2019

SUBSTANCE USE ADMISSION TRENDS FROM 2000 TO 2015 WITHIN AND ACROSS RACIAL, GENDER, AND AGE GROUPS

Marie C. Tate
University of Rhode Island, marie_tate15@uri.edu

SUBSTANCE USE ADMISSION TRENDS FROM 2000 TO 2015 WITHIN AND ACROSS RACIAL, GENDER, AND AGE GROUPS

BY

MARIE C. TATE

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF REQUIREMENTS FOR

THE DEGREE OF

MASTER OF ARTS

IN PSYCHOLOGY

UNIVERSITY OF RHODE ISLAND

2019

MASTER OF ARTS THESIS

OF

MARIE TATE

APPROVED:

Thesis Committee:

Major Professor:
Andrea Paiva

Lynda Stein

Bryan Blissmer

Nasser H. Zawia
DEAN OF THE GRADUATE SCHOOL

UNIVERSITY OF RHODE ISLAND

2019

ABSTRACT

Although there has been illicit drug use problems in the United States since the 1960s (Johnston, O'Malley, Bachman, & Schulenberg, 2009), the federal government only began collecting data on people seeking substance use treatment in 1992 in order to track the trends of substances being used (Substance Abuse and Mental Health Services Administration (SAMHSA), 1999). Many of the analysis of the substance use data has focused on national level data, however, states are responsible for their treatment and prevention efforts, therefore examining state level data should play an important role in determining state level responses. The current study focuses on the substance admission trends in Virginia (VA), which saw a steep increase of death by opiates from 1997 to 2003 (Johnston et al., 2009) and again between 2013 and 2015 (Johnston et al., 2009) The substance use patterns were be broken down by age groups, racial groups, and genders from 2000 to 2015. Results show the substance use trends in VA, and how significant changes in admission rates occurred over time for different genders and races. Significant changes occurred differently for each group. These trends could inform prevention and treatment services, as well as future policies. Having knowledge of significant changes provides insight into what substances are becoming more popular in VA specifically.

ACKNOWLEDGMENTS

Thank you to Andrea Paiva for all the help and support over the past two years. Also, thank you to my committee for supporting me through all the changes I have made since beginning my time at the University of Rhode Island.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

FIGURE PAGE

Chapter 1

Introduction

Substance use has been a chronic problem in the United States (US) for many years (Johnston, O'Mally, Bachman, & Schulenberg, 2009; Schulden, Lopez, & Compton, 2009). In 1960 an illicit drug use epidemic started in the US, which began the War on Drugs (Johnston et. al, 2018; Schulden et. al, 2009). Preventing substance use is an ongoing challenge as the popularity of specific substances change over time and across age cohorts, genders, and racial backgrounds (American Association of Pediatrics (AAP), 2015; John & Wu, 2017; McCabe, Morales, Cranford, Delva, & Boyd, 2007; McHugh, Votaw, Sugarman, & Greenfield, 2018; Nicholson & Ford, 2019; United Nations Office on Drug and Crime (UNODC), 2010). The trends of popularity in substances shift, for example some years there are spikes in cocaine use and other years there are increases in heroin use (Johnston et al., 2018). The current study focuses on substance use patterns in Virginia (VA) because of a growing concern for opiate use in this state (Virginia Department of Behavioral Health and Developmental Services (DBHDS), 2015). Death by opiate use had a reported increase of 300% from 1997 to 2003 (DBHDS, 2015) and then another increase of 180% from 2008 (73) to 2013 (174) (DBHDS, 2015). The overall death by drugs in VA has increased 31.8% since 2010, going from 692 to 912 by 2013 (DBHDS, 2015).

As substance use shifts over time the popularity of substances within different gender and racial groups may vary (McCabe et al., 2007; McHugh et al., 2018). Studying differences in substance use would provide insightful information, which can be used to promote or tailor treatment (McHugh et al., 2018; Nicholson & Ford, 2009). Reasons to study these patterns extend beyond the clients, use impacts families, law enforcement,

health professionals, school systems, and public health (Johnston et. al, 2018; Schulden, Lopez, & Compton, 2012). With substance use being a concern for multiple populations (Johnston et al., 2018), studying trends could impact policies, education on substances, prevention, treatment and recovery programs, and funding.

In 1992 the federal government noticed the importance of tracking substance use patterns and began collecting data on substances used at time of admission into treatment facilities (SAMHSA,1999). When people are admitted into substance use treatment facilities that are federally funded, there is a requirement to keep track of what substances people are currently using (primary, secondary, and tertiary), the method they use (injection, inhaling, etc.), how old the person is, race, gender, and other demographic variables (SAMHSA, 1999). These data can provide insight on what substances may be increasing in popularity and if there needs to be a shift in resources provided (SAMHSA, 1999). Treatment Episode Data Set – Admission (TEDS-A) can be analyzed at the state level, which allows states to determine what, if any, changes in policies, prevention, and/or treatment need to be made.

Each state within the US manages its substance abuse problems, which allows the state to focus on which substance is of highest concern within said state (SAMHSA, 1999). In the state of VA substance use rates were reported as below the national average. Regardless of how low the rates are, substance use has increased since 2011 as have deaths related to substance use (DBHDS, 2015). According to the TEDS-A data (SAMHSA, 2015), VA's rate of admission into substance abuse treatment from 2004 to 2014 indicated alcohol was the most frequent reason for admission at 40% and stayed consistently high through those 10 years. The second most prevalent substance has been

marijuana, which stayed at around 20% since at least 2004 (SAMHSA, 2015). The third most frequent substance reported for admission was cocaine, which has dropped from 20% to about 10% since 2004 (SAMHSA, 2015). Heroin was the fourth most reported substance, which has gone from 10% to 12% of admissions since 2004 (SAMHSA, 2015). The fifth most frequently reported substance was other opiates, going from about 5% in 2004 to 15% in 2014 (SAMHSA, 2015). The substance that was reported the least frequently was methamphetamines which have consistently made up about 1% of persons in the VA-specific TEDS-A data (SAMHSA, 2015).

The current study will look at substance use admission trends from 2000 to 2015 in VA and will investigate these trends within age groups, within and between racial groups, and within and between genders reported in TEDS-A. According to past research (Chhatre et al., 2017), 90% of the substances reported in TEDS-A were alcohol, marijuana, cocaine, heroin, and other opiates. Therefore, it is hypothesized that (1) the aforementioned substances will make up at least 90% of the total substances reported in VA and will be the focus of the analysis, (2) descriptive statistics will provide information on the trends of substance use admission over time for different age groups, (3) there will be significant trends found over time for males and females in alcohol, marijuana, heroin, cocaine and other opiates, and (4) there will be significant trends found over time for the White and Non-white groups for alcohol, marijuana, heroin, cocaine, and other opiates.

Chapter 2

Literature Review

VA's rate of admission into substance use treatment from 2004 to 2014 had alcohol as the top substance reported, with 40% of admissions, and stayed consistent

through those 10 years (SAMHSA, 2015). Nationally the trend for alcohol use has stayed consistent and continues to be a concern to people being admitted for substance use treatment (SAMHSA, 2015). The importance of tracking these trends among different ages, genders, and racial groups is to gain insight into the popularity of substances among all the groups (Amaro, Blake, Schwartz, & Flinchbaugh, 2001; Resnicow, Soler, Braithwaite, Ahluwalia, & Butler, 2000).

The Biennial Report on Substance Abuse Services Per Code 37.2-310 (DBHDS, 2015) reported the comparison between VA and the national levels of substance use. Alcohol dependency was reported approximately the same level, illicit drug use in the past month was lower in VA, marijuana use in the past year was lower in VA, nonmedical use of pain relievers in the past year was higher in VA. An increase in death by heroin of 170% and 31.8% for death by illicit drugs within five years is a concern (DBHDS, 2015). The Virginia Behavioral Health Barometer (SAMHSA, 2017) also reported that heroin use was equal to and barely higher than the national level. Breaking down the VA sample into age, gender, and racial groups might allow for a more in depth understanding of who is being impacted by these substance trends.

Age. Researchers have investigated substance use within unique populations in the past (AAP, 2015; Martin, Longinaker, & Terplan, 2015). These studies help determine the struggles that the population experiences and bring to light issues that may have gone unnoticed otherwise. Typically, the data are investigated within a specific age group (i.e. 55 and older (Chhatre et al., 2017)). Studying these substance use trends across multiple age groups could provide insight on how prevention work could be

tailored for targeted populations. Below is a breakdown of how alcohol, marijuana, heroin, cocaine, and other opiates affect different age groups.

Alcohol, marijuana, and tobacco are the most popular substances used in adolescents (AAP, 2015; Mutter et al., 2012). A unique issue related to substance use among adolescents is its relation to increased risk behavior problems, physical and mental development, substance dependency as an adult, and adolescent deaths (Mutter et al., 2012; AAP, 2015). According to the American Academy of Pediatrics (AAP, 2015), 28% of eighth-graders have used alcohol, 45% of students between 9th and 12th grade have tried marijuana, and 15% of 12th graders reported misuse of prescription medicine. Toumbourou, Stockwell, Neighbors, Marlatt, Struge, and Rehm (2007) reported that 2.4 million people 12 to 17 have used illicit drugs within the last month. However, alcohol and marijuana are not the only two substances that impact adolescents. Schneider et al. (2017) conducted a study investigating cocaine use among high school students. There has been shifting in cocaine use patterns in adolescents over time. Data suggested that the prevalence of cocaine use among high school students double from 2009 to 2011 (Schneider et al., 2017). Cocaine use in adolescents was highest in 1999 at 9.7% and lowest in 2009 at 2.3% but increased to 5.2% by 2015 (Schneider et al., 2017). While it is good that the cocaine use rates are lower than they were in the 1990s, it is important to note that it did increase from 2009 to 2015 and it is important to continue to study as time goes on (Schneider et al., 2017). Studying these trends in VA will be important to determine where resources for prevention and treatment in adolescents would be beneficial.

Shifting the focus from adolescents to young adults, McCabe et al. (2008) conducted a study on substance use prevalence in a college population. The average age for McCabe et al.'s (2008) study was 20 and questions included the use of marijuana, cocaine, LSD, other psychedelics, methamphetamine, heroin, inhalants, and ecstasy were asked and prescription drugs that were not prescribed to you (sleeping, sedative/ anxiety, stimulant, and pain medication). The results found that marijuana use was the most common substance used among college students, followed by opioids, prescription stimulants and psychedelics (McCabe et al., 2008). These findings were able to provide insight into future work on prevention and intervention services among the collegiate population (McCabe et al., 2014).

As for people who are in their 30s to 50s and older, Nicholson and Ford (2009) found that cocaine use among adults 35 and older was higher than ages below 35. Choi et al. (2018) found that people who used marijuana and were 35 and older were the highest age group to be continued users in their one year follow up. Also, when looking at substance trends in this age population, alcohol and marijuana seem to reduce in the older sample, heroin and prescription pain relievers increase in the older sample (Age of Substance Use Initiation among Treatment Admissions Aged 10 to 30, 2014). Chhatre et al. (2017) found that people who were 55 and older were seeking substance use treatment for alcohol more than any other substance. However, cocaine, marijuana, heroin, nonprescription methadone, other opiates, and synthetics have also increased in proportion (Chhatre et al., 2017).

Gender. The trends of substance use among males and females have historically been different, as males use substances more frequently than females (McHugh et al.,

2018). It was stated that the substance use gap between males and females is narrowing but males are not using substances less (McHugh et al., 2018). This leads researchers to believe increases in specific drugs make it appear as if the gap is narrowing and women are using more overall substances. Investigating these substance use trends could allow for more targeted prevention and treatment for females since females have increased risks during childbearing years (Martin et al., 2015) and past research has shown certain treatments are more effective for females **(**Yonkers et al., 2014**)**. When focusing on cocaine addiction in post-partum women, Yonkers et al. (2014) found that women who received progesterone relapsed less than women who received a placebo.

