitations in this study also exist. Data from treatment centers not funded through state block grants or Medicaid are not captured in this study. When assessing relationships between independent variables, all levels showed significant differences due to large sample size. Therefore stratification for the purpose of examining the real relationship between variables was used only when recommended, not when significance was found. This is a cross-sectional study; therefore the data is only able to describe associations not causation.

Another limitation is that individuals who enter treatment are not tracked over time, nor are there objective ways of assessing recurrence in treatment. There is a variable in the data set labeled as “number of prior treatment episodes” that allows for the assessment of how many previous treatment episodes a person has experienced. However, this variable does not show how often or when the previous treatment episodes took place.



### Implications

The major findings in this analysis align with what is known about substance abuse and the associated socio-demographic factors. Though what makes this study significant is it shows that these associations occur not only in the general population, but also among those admitted to substance abuse treatment. Other findings in this study lend more questions, such as why most socio-demographic distributions are the same for those admitted for illicit and licit substances.

The results of this study show that prevalence of illicit and licit substance abuse are the highest between ages 21 and 55. Prevention of substance use in Georgia is mainly targeted towards youth, however the implications of this study indicate that a higher target age can be considered (G.A. Department of Behavioral Health and Developmental Disabilities, 2014). The lower prevalence of Blacks who are admitted into treatment facilities also points to implications for public health. Blacks have higher prevalence of illicit drug use compared to whites, however they are less likely to initiate and engage in substance abuse treatment (Acevedo et al., 2012; Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality, 2014b). Other minorities like American Indian/Alaskan natives and Native Hawaiians/Pacific Islanders have higher prevalence of substance abuse compared to both Whites and Blacks, but not as many enter treatment. Tailored prevention methods could be developed to reach these populations about the adverse health effects of substance abuse.

The National Institute on Drug Abuse (NIDA) has defined 16 principles that are integral to prevention (National Institution on Drug Abuse, 2014). Prevention is a long-term goal. Just as social determinants cannot be changed in one day, health behaviors

generally take a long time to change. Prevention needs to be long-term, and often repeated. Additionally, in order for prevention to be effective, it should be adapted to match the needs and culture norms.

The results of this study are preliminary but they indicate that possible “culture” differences exist between those who are homeless and those who are not. Culture differences may also exist between those who have who completed less than 12 years of school and those who completed 16 or more years of school. It could also indicate that there is a lack of education about substance abuse at transitional points in a person’s life. It may be likely that someone who completed high school and college had more time to be educated about substance abuse. One avenue would be to tailor a prevention method towards persons who transitioned out of school before graduation. Another group of people in transition are those who are homeless or unemployed. The results of this study also show that illicit substance abusers tend to be young adults between the ages of 30-35. Prevention at an early age has been proven to be an effective way of deterring future substance abuse, but a possible method may also be to tailor prevention strategies for adults.

Substance abuse prevention is an important issue in the United States especially at this time. The Prescription Drug Monitoring Program may control the over-prescribing of certain opioids, but it could also shift use (Huecker & Shoff, 2014). Additionally this dataset shows that treatment for opioids, 14.03%, is lower marijuana and crack, 35.74% and 27.39% respectively. Efforts to stop prescription drug abuse should include educating prescribing doctors and pharmacists as well as educating the general population (Manchikanti, 2007). The results of this analysis also show that the majority

of those in treatment for marijuana, crack, and opioids are between the ages of 25 and 44. Substance abuse prevention is Persons who receive treatment are inherently different from those who do not. However, prevention education is often targeted towards youths, parents, or the general population.

### Recommendations for Future Research

Substance use disorders occur at varying levels of severity and occur when repeated use of alcohol and/or other drugs causes a person to have health problems, disability, and impaired function in the home or work or school (“Substance Use Disorders,” n.d.). In this dataset, substance use disorders besides alcohol use disorders, and other mental health disorders were unable to be studied. Co-occurrence of substance use disorders and mental illness is a problem that is difficult to diagnose but is one that should be studied. The National Survey of Substance Abuse Treatment Services (NSSAT) has estimated that 45% of Americans who seek substance use disorder treatment have been diagnosed as having co-occurring conditions (“Behavioral Health Treatments and Services,” n.d.). Common co-occurring conditions include mood, anxiety, and personality disorders (Schulden, Lopez, & Compton, 2012).