McHugh et. al (2018) conducted a review of the substance use disorder differences between males and females. Substance use studies have focused more on males in the past because they use substances at a higher rate than females typically (Muhugh et al., 2018; SAMHSA, 2015) However, use is increasing in females and knowing the difference in substance use patterns and the effectiveness of prevention and treatment moving forward is important to study (McHugh et al., 2018). The use of substances among women provides a unique impact, especially during childbearing years as the substances not only impact the mother but potentially the child as well (Behnke, Smith, Committee on Substance Abuse, & Committee on Fetus and Newborn, 2013; Martin et al., 2015). Martin et al. (2015) investigated prescription opioid abuse during pregnancy. Using TEDS, all clients who were identified as pregnant (410,665 people) at the time of entry were included (Martin et al., 2015). While admission rates for pregnant women have remained stable over time, women reporting prescription opioid use as their primary substance increased from 2% in 1992 to 19% in 2012 (Martin et al., 2015).

Targeting prevention and treatment services for the most frequently used substances in women could provide a deeper understanding of how substances affect their bodies if they were currently or were to become pregnant.

Beyond the scope of pregnant women, McCabe et al. (2007) studied gender differences in college students. McCabe et al. (2007) had 4,580 participants with 51% of the sample being women and the average age of 20 years old. Of the substances that were included in the questionnaire (marijuana, cocaine, LSD, other psychedelics, methamphetamine, heroin, inhalants, ecstasy, sleeping, sedative/ anxiety, stimulant, and pain medication) were broken down by gender and then by racial/ ethnic background. It was reported that 40% of the Hispanic women in the sample used marijuana, 38.1% of the White women sample, 20.6% of the Asian women sample, 18.7% of the African American women sample, and 32.4% for women of other racial categories. The prevalence was higher for men, illicit drug use was 45.1% for Hispanic, 41.5% for White, 22.8% for Asian, and 34.1% for African American, it was lower for men in other racial categories at 28.3% (McCabe et al., 2008). For women who used prescription drugs not prescribed to them were 18.2% of the Hispanic sample, 13.8% for the White sample, 6.3% for the Asian sample, 8.4% for the African American sample, and 11.6% for the women in other racial categories. The prevalence of prescription drugs not prescribed to them was lower for Hispanic men at 16.2%, White men at 13.8%, other racial categories men at 9.9%. It was higher for the men in the Asian sample at 9%, and men in the African American sample at 8.6% (McCabe et al., 2008). Nolen-Hoeksema (2004) reported that while there are not many gender differences in the amount of risk factors when consuming alcohol, the risks that each gender faces are different. Men have higher

chances of alcohol related physical problems than women and are more likely to be part of partner assault when both parties are drinking (Nolen-Hoeksema, 2004). Women are more likely to suffer cognitive impairments than men and are more likely to be victims of partner assault (Nolen-Hoeksema, 2004). These differences between men and women all support the idea that study use over time allows for tailored prevention, treatment, and services available for both genders.

Race. Past research (McCabe et al., 2007; Nicholson & Ford, 2009) has also shown differences in illicit drug use between racial groups. The main substances reported included, marijuana, cocaine, heroin, and any prescription drug (McCabe et. al, 2007). McCabe et. al (2007) studied the collegiate population and results indicated, White and Hispanic participants used substances more than African American participants. Nicholson and Ford (2009) investigated substance use among Black adults and found, cocaine affects the Black population more so than other racial groups. They reported that cocaine use in the Black population increased significantly from 2011 to 2015 (Nicholson & Ford, 2009). The same article reported the older (35 and older) population is more affected by cocaine use because of increased disadvantages (Nicholson & Ford, 2009). These disadvantages include, an increased likelihood of living in a low SES area, easy access, lack of interventions, unemployment is high (Nicholson & Ford, 2009) Determining such trends may inform important for future funding distribution and policies.

Studying the differences in substance use between people with different racial and ethnic backgrounds is important for many reasons. Starting at a young age, minority children have a higher chance of being exposed to more risk factors than White children

(Vega, Zimmerman, Warheit, Apospori, & Gil, 1993). This risk is thought to be potentially related to the socioeconomic (SES) or cultural differences (Vega et al., 1993). Studying the patterns of substance use in the minority population can allow for policies to be developed and preventions to be tailored to reach people who are at higher risk of substance use and abuse. Nicholson and Ford (2009) investigated substance use among Black adults and found cocaine affects the Black population more so than other racial groups. Using the National Survey on Drug Use and Health, it was supported that more Blacks used cocaine than Whites (Nicholson & Ford, 2009). It is theorized to impact the Black community more than the White due to socioeconomic disadvantage and discrimination (Carliner, Delker, Fink, Keyes, Hasin, 2016; Zapolski, Baldwin, Banks & Stump, 2017). This information is important for future prevention and intervention work on the Black population. Nicholson and Ford (2009) found that opiate use in Blacks was increasing and those in low income areas have been increasingly exposed to fentanyl. McCabe et al. (2007) found that marijuana was the most prevalent substance before college in the White and Hispanic students prior to college. Hispanic students were found to be at risk for severe consequences associated with several drug use behaviors (McCabe et al., 2007). These differences all led to the scope of this study and investigating the changes in substance use patterns over time for multiple groups including age, gender, and race.

Investigating the trends for people of different ages, genders, and races in VA will be able to provide insight on where resources would be beneficial for prevention, treatment, and policy work. Being able to study the trends of substance admission rates

statistically for different genders and races will provide more solidified support for substances becoming more popular among specific groups of people.

Chapter 3

Methodology

Treatment Episode Data Set - Admissions

Data being used for the current study is from the Treatment Episode Data Set – Admissions (TEDS-A) (SAMHSA, 2017). This dataset was created to track admissions into substance treatment facilities that are receiving federal funding, across the 50 states, Washington D.C., and Puerto Rico. The data includes information from people ages, 12 to 95. The data have been collected annually since 1992, and it is estimated to include 83% of all substance and alcohol treatment admissions that are eligible in the US (SAMHSA, 2013a). When clients seek treatment, the facilities record data at intake, including basic demographics (age, race, and housing), treatment characteristics (referral, prior treatment), and self-reported substance use, including primary, secondary, and tertiary. There is no required method to collect this data, therefore each state and facility is able to collect the data however they choose (SAMHSA, 2017).

Sample

The current study will use data from 2000-2015. There are 29,635,901 participants in the overall TEDS-A national database. For the purposes of this study, the Virginia TEDS-A data will be separated ~~and~~ analyzed. The VA sample contains 513,844 people admitted into treatment, averaging 32,115.25 per year. The admission numbers were mostly white (60%), 30% were African American (see table 1 for breakdown by year). There are 166,955 females and 346,092 males (see table 2 for breakdown by year). The total sample included 513,844 people over from 2000 to 2015, however, 264,797

(54.57%) of this sample were excluded from the analysis because they had reported one or more prior treatment episodes. People who had reported more than one prior treatment were excluded because there was no way to account for the dependency of potential data collected from an individual more than once. The current study included the remaining 248,647 participants over the 15 years of data, who reported zero prior treatment episodes. The average number of people admitted per year was 16,576 (see table 3 for a breakdown of number of first-time admissions per year).

Table 1.
Breakdown of admission numbers by race for each year (2000-2015).

Virginia Race						
	2000	2001	2002	2003	2004	2005
White/ Caucasian	13,445	15,442	20,348	30,513	34,437	22,274
Black/ African American	8,225	8,954	11,299	16,273	18,309	11,326
Alaska Native	14	19	15	21	36	13
American Indian	90	105	127	196	223	111
Asian or Pacific Islander	197	259	253	396	371	240
Asian	1	1	0	18	55	53
Other Single Race	1,234	1,561	1,754	2,691	2,886	2,038
Native Hawaiian or Other Pacific Islander	0	1	4	2	7	6
Two or more races	0	0	0	0	0	113
	23,206	26,342	33,800	50,110	56,324	36,174
	2006	2007	2008	2009	2010	2011
White/ Caucasian	20,796	18,682	20,030	18,214	16,327	16,367
Black/ African American	10,460	9,256	9,570	8,650	7,653	8,045
Alaska Native	13	14	14	19	18	5
American Indian	119	102	90	109	69	87
Asian or Pacific Islander	205	71	0	0	0	0
Asian	65	138	281	244	195	259
Other Single Race	2,126	2,071	2,195	1,924	1,654	1,880
Native Hawaiian or Other Pacific Islander	9	15	26	20	23	12
Two or more races	385	404	490	499	513	608
	2012	2013	2014	2015	Total	
White/ Caucasian	16,308	14,879	15,379	14,608	308,049	
Black/ African American	7,857	6,780	6,464	5,869	154,990	
Alaska Native	15	12	4	4	236	

American Indian	82	54	58	57	1,679	
Asian or Pacific Islander	0	0	0	0	1,992	
Asian	243	174	182	118	2,027	
Other Single Race	1,388	1,324	1,273	949	28,948	
Native Hawaiian or Other Pacific Islander	24	15	9	15	188	
Two or more races	836	892	878	809	6,427	

Table 2.
Breakdown of admission number by gender for each year (2000-2015).

Virginia Gender						
	2000	2001	2002	2003	2004	2005
Male	16,303	18,451	23,690	34,557	38,516	24,736
Female	7,152	8,108	10,442	15,993	18,441	11,834
	2006	2007	2008	2009	2010	2011
Male	23,774	21,332	22,881	20,312	17,885	18,613
Female	11,120	10,084	10,799	9,664	8,766	9,027
	2012	2013	2014	2015	Total	
Male	18,206	16,397	16,148	14,291	346,092	
Female	9,496	8,622	8,790	8,617	166,955	

Table 3.
Breakdown of first time admissions by year in VA

Virginia First Time Admissions by Year					
2000	2001	2002	2003	2004	2005
12334	13319	18595	26682	28460	18390
2006	2007	2008	2009	2010	2011
17874	16325	16549	14098	12085	11900
2012	2013	2014	2015	Total	
11282	10663	10713	9378	248647	

Measures

The measures that are the focus for the current study include only the primary substance reported at the time of admission (SAMHSA, 2017). Primary substances were selected because the records of them are generally more accurate than secondary or tertiary substances reported. The inconsistencies in secondary and tertiary substances come from the facilities, employees do not always report secondary/ tertiary substances

or do not list them in a meaningful order. Eighteen possible substances can be selected and only one substance can be selected as primary substance used. Substances used include, alcohol, cocaine (including crack), marijuana (including hashish), heroin, methadone, other opiates and synthetics (prescription opioids), PCP, hallucinogens, methamphetamine, other amphetamines, other stimulants, benzodiazepines, other tranquilizers, barbiturates, other sedatives or hypnotics, inhalants, over-the-counter medications, and other substances (nicotine is not included). The same 18 substances are included at every time point. Age was recorded continuously initially but then recoded into categories. Age categories include, 12 to 14, 15 to 17, 18 to 20, 21 to 24, 25 to 29, 30 to 34, 35 to 39, 40 to 44, 45 to 49, 50 to 54, and 55 and over. Racial categories that were collected over time and the majority of people were white (60%) therefore the groups will be white and non-white. Gender was collected as male and female (SAMHSA, 2017).

Analysis

For the current study, the first analysis investigated frequencies to ensure that at least 90% of the primary substances reported at admission in VA are alcohol, marijuana, cocaine, heroin, and other opiates. Next, descriptive statistics were used to explore the trends of alcohol, marijuana, heroin, cocaine, and other opiates within and between age groups. To answer the research question regarding trends over time, a Mann Kendall trend analysis was conducted on each of the substances reported from 2000 to 2015 for race and gender. For the Mann Kendall trend test, all primary substances (alcohol, marijuana, heroin, cocaine, and other opiates) were converted from frequencies to rates of admission per year and analyzed based off percentage rates.

Mann Kendall Trend Analysis

The Mann-Kendall trend analysis was selected based on the ability to handle data that is converted into rates and analyzed using the median to determine if there is a significant increase or decrease in rates over time. It is commonly used in studies that investigate significant trends over time (McCarthy et al., 2015; Yue, Pilon, & Cavadias, 2002). The data will be converted into rates based on the number of admissions per primary substance and analyzed for each substance per male/female and White/non-White. The numerator for each percentage was the number of people admitted for the specific substance for the category they are in (i.e.: male, female) and the denominator is the total number of people admitted into treatment facilities per year for the first time and in VA.

Chapter 4

Findings

Overall Results

When investigating the frequencies of primary substance reported at admission into substance use treatment facilities, alcohol, marijuana, heroin, cocaine, and other opiates accounted for 96.5%. Overall, during the years of 2003 and 2004 admissions spiked in every substance (alcohol, marijuana, heroin, cocaine, other opiates) reported throughout every group (age, gender, racial). In 2005 admission numbers decreased back to approximately where they were in 2002 and remained there. See figure 1 for a visual of all admission numbers.

Alcohol. Alcohol admission rates over the 15 years have fluctuated in admission numbers by 7,102 (13.02%) people, on average 5,719 (37.13%) new people have been admitted into substance use treatment facilities for alcohol use per year in VA. In 2003 alcohol admissions increased by 3,738 (4.57%) people from 2002 and then in 2004

decreased by 3,527 (-.64) by 2005. However, it is important to note that the percentage of admissions from 2004 to 2005 of people being admitted for alcohol use increased. For alcohol admissions, the highest number of people were admitted in 2004 (10,298) but the highest percentage of people being admitted for alcohol use did not occur until 2010 (42.8%).

Marijuana. Marijuana admission rates over the 15 years have fluctuated in admission numbers by 3,754 (11.16%) people, on average 3,482 (23.21%) new people per year have been admitted into substance use treatment facilities for marijuana in VA. In 2003 alcohol admissions increased by 1,915 people from 2002 and then in 2004 decreased by 2,078 by 2005. The rates of admissions for marijuana use did not match the high number of people admitted for marijuana use, the years where the highest number of people being admitted did not match the years the highest percentage of people admitted that year for marijuana use. For marijuana admissions, the highest number of people were admitted in 2004, with 5,907 but the highest percentage of people being admitted did not occur until 2013 with 28.44% of people admitted that year being admitted for marijuana use.

Heroin. Heroin use admissions overall have increased since 2000, from 569 to 923 in 2015. The overall percentage of people being admitted to heroin use has increased from 4.61% to 9.84%. There was a spike in admission numbers for heroin use in 2003 with 1,287 people and 2004 with 1,470 people however because of the spike in admission for all substances the percentage rates did not increase much these years. Percentage rates for heroin admissions spiked in 2012 increasing from 4.59% in 2011 to 6.02%. Since 2012 rates have only continued to increase.

Cocaine. Cocaine admissions, in general, seem to have decreased over time. In 2000 there were 1,246 (10.91%) people admitted for cocaine use and by 2015 only 512 (5.46%) people were admitted for cocaine use. The highest spike in cocaine admission numbers was also in 2003 and 2004 with 3,411 people in 2003 and 4,474 people in 2004. The highest admission rate was also in 2004, with 15.72% of people being admitted into treatment reported cocaine as their primary substance.

Other Opiates. Admissions for other opiates use have fluctuated over time. There was an increase in 2003 through 2004 and again from 2010 through 2012. Admission numbers have ranged from 507 to 1,184 people. The numbers peaked between the years of 2011 and 2012. In 2011 there were 1,138 people admitted and the percentage was 9.56%, it increased slightly in 2012 with 1,184 people and 10.49%. The only spike in rates occurred from 2010 to 2012, however, the rates have not gone back down to where they were prior to 2010 yet. It is important to note, the years with the highest percentage rates do not always match up with the numbers of people admitted due to fluctuations in overall admission numbers.

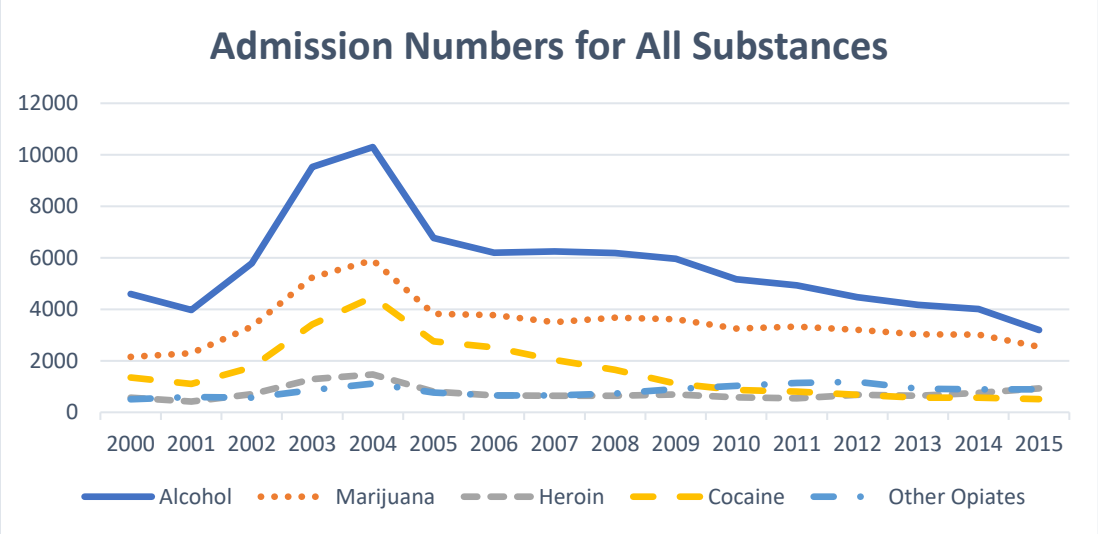

Figure 1.

Primary substance admission numbers over time for all substances.

Age.

Alcohol. When alcohol admissions were broken down by age groups, adolescents' groups had the lowest admissions on average. People between 12 and 14 years of age had an average of 50.81 (.3%) people admitted and those between 15 and 17 years of age had an average of 284.69 (1.76%) admitted. People between 25 to 29, 30 to 34, 35 to 39, and 40 to 44 years of age were the four largest groups for average alcohol admissions. See figure 2 for a full chart of alcohol admissions over time by age groups and figure 3 for the admission rates over time by age. When looking at the average number of people admitted per age group, it starts low with adolescents and increases through young adulthood then peaks at 25 to 29 years old and then stays high until 45 to 49 years old before going back down.

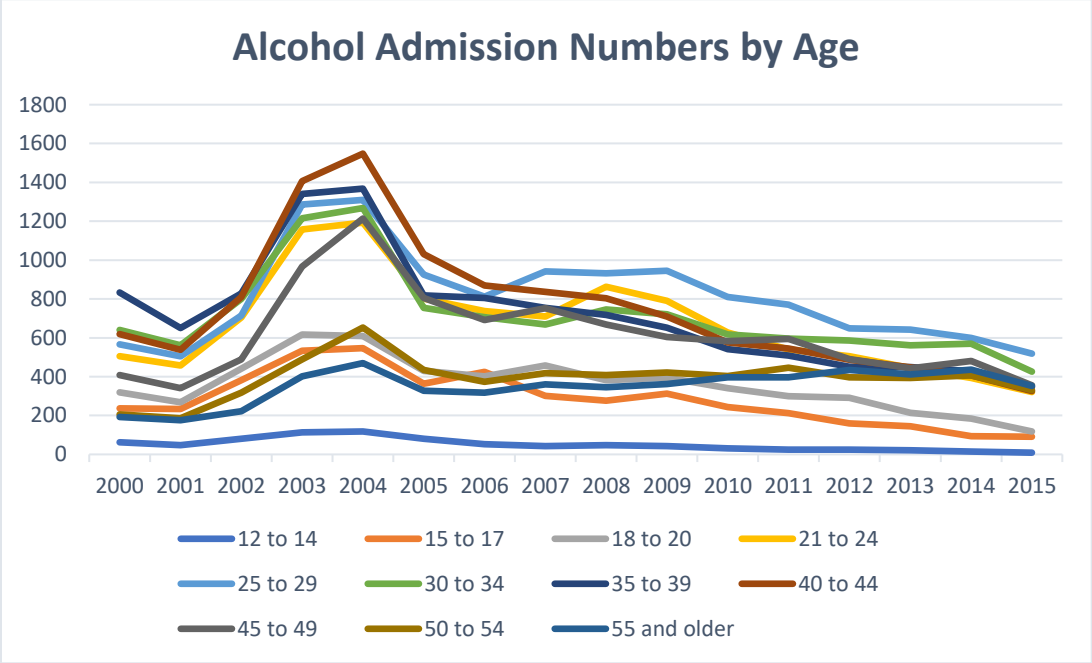

Figure 2.
Admission numbers for alcohol admission by age group from 2000 to 2015.

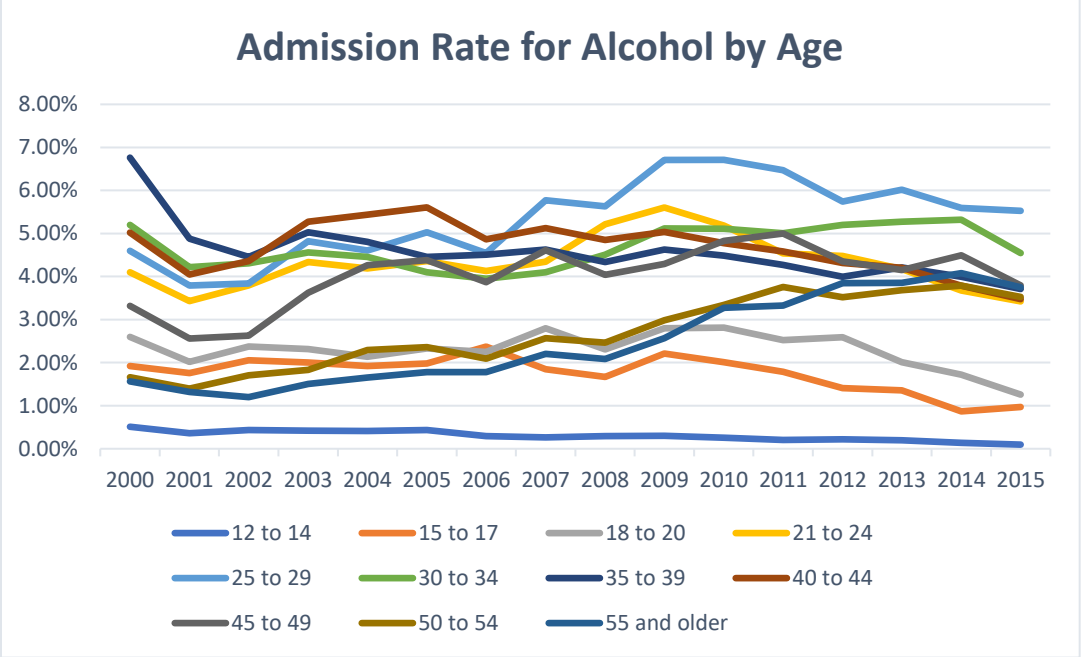

Figure 3.
Percentage rate of alcohol admission by age group from 2000 to 2015.