Another area of research is the difference between male and female substance abuse treatment. This study has shown that women were more likely to be admitted for

licit substance use compared to illicit. However, the reasons why this may be are unknown.

Unique identifiers are not assigned to individuals but are assigned to each person admitted into the treatment facility, therefore an individual can enter the facility multiple times within a year. In addition to studying co-occurring mental conditions in TEDS, another direction for future research would be to obtain longitudinal data for those in TEDS to determine the effectiveness of treatment on readmission.

This study found significant differences between illicit substance abuse and licit substance abuse, but the increase in risk was minimal. The greatest risk ratio in this study was 1.27, found in those living independently. A risk ratio of 1.27 equates to a 27% increase in risk of abusing an illicit substance compared to a licit one. And the difference in prevalence of illicit substance abusers compared to licit substance abusers was roughly 3%. A possible area of study is the importance of emphasizing drug policy when it comes to substance abuse prevention.

The racial profile of persons who entered treatment facilities was also vastly different from the prevalence rates found in the NSDUH reports. A possible area of research is learning why certain racial groups, such as Pacific Islanders, are not entering into treatment if their prevalence of substance abuse is high. There may be cultural stigma at play or other underlying risk factors.

## Conclusion

Current research findings often address specific types of substance abuse such as alcohol, marijuana, cocaine, and heroin. A growing concern in the United States is prescription drug abuse particularly opioids which has led to the establishment of the Prescription Drug Monitoring Program. However, placing a restriction on these medications may not be enough to prevent substance abuse—it may even incite abusers to find new ways of continuing their habit. Educating people about the adverse mental and physical health problems is an important component of prevention but targeting prevention programs at the right populations should be just as important.

This study has shown those being treated for illicit substance abuse are inherently different from those who are treated for licit substance abuse. It is only a general comparison that does not take into consideration polysubstance abuse (Ogbu, Lotfipour, & Chakravarthy, 2015), another growing area of research. And substance abuse is also a mental health concern. Creating legislation may curb the use of certain drugs, but one of the biggest concerns is getting at the reason behind why people use substances. Substance abuse treatment is often tailored to the individual's needs based on a combination of which substance(s) is being abused and if there are mental health problems. Though persons who enter treatment are inherently different from those who do not, it may be beneficial to take a similar tailored approach towards preventing substance abuse.

## APPENDIX A

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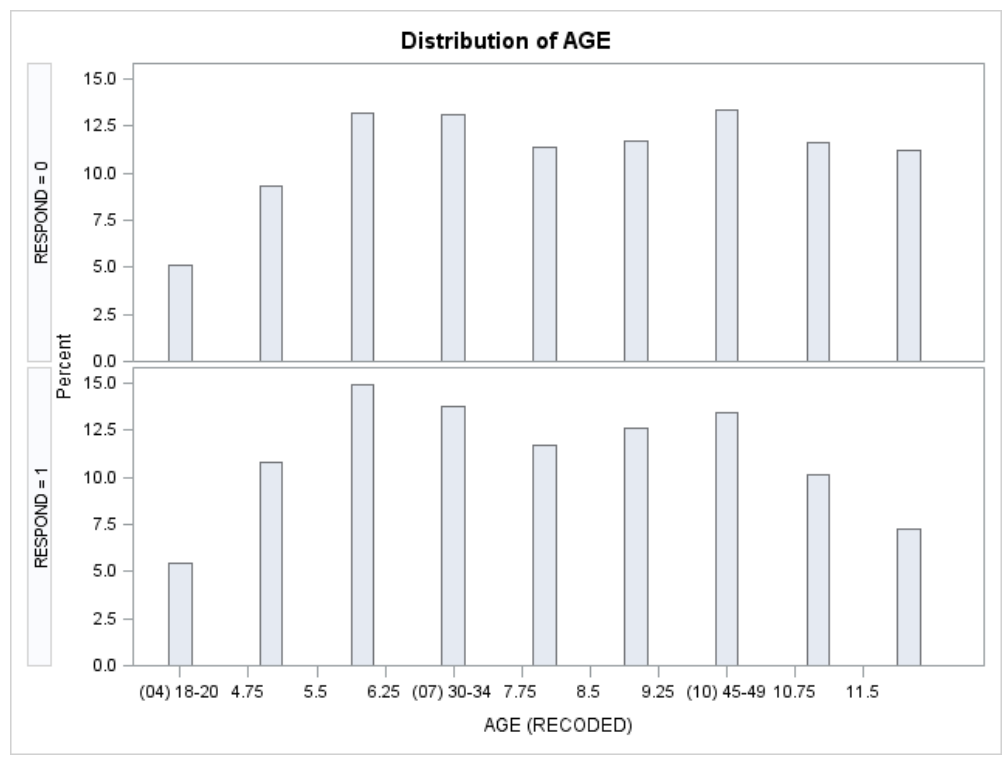
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### APPENDIX B