The pattern of admission percentage for people 12 to 14 stayed very low over the 15 years, the highest percentage was in 2000 with .51% and then the lowest was in 2015 with .1%. Adolescents from 15 to 17 years of age had low admission rates as well, only fluctuating 1.5% over the 15-year span, the highest being in 2006 with 2.37% and the lowest being in 2014 with .87%. For people between the ages of 18 and 24, admission rates ranged from around 2% to 2.8% until 2014, in which case rates started dropping. In 2014 the percentage of people being admitted to treatment for alcohol use was 1.72% and in 2015 it dropped lower to 1.24%. People ranging from 21 to 24 have had fluctuating admission rates between 3.42% and 5.6% over the 15-year span. People between the ages of 25 to 29 and 30 to 34 have had a similar pattern, however, the rates were slightly higher, ranging from 3.74% to 6.71% for 25 to 29-year-olds and 3.95% to 5.32% for 30 to 34 year-olds. For people between 35 and 39 years old the rate has stayed around 4% after 2000 in which case the rate was 6.76%. People between 40 to 44 and 45 to 50 also

remained consistent over time. However, people in the 50 to 54 and 55 and older groups have increased over time, both starting approximately 1.6% and increasing to approximately 3.6%.

Marijuana. People being admitted to substance use facilities for marijuana use has increased slightly over fifteen years. The age group with the highest rate of admission for marijuana use is 15 to 17 years old, with an average of 894 (5.49%) people admitted per year, which remained stable over the 15-year span of data. People who were admitted at 55 and older remained stable with the lowest admission rate for marijuana use, on average 20.25 (.15%) per year. All age groups from 21 to 24 and above increased in the rate of admissions. In 2000 approximately 2.84% of people between 21 and 24 were admitted for marijuana use and by 2015 approximately 4.87% were admitted for marijuana use. People in the 25 to 29 category went from 1.97% to 4.67% in 2015, similarly people between 30 and 34 went from 1.35% to 3.31%. These increases were approximately 2.23% over the 15-year span. The increases for the remaining four groups still did not bring any of them above 2% admission rate for marijuana. (See figure 4 for full breakdown of admissions).

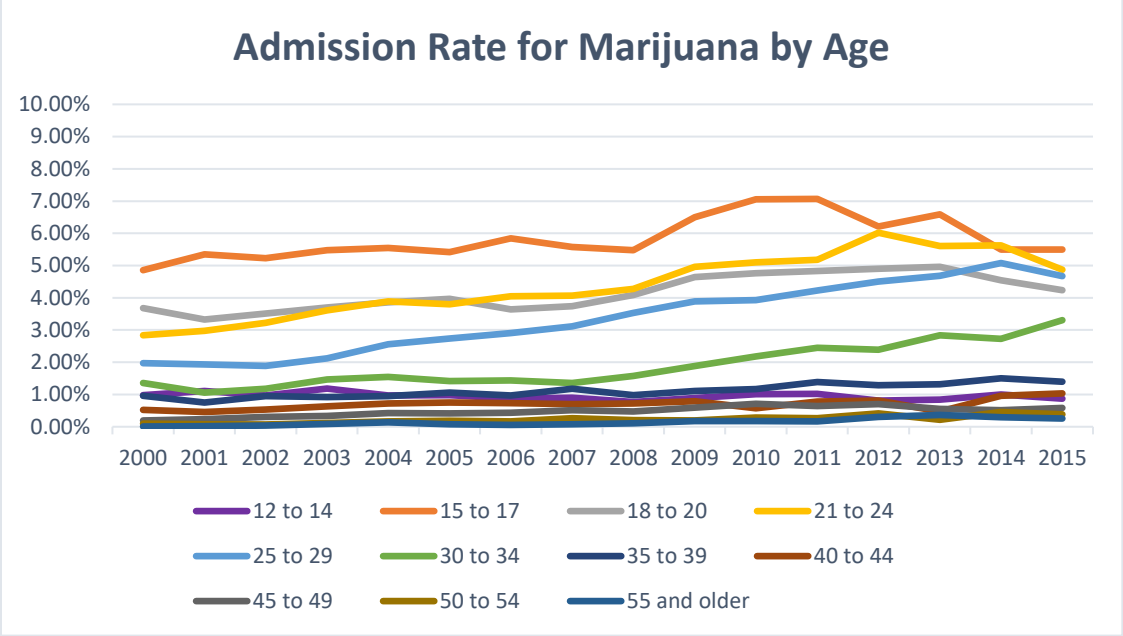

Figure 4.
Percentage rate of marijuana admission by age group from 2000 to 2015.

Heroin. Admission numbers for heroin use have seemed to increase for people in all age groups except for the adolescence (12 to 14 and 15 to 17). People in the age groups of 12 to 14, and 15 to 17 remain very low, never getting above a .07% admission rate. The largest increase seems to be for people between 25 and 29, increasing from 95 (.77%) people admitted in 2000 to 230 (2.45%) people admitted in 2015. By 2015, four age groups (21 to 24, 25 to 29, 30 to 34, and 35 to 39) had more than a 1% admission rate of heroin use for people seeking treatment for the first time. Admission rates for people 40 to 44 and 45 to 49 stayed around .5% over the 15-year span. However, rates from people 50 to 54 and 55 and older while remaining low, they have increased over time, from an average of .1% to .52%. See figure 5 for a full chart of heroin admissions over time by age groups.

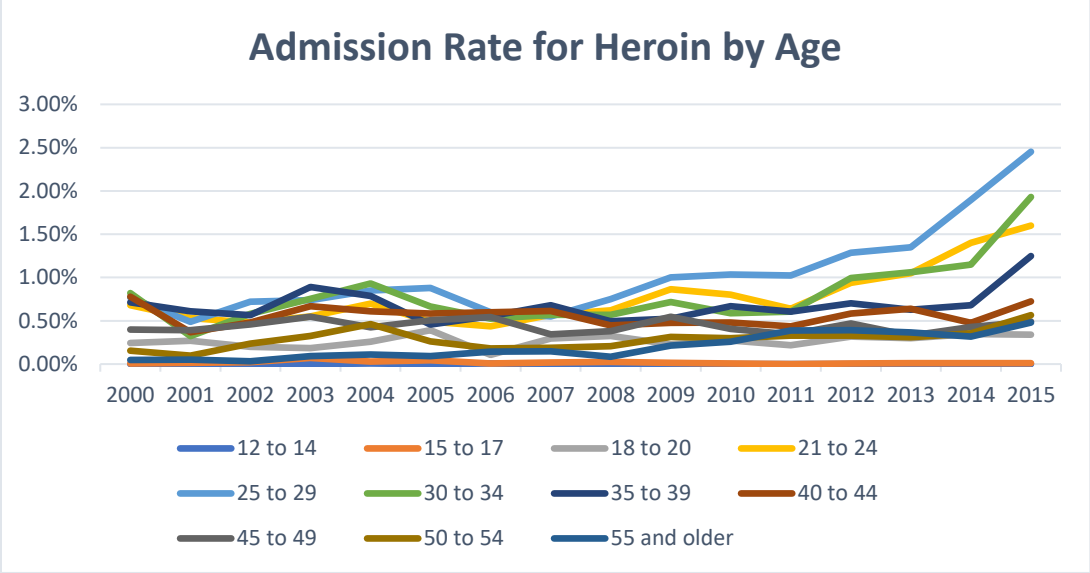

Figure 5.
Percentage rate of heroin admission by age group from 2000 to 2015.

Cocaine. The age group with the largest reduction in cocaine admissions were the 35 to 39 year-olds, going from 341 people (2.75%) being admitted in 2000 to 66 people (1.25%) in 2015. All groups had increases in admissions from 2002 to 2006 and decreased after 2006, all groups fell below 1.5% admission rates. Adolescents (12 to 14, 15 to 17, and 18 to 20) stay consistently less than 1% from 2000 to 2015. See figure 6 for a more detail look at the rates.

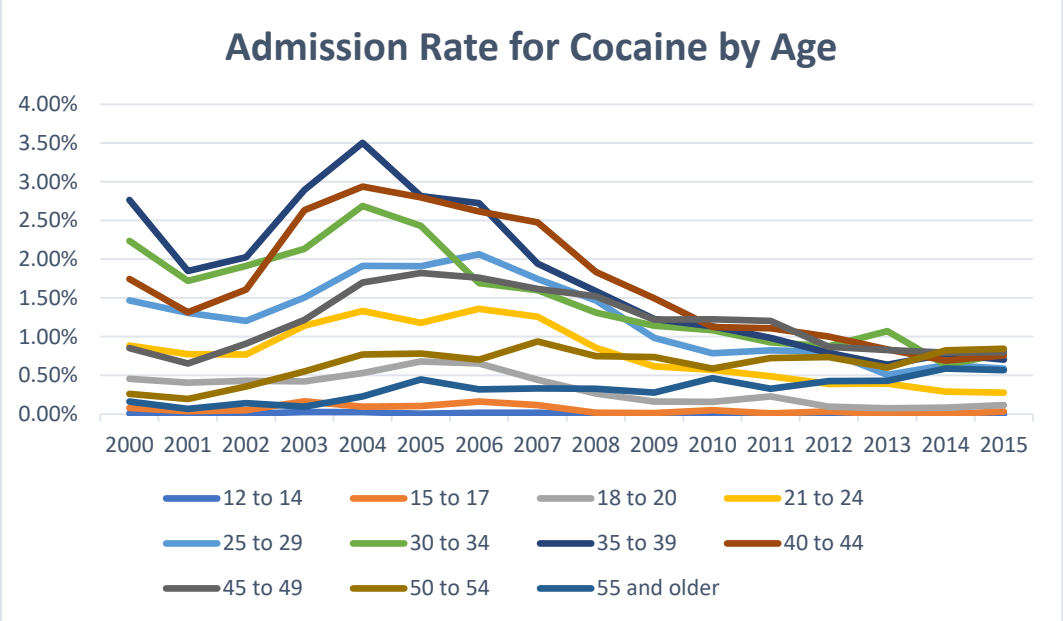

Figure 6.
Percentage rate of cocaine admission by age group from 2000 to 2015.

Other Opiates. With the current opioid epidemic, the number of people being admitted for opiate use has increased. People in the age group of 30 to 34 had the most dramatic increase of admission numbers and rates of all groups. There were 80 (.65%) people in 2000 and by 2015 it was reported that 214 (2.28%) of people were admitted for other opiate use. Almost all other age ranges experienced an increase of other opiate admissions, with the exception of 12 to 14 year-olds, 15 to 17 year-olds, and 18 to 20 year-olds. Both adolescent groups remained stable with barely any increase or decrease over time. However, 18 to 20 year-olds have decreased in other opiate admission and rates over time, going from 65 (.53%) in 2000 to 37 (.39%) in 2015. See figure 7 for a more detailed depiction.

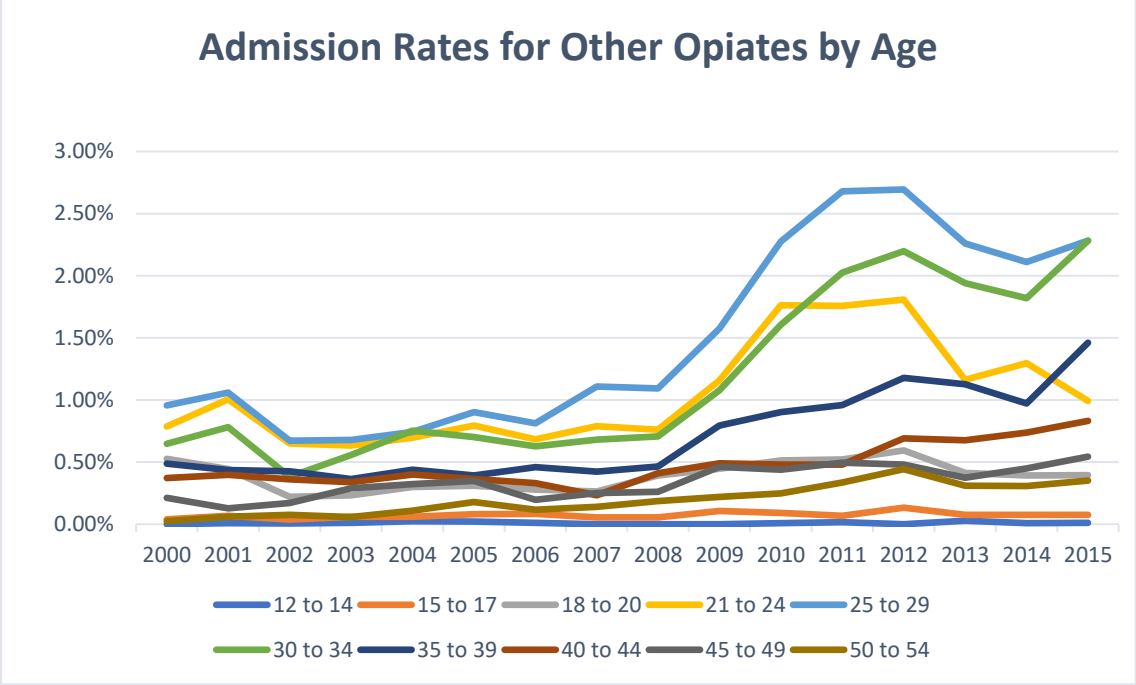

Figure 7.
Percentage rate of other opiate admission by age group from 2000 to 2015.

Gender

Alcohol. Alcohol admission numbers of males are higher than for females consistently over the 15 years of data. The average admission number for males was 4,247 (27.46%) and for females, it was 1,465.19 (9.63%). The largest difference between groups was in 2004, with 4,906 (17.24%) more males admitted for alcohol use than females. Alcohol use for females has fluctuated slightly over time and for males, it decreased. In 2000, there were 1,069 (8.67%) females admitted and in 2015 there were 959 (10.23%). For males, 3,523 (28.56%) were admitted in 2000 and 2,236 (23.84%) were admitted in 2015. See figure 8 for a full chart of alcohol admission rates over time by males and females.

Using the Mann-Kendall trend analysis, there was not a significant trend for alcohol admission rates in males from 2000 to 2015, Kendall Tau= .142, p =.47. There was a significant trend over time for female alcohol admission rates, Kendall Tau=.567, p

<.05. When running a follow-up Pettitt test to determine the year that a significant change occurred, results found a significant change in the year 2008 for females, $p < .05$. In 2008 the rate of admission for alcohol as the primary substance was 8.97% and in 2009 it was reported at 10.55%. Overall, alcohol use admission rates for females had a significant trend increase from 2000 to 2015 (see figure 8).

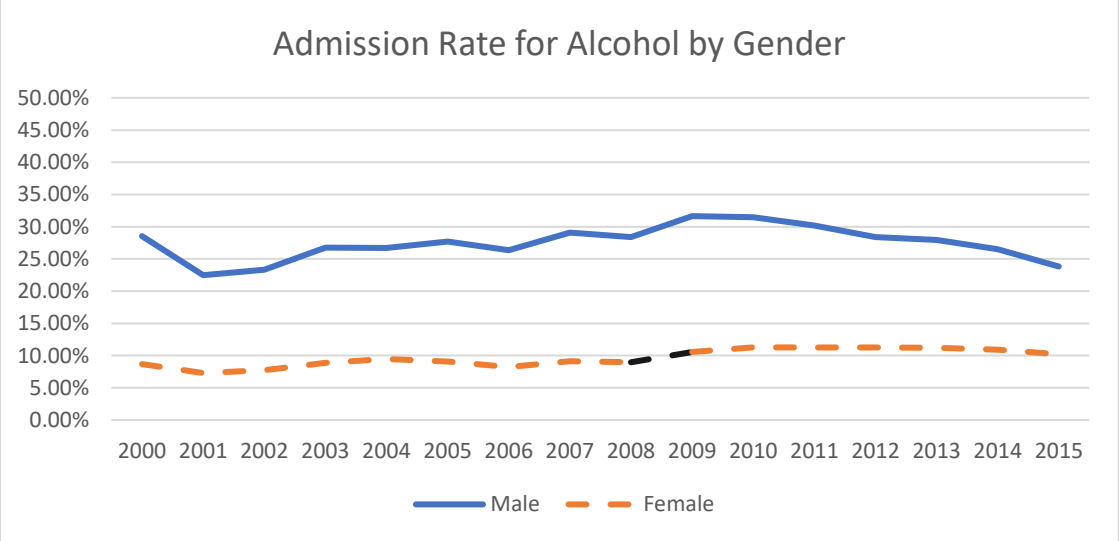

Figure 8.
Percentage rate of alcohol admission by males and females from 2000 to 2015.
Note: The black line is where there was a significant difference in alcohol rates.

Marijuana. People being admitted to treatment facilities for marijuana use has been consistently higher for males (*M*=2,576.75) than females (*M*=904.63). The largest gap between male and female admission numbers was in 2004 with 2,903 (10.20%) more males being admitted for marijuana use than females. However, the year with the largest difference in admission rates occurred in 2011 with a 14.2% difference. Admission to treatment for marijuana has increased for both males and females over the l5-year span. In 2000, there were 1,610 (13.05%) males admitted into treatment and in 2015 there were 1,749 (18.65%). For females, 540 (4.38%) were admitted in 2000 and 793 (8.46%) were

admitted in 2015. See figure 9 for a full chart of marijuana admissions over time by males and females.

Using the Mann-Kendall trend analysis, there was a significant trend for marijuana admission rates in males from 2000 to 2015, Kendall Tau= .783, $p < .05$. A pettitt test revealed, the significant change occurred in 2007, $p < .05$. In 2007 there was an admission rate of 16.42% and in 2008 it was 16.68% and stayed consistently higher. There was an overall increase in marijuana admission rates for males (see Figure 9).

There was a significant trend over time for female alcohol admission rates, Kendall Tau=.833, $p < .05$. When running a follow-up Pettitt test, results found a significant change in the year 2007 for females, $p < .05$. In 2007 the rate of admission for marijuana as the primary substance was 5.04% and in 2008 it was reported at 5.52%. Overall, marijuana use admission rates for females had a significant trend increase from 2000 to 2015 (see figure 9).

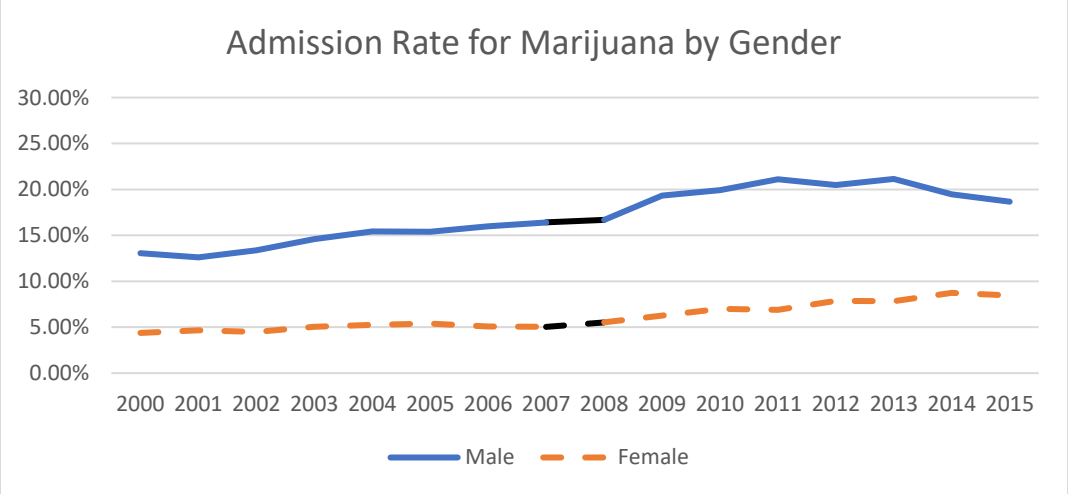

Figure 9.
Percentage rate of marijuana admission by male and female samples from 2000 to 2015. Note: The black line is where there was a significant difference in marijuana rates.

Heroin. People being admitted for heroin use has fluctuated over time and was increasing in the last three years of data (2013-2015). While admission numbers were

increasing for both males (117 more males in 2015 than 2013) and females (162 more females in 2015 than 2013), it has increased more for females than males. The largest gap between males and females was in 2004, with 447 (1.57%) more males being admitted. On average, 450.94 (2.98%) males are being admitted into treatment per year, and 299.44 (2.06%) females are being admitted per year. The gap between male and female admissions for heroin has been narrowing due to the fact that female use is increasing. In 2000, there were 197 (1.6%) females admitted for heroin use and in 2015 there was 436 (4.65%). For males, 372 (3.02%) were admitted in 2000 and 487 (5.19%) were admitted in 2015. See figure 10 for a full chart of heroin admissions over time by males and females.

Using the Mann-Kendall trend analysis, there was a significant trend for heroin admission rates in males from 2000 to 2015, Kendall Tau= .383, $p < .05$. A pettitt test revealed, the significant change occurred in 2011, $p < .05$. In 2011 there was an admission rate of 2.59% and in 2012 it was 3.64%. There was an overall increase in heroin admission rates for males (see figure 10).

There was a significant trend over time for female heroin admission rates, Kendall Tau=.7, $p <.05$. When running a follow-up Pettitt test, results found a significant change in the year 2008 for females, $p < .05$. In 2008 the rate of admission for heroin as primary substance was 1.65% and in 2009 it was reported at 1.96%. Overall, heroin use admission rates for females had a significant trend increase from 2000 to 2015 (see figure 10).

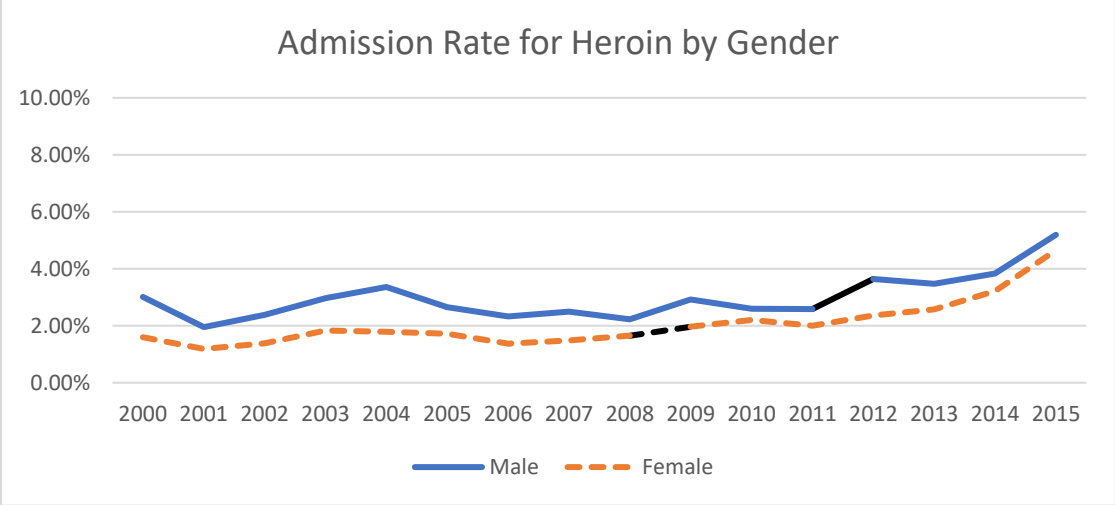

Figure 10.
Percentage rate of heroin admission by white and non-white samples from 2000 to 2015. Note: The black line is where there was a significant difference in heroin rates.