#### Figures

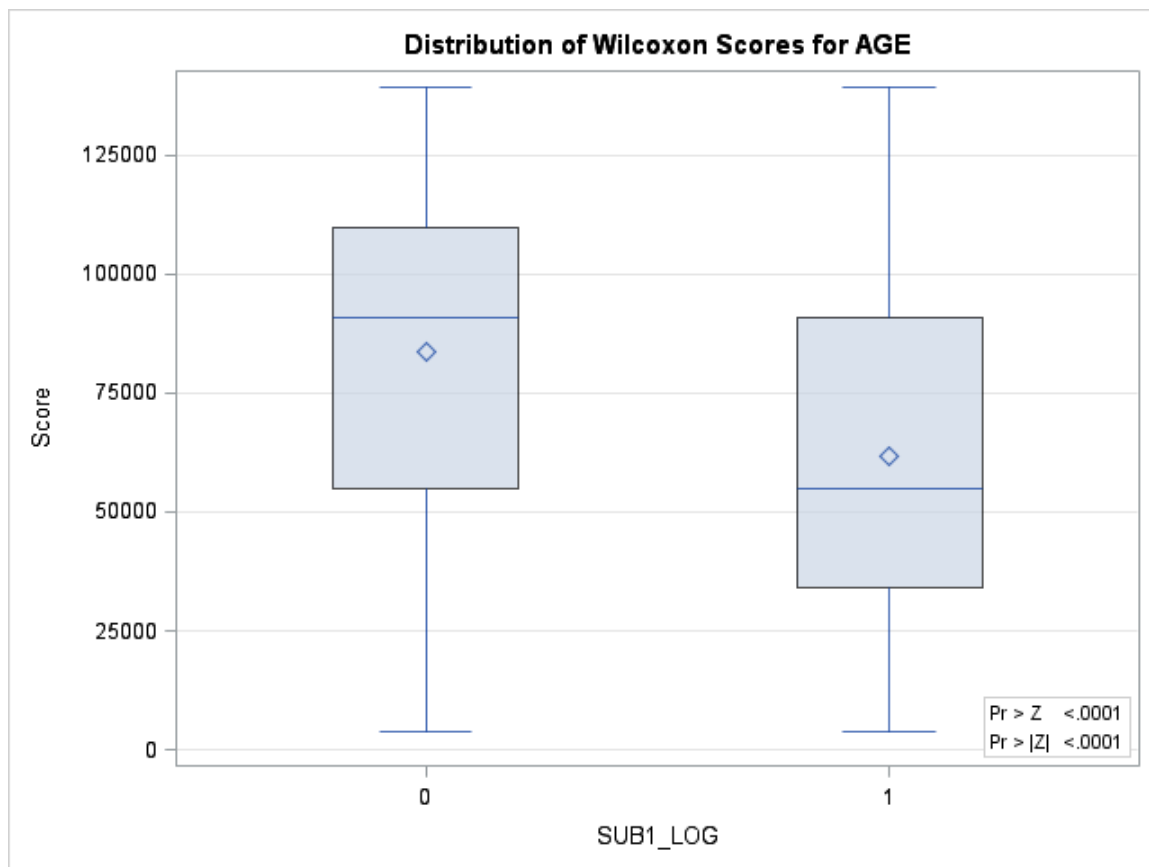
Figure 5.

*Age Distribution of the Sample*



*Note:* [The histogram shows the age distribution for those who indicated having a primary substance of abuse at admission (RESPOND=1) and those who did not (RESPOND=0).]

Figure 6.

*Distribution of Age by Substance Type*

*Note:* [Between illicit substance admission and licit substance admission the median age was different. The variable SUB1\_LOG is a dichotomous variable. 0 denotes admission for a licit primary substance. 1 denotes admission for an illicit primary substance.]