Cocaine. Admission into substance use treatment facilities for cocaine use has decreased both males' and females' over time. On average, more males (*M*=964.81) are admitted per year than females (*M*=668.38), the largest gap was in 2003 with 782 (2.93%) more males being admitted than females. The smallest gap was in 2015, with 80 (.85%) more males than females being admitted. The gap in percentage rates for admissions to treatment because of cocaine use has narrowed from 2.47% to .85% over the 15-year span. See figure 11 for a full chart of cocaine admissions over time by males and females.

Using the Mann-Kendall trend analysis, there was a significant trend for cocaine admission rates in males from 2000 to 2015, Kendall Tau= -.617, $p < .05$. A pettitt test revealed, the significant change occurred in 2008, $p < .05$. In 2008 there was an admission rate of 5.97% and in 2009 it was 4.48%. There was an overall decrease in cocaine admission rates for males (see figure 11).

There was a significant trend over time for female cocaine admission rates, Kendall Tau = -.577, $p < .05$. When running a follow-up Pettitt test, results found a

significant change in the year 2008 for females, $p < .05$. In 2008 the rate of admission for cocaine as the primary substance was 3.96% and in 2009 it was reported at 3.4%. Overall, cocaine use admission rates for females had a significant trend decrease from 2000 to 2015 (see figure 11).

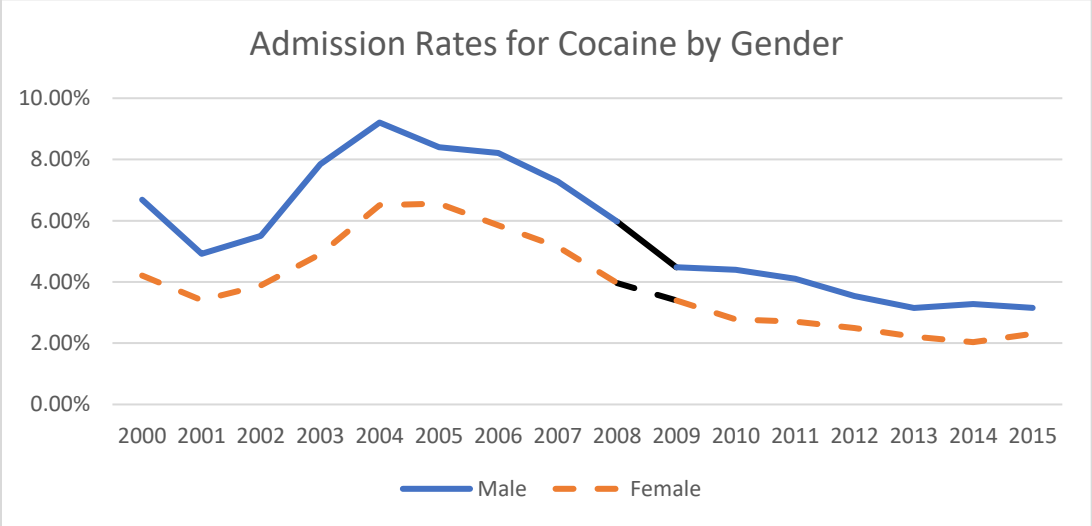

Figure 11.
Percentage rate of cocaine admission by male and female samples from 2000 to 2015. Note: The black line is where there was a significant difference in cocaine rates.

Other Opiate. Admission into treatment for other opiate use has increased over time for both males and females. This is the only substance reported where females (M=430.75) have a higher average admission number than males (M=408.88). The largest gap between genders was reported in 2001 with 112 more males than females being admitted, and an admission rate that was .84% higher than females. However, the largest gap where more females than males were admitted occurred in 2012 and 2013, each with 64 more females than males. The admission rate difference here was, .57% in 2012 and .6% in 2013. The pattern for female admission for other opiates over time has increased, in 2000 there were 219 women admitted, which took up 1.78% of the total admission percentage, and by 2015 there were 469 women admitted and the rate

increased to 5%. For males, there has also been an increase in other opiate admission, but it has not been as drastic. In 2000, there were 288 (2.34%) and by 2015 there was 417 (4.45%). See figure 12 for a full chart of other opiate admissions over time by males and females.

Using the Mann-Kendall trend analysis, there was a significant trend for other opiate admission rates in males from 2000 to 2015, Kendall Tau= .583, $p < .05$. A pettitt test revealed, the significant change occurred in 2008, $p < .05$. In 2008 there was an admission rate of 2.05% and in 2009 it was 3.04%. There was an overall increase in other opiate admission rates for males (see figure 12).

There was a significant trend over time for female other opiates admission rates, Kendall Tau = .783, $p < .05$. When running a follow-up Pettitt test, results found a significant change in the year 2007 for females, $p < .05$. In 2007 the rate of admission for cocaine as the primary substance was 2.08% and in 2008 it was reported at 2.38. Overall, other opiate use admission rates for females had a significant trend increase from 2000 to 2015 (see figure 12).

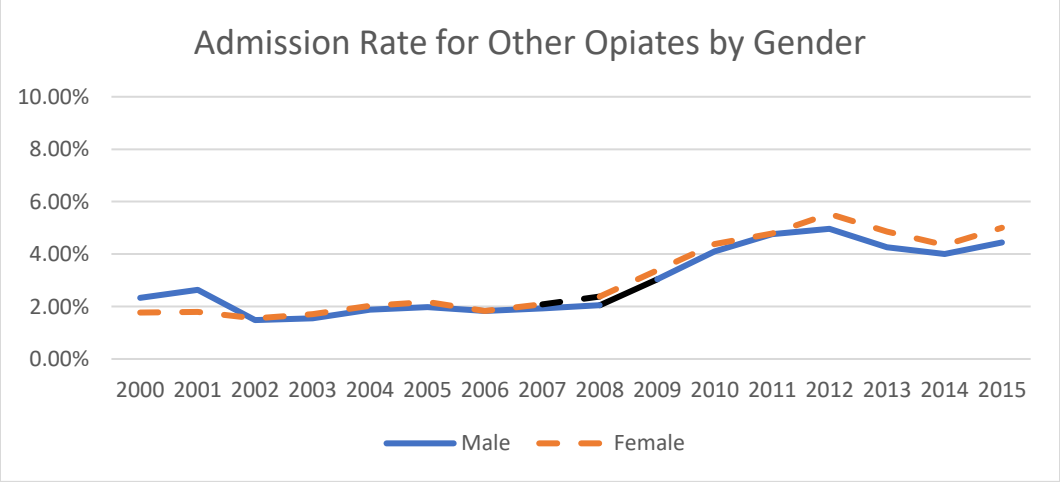

Figure 12.
Percentage rate of other opiate admission by male and female samples from 2000 to 2015.

Note: The black line is where there was a significant difference in other opiates rates.

Race.

Alcohol. The number of white people being admitted into treatment for alcohol use is higher than for non-white people consistently over the 15 years of data. The largest difference between groups was in 2004, with 2,726 (9.58%) more white people being admitted than non-white people. The average number of white people being admitted for alcohol was 3,533.31 (22.85%), while for non-white it was 2,185.38 (14.28%). The admission numbers and rates for both white and non-white populations fluctuated over time. In 2000, there were 3,043 (24.67%) and in 2015 there were 2,017 (21.51%) white people admitted. For the non-white population, 1,551 (12.57%) were admitted in 2000 and 1,179 (12.57%) were admitted in 2015. See figure 13 for a full chart of alcohol admissions over time by white and non-white groups.

Using the Mann-Kendall trend analysis, there was a significant trend for alcohol admission rates in non-white people from 2000 to 2015, Kendall Tau= .427, p <.05. When running a follow-up Pettitt test to determine the year that a significant change occurred, results found a significant change in the year 2006, p < .05. In 2006 the admission rate for alcohol use was 13.19% and in 2007 it went up to 15.44%. There was an overall significant increase in alcohol admission rates for the non-white people sample (see figure 13).

There was not a significant trend over time for white alcohol admission rates, Kendall Tau=.1, p = .62. Overall, alcohol use admission rates for the white people sample had no significant trend from 2000 to 2015.

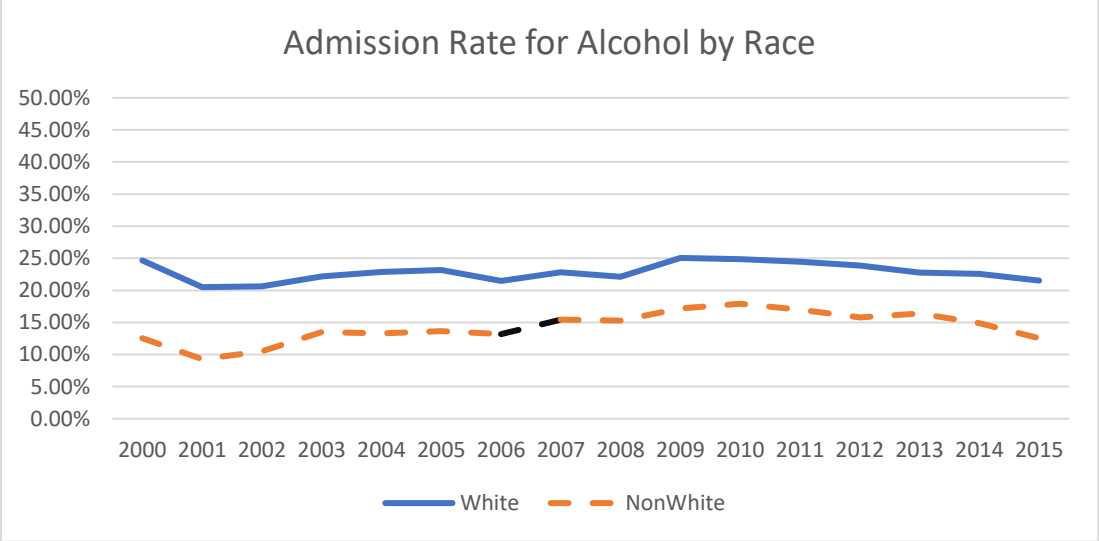

Figure 13.
Percentage rate of alcohol admission by white and non-white samples from 2000 to 2015. Note: The black line is where there was a significant difference in alcohol rates.

Marijuana. People being admitted to treatment facilities for marijuana has fluctuated a lot over time. In 2000, more white people (2.75%) were being admitted into treatment for marijuana use, but by 2008 there was a shift and more non-white people (1.06%) were being admitted. The largest gap between white and non-white admissions occurred in 2003 with 608 (2.28%) more white people being admitted for marijuana use than non-white people. In 2013 the largest gap with non-white people admission numbers being the highest was 408 (3.83%). The percentage of white people being admitted for marijuana over other substances has increased since 2000 from 10.10% to 12% in 2015. The percentage for non-white people has also increased over time from 7.35% in 2000 to 15.11% in 2015. See figure 14 for a full chart of marijuana admissions over time by white and non-white groups.

There was a significant trend over time for the non-white sample with regards to marijuana admission rates, Kendall Tau=.9 p <.05. When running a follow-up Pettitt test, results found a significant change in the year 2007 for non-white people, p < .05. In 2007

the rate of admission for marijuana as primary substance was 10.74% and in 2008 it was reported at 11.64%. Overall, marijuana use admission rates for non-white people had a significant trend increase from 2000 to 2015 (see figure 14).

There was a significant trend over time for the white sample with regards to marijuana admission rates, Kendall Tau=.517, p <.05. When running a follow-up Pettitt test, results found a significant change in the year 2008 for non-white people, p < .05. In 2008 the rate of admission for marijuana as the primary substance was 10.58% and in 2009 it was reported at 12.34%. Overall, marijuana use admission rates for white people had a significant trend increase from 2000 to 2015 (see figure 14).

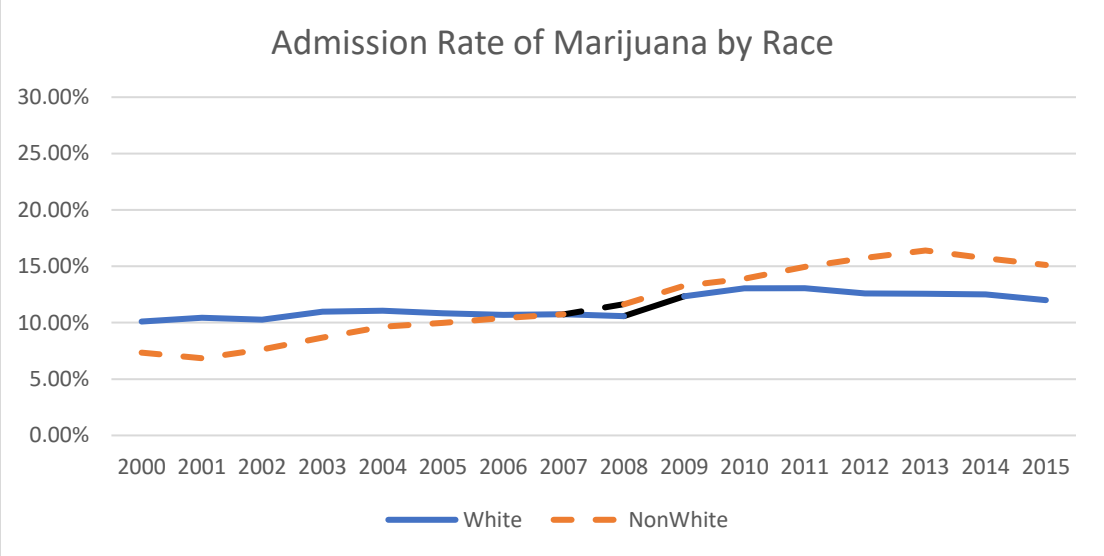

Figure 14.
Percentage rate of marijuana admission by white and non-white samples from 2000 to 2015.
Note: The black line is where there was a significant difference in marijuana rates.

Heroin. People being admitted for heroin use has steadily increased over time for both white and non-white people, more so for the white population than the non-white population. White people (M=423.94) have higher admission numbers than non-white people (M=327.62), with the largest gap being in 2015 had 325 (3.47%) more white

people than non-white were admitted. In 2000 there were 215 (1.74%) white people admitted for treatment of heroin and in 2015, there was 624 (6.65%) admitted. For non-white people, 354 (2.87%) were admitted in 2000 and 299 (3.19%) were admitted in 2015. See figure 15 for a full chart of heroin admissions over time by white and non-white groups.

There was no significant trend over time for the non-white sample with regards to heroin admission rates, Kendall Tau=.209, p =.28. There was a significant trend over time for the white sample with regards to heroin admission rates, Kendall Tau=.728, p <.05. When running a follow-up Pettitt test, results found a significant change in the year 2008 for non-white people, $p < .05$. In 2008 the rate of admission for marijuana as primary substance was 2.25% and in 2009 it was reported at 2.97%. Overall, heroin use admission rates for white people had a significant trend increase from 2000 to 2015 (see figure 15).

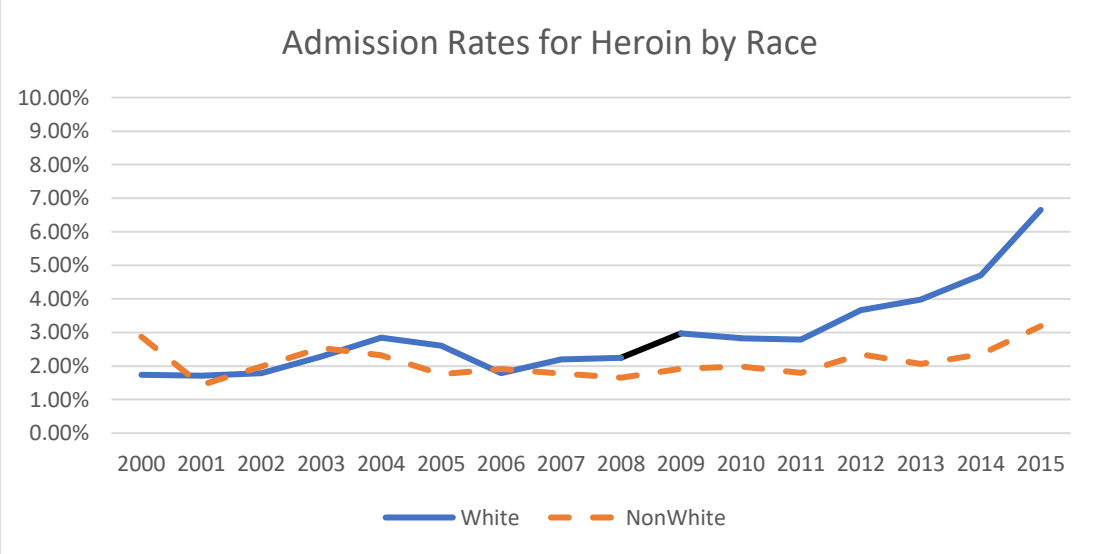

Figure 15.
Percentage rate of heroin admission by white and non-white samples from 2000 to 2015. Note: The black line is where there was a significant difference in heroin rates.

Cocaine. Admission into substance use treatment facilities for cocaine use has decreased both white and non-white people over time. On average, more non-white people (*M*=928.5) are admitted per year than white people (*M*=707), the largest gap was in 2003 with 677 (2.86%) more non-white people being admitted than white people. Cocaine use in the non-white people population has been higher than the white population overall 15 years. Both groups have had decreases in substance use over the time span as well. See figure 16 for a full chart of cocaine admissions over time by white and non-white groups.

There was a significant trend over time for the non-white sample with regards to cocaine admission rates, Kendall Tau=-.628, p <.05. When running a follow-up Pettitt test, results found a significant change in the year 2008 for non-white people, p < .05. In 2008, there was an admission rate of 5.83% and in 2009 it dropped to 4.84%. Overall, there was a significant decrease in admission rates for cocaine use in the non-white people sample (see figure 16).

There was a significant trend over time for the white sample with regards to cocaine admission rates, Kendall Tau= -.583, p <.05. When running a follow-up Pettitt test, results found a significant change in the year 2008 for white people, p < .05. In 2008 the rate of admission for marijuana as the primary substance was 4.12% and in 2009 it was reported at 3.05%. Overall, cocaine admission rates for white people had a significant trend decrease from 2000 to 2015 (see figure 16).

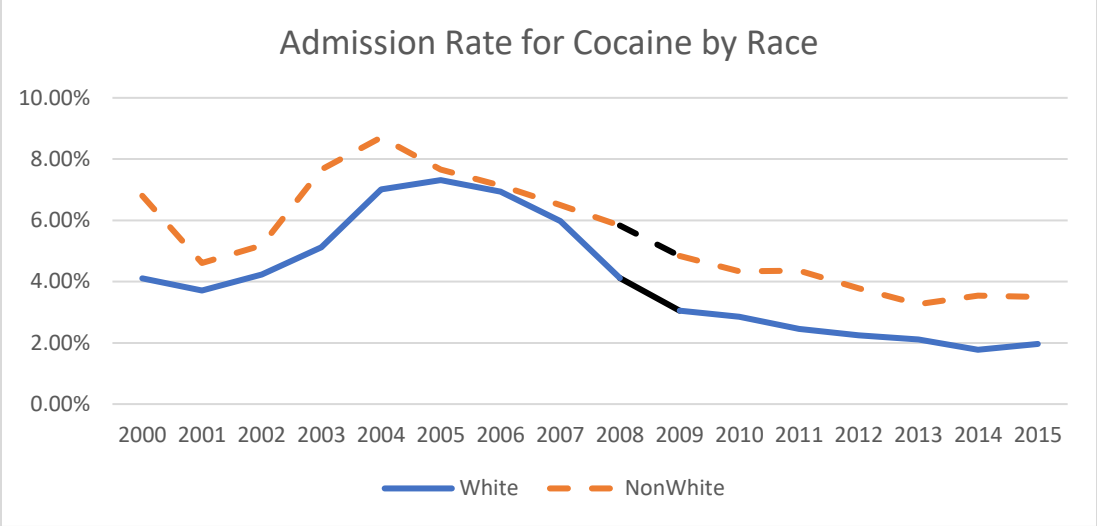

Figure 16.
Percentage rate of cocaine admission by white and non-white samples from 2000 to 2015. Note: The black line is where there was a significant difference in cocaine rates.

Other Opiate. Admission into treatment for other opiate use has increased over time for both white and non-white people. However, white people have higher admission number and a higher admission rate than non-white people. The difference between the groups for other opiates is larger than any other substance reported, the largest gap was in 2004 with 971 (3.41%) more white people than non-white people being admitted. While the largest number of admissions gaps was in 2004, the largest gap in percentage of admissions occurred in 2012 with 8.72% difference between white and non-white people. The average number of white people per year was 771.31 (5.52%), while non-white people averaged 69.63 (.53%) per year. See figure 17 for a full chart of other opiate admissions over time by white and non-white groups.

There was a significant trend over time for the non-white sample with regards to other opiate admission rates, Kendall Tau=.971, p <.05. When running a follow-up Pettitt test, results found a significant change in the year 2008 for non-white people, p < .05. In 2007, there was an admission rate of .31% and in 2008 it increased to .4%. Overall, there

was a significant increase in admission rates for cocaine use in the non-white people sample (see figure 17).

There was a significant trend over time for the white sample with regards to other opiate admission rates, Kendall Tau= .6, p <.05. When running a follow-up Pettitt test, results found a significant change in the year 2008 for white people, p < .05. In 2008 the rate of admission for other opiates as the primary substance was 4.03% and in 2009 it was reported at 5.94%. Overall, other opiate admission rates for white people had a significant trend increase from 2000 to 2015 (see figure 17).

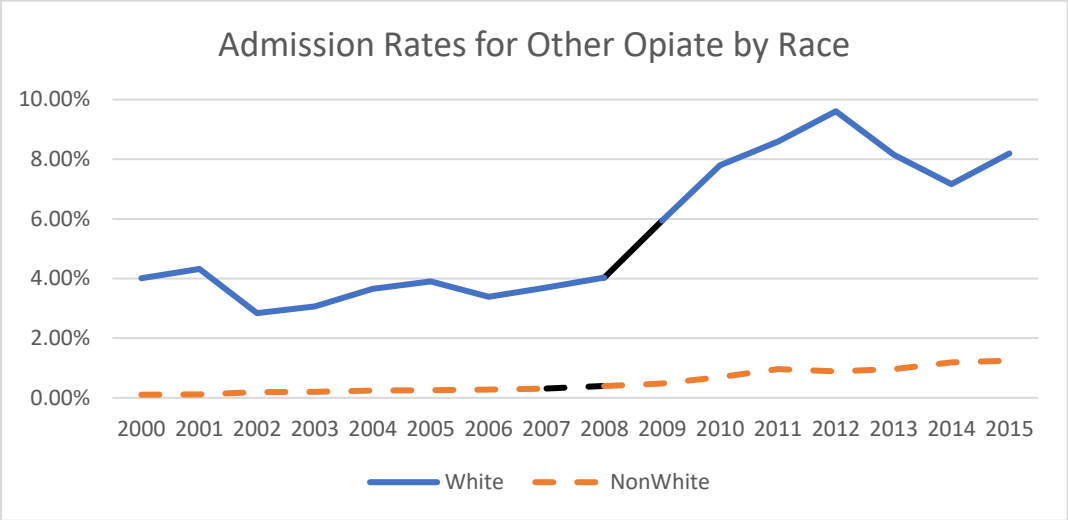

Figure 17.
Percentage rate of other opiate admission by white and non-white samples from 2000 to 2015.
Note: The black line is where there was a significant difference in other opiates rates.

Chapter 5

Discussion

This study investigated many trends over time and it was determined that alcohol, marijuana, heroin, cocaine, and other opiates, represented 96.5% of the substances reported as the primary substance used at time of admission. This means that VA follows along with the typical patterns found nationally for the most popular substances (Chhatre

et al., 2017). When studying the trend within these substances we four major findings per substance, resulting in 20 trends overall.

It is important to note, there was an unusual substance admission increased for alcohol, marijuana, heroin, cocaine, and other opiates in 2003 and 2004, upon review of the literature it was found that policy changes occurred in 2003. The Drug Control Act (2003) was implemented in 2003 and will be effective until July 1, 2020. The goal of the act was to redefine various terms to have a larger umbrella for what classifies as a person using substances. These policies have been altered a little bit but did not change drastically since 2003, however, the admission levels still dropped in 2005 back to the levels that they were in 2002. While this policy change cannot for certain account for the increase in substance admissions during 2003 and 2004 they may be related. However, opiate use admission rates have increased for males, females, and white people over the years. This is important to note as the opioid epidemic has not decreased in admission in VA. In 2018 VA implemented an opiate prescription limit. The impact of these laws will not be seen for a few more years and we did not have access to the admission data for 2018, however, the goal was to reduce opiate use (Allen, 2018).

Age. When looking at different age groups and what substances are most popular over time within those groups, we see differences by age. Since we did not conduct trend analyses for each of these slopes we were not able to report significant findings. However, we did see that admission rates for substances varied by age groups. Adolescents were admitted into treatment for alcohol and marijuana at the highest rate as compared to other substances. Marijuana admission rates for people 15 to 17 are the highest of all age categories. Admission rates for heroin, cocaine, and other opiates are

<.5% for adolescents. People 18 to 20 and 21 to 24 have higher alcohol admission rates than younger adolescents, although falls in line with people 25 to 29, 30 to 34, 35 to 39, and 40 to 44 overall and have high admission rates for marijuana use. People 15 to 17, 18 to 20, and 21 to 24 had the top three highest admission rates for marijuana as their primary substance ~~used~~ at time of admission. Opiate admission rates are high among the 21 to 24-year old, they are in the top four of all the age categories. It may be that older adolescents seeking treatment have progressed to or chosen to use "harder" drugs (e.g., opiates) which lead to admission (see SAMHSA, 2014). Although funding is increasing for treating and preventing opioids, trends found in this report clearly indicate that marijuana and alcohol remain important drugs to target for prevention and treatment in the 12 to 17 age range. At the same time, findings also support that persons 18 to 24 may benefit from prevention of "harder" illicit drugs as well.

Admission rates for people 25 to 30 and 31 to 34 have increased for heroin use and other opiates. These age categories have the first and second highest admission rates for alcohol, heroin, and other opiates. This could mean that targeting prevention for heroin and opiates could be beneficial in a college or community setting. Finding ways to address these substances at the community level would be very important since this age group is out of high school.

For people in the 35 to 39, heroin admission rates were still in the top four, and so were opiate admission rates, however by 40 to 44 and 45 to 49 substance admission rates for alcohol, marijuana, heroin, cocaine, and other opiates fell in the middle of the age categories. As for people 50 to 54, and 55 and older, heroin and other opiate admission rates have been increasing. However, the admission rates for people in these age

categories are fairly low. This could be due to the fact that first-time admission at an older age is not as common, and we might see different trends if we included people who had already been admitted into facilities in the past. However, it could be important to create policies to help people not get addicted to opiates if they are exposed at an older age through injuries, surgeries, and chronic pain.

Gender. The rates for substance use admissions did significantly change over time for different gender groups, which supported the hypothesis. The alcohol pattern here shows that consistently the admission rates for alcohol use are high for both males and females. Although males are being admitted into facilities at a higher rate than females, there were significant increases in alcohol admission rates for females in 2008 that do not exist for males. This is consistent with other findings indicating that females consume more alcohol than in previous years (McHugh et al., 2015). Therefore, prevention should be tailored to highlight the increased risks women face (e.g., pregnancy, sexual assault, and greater cognitive impairment) when consuming alcohol versus the risks men face (McHugh et al., 2015; Nolen-Hoeksama, 2004). There was an increase in marijuana use over time for both males and females providing prevention for marijuana for both males and females is important, as is increasing the awareness of its adverse effects on adolescent development. As for heroin admission rates, males and females both increased in heroin use over time. This is a societal problem that is seen in more than just this VA sample. As heroin use increases, policies need to be considered on how to prevent people from using heroin and treat people that are already addicted. Cocaine use actually decreased over time for males, and females. The admission rates for other opiate use for both males and females have increased. This increase can have a

long-lasting effect and could potentially lead to addiction to heroin as prescription drugs get harder to access. Tetrault et al. (2008) reported that it is important for clinicians to take into account gender-specific risk factors when prescribing medication to people who have a history of abuse. One risk factor that women experience more than men is the correlation between opiate use and anxiety/depression (Tetrault et al., 2008). Policies for restriction on opiates are becoming more popular and there could be a reduction in admission within the next few years.

Biological differences in drug effects by gender (McHugh, Votaw, Sugarman, and Greenfield, 2018) is an important consideration in providing services. Looking at sex and gender differences in substance use and treatment through a literature review was the goal of McHugh et al.'s (2018). It was found that males and females biological reactions to substances were different. Females become more intoxicated with the same amount of alcohol consumed as males, have higher peaks in plasma levels of cocaine (McHugh et al., 2018). For people who do not frequently smoke marijuana it was found that males produce greater subjective ratings of THC, however, among frequent users, there were no differences reported between males and females for THC (McHugh et al., 2018). One study found postpartum women who receive progesterone treatment has been associated with less cocaine relapse (Yonkers et al., 2014). Although males generally use substances more than females (McHugh et. al, 2018) this gap is narrowing. The current data also demonstrates this trend over time for, cocaine and heroin.

It was also report found that women are seeking treatment for substance use less frequently than males which can be an issue for recovery (McHugh et al., 2018). A few reasons women do not seek treatment may be due to greater perceived stigma, having

dependence without reliable childcare, or lack of family support (McHugh et al., 2018). One of the struggles females face is substance use during pregnancy, with marijuana being the most frequently used substance during pregnancy (McHugh et al., 2018). Approximately 8.7% of pregnant women who are struggling with substance use during pregnancy receive specialized treatment, which can make receiving treatment and recovery difficult (McHugh et al., 2018).

Race. Substance use admission patterns did significantly change over time for different racial groups, which supported the hypothesis. Alcohol admission rates for White people were higher than non-White people over time. Although the non-White sample has been increasing over time. Marijuana use increased over time for both the non-White and White sample over time. Marijuana use was higher in the White sample until 2006 then the non-White sample increased and became higher than the White sample. Heroin use increased for the White sample over time but not for the non-White sample. The White sample became higher in 2008 and continued to become higher over time. Cocaine use actually decreased over time for both the White and non-White sample. The admission rates for cocaine use supported past research (Nicholson & Ford, 2009) with the non-White sample being higher than the White sample. Other opiates admission rates increased within both White and non-White people. Over time the only two substances that the non-White sample had more admissions for have been marijuana and cocaine. Making sure to provide prevention for marijuana use is important as it becomes more accepted in society.

One issue with studying the substance use admission patterns between the White and non-White samples is that we may not be getting all the non-White people who have a

substance dependency. This could be due to lack of access when in low SES neighborhoods or because culturally receiving help is not viewed positively (Alegria et al., 2010; Chow et al., 2003).

Limitations

TEDS-A (SAMHSA, 2017) is a national dataset that collects data from all federally funded substance treatment facilities, providing researchers with a lot of data regarding the substance use patterns in each state, there are still a lot of limitations. The government does not place strict rules as to how the data are collected per facility (SAMHSA, 1999; SAMHSA, 2014; SAMHSA, 2015; SAMHSA, 2017). The data collection method may vary depending on location. If a facility does not receive federal funds, they do not need to report their substance use admissions data, which means we do not have access to all substance treatment admissions data. TEDS-A is also cross-sectional and does not follow specific clients over time, as we have information on the amount of times a person has sought treatment but no information to connect them to past reports (SAMHSA, 2017).

Also, while trends over time were investigated, there was no statistical comparison between groups. It can be seen that males and white people are typically higher for most substances than females and non-white people, but there is no statistical significant test being conducted. There was also no predictive model created to determine possible factors that could be related to substance use and admission among people of all ages, genders, and racial backgrounds. In future studying substance use patterns over time would be more informative when including a variety of factors that could contribute to these patterns. This would allow for conclusions to be drawn regarding why these patterns may be occurring and/or changing over time for different populations. It would also be beneficial to

investigate multiple substances used, in order to account for co-occurrence. Using the TEDS-A data for this investigation would be possible, although not the most valid due to the lack of data collection requirements specified by the federal government.

There was not an in-depth look at all of the policies implemented over the years and being able to do a deeper dive into what policies come into play with the changes in trends would be interesting in the future. Also, looking into what factors play a role in being readmitted into the treatment facilities. Investigating the readmission risks would be difficult with the TEDS-A data due to the inability to account for dependency within the sample. Even if researchers were to use a single time point to study this, an individual could still be in the data twice and there would be no way to know. However, the use of different national datasets, such as the National Survey on Drug Use and Health (NSDUH), would be able to account for this information.

Conclusion

Studying these patterns in VA specifically could inform policies on prevention work and the populations that would benefit from more focus than others. While this information isn't enough to inform these policies out right, it is a place to start. Moving forward looking at consistent drug use over time, how many times treatment has been sought, and breaking it down by region in VA could provide even more information to help shape policies and prevention work. Moving forward, it would be beneficial for the state to target prevention work tailored for females, as this population has increasing admission rates for alcohol, marijuana, heroin, and other opiates. Since females tend to not seek treatment for substance use at the same level as males (McHugh et al., 2018), increasing awareness and reducing stigma within this population is needed. Another

recommendation would be to continue to do prevention work that focuses on alcohol and marijuana as those two substances are still highly prevalent even though the opioid epidemic is where federal funding seems to be.

The Virginia state prevention collaborated with the Alcoholic Beverage Control Authority (ABC) , DBHDS, Criminal Justice Services, Department of Education, Department of Health, Department of Juvenile Justice, Department of Motor Vehicles, Department of Social Services, State Police, Virginia Foundation for Healthy Youth, Virginia National Guard, Office of the Secretary of Health and Human Resources, and Community Coalitions of Virginia to work on a review of the substance use prevention services in VA (Virginia Office for Substance Abuse Prevention (VOSAP), 2018). In 2018, ABC developed initiatives working with youth and adolescents, college students and adults. Some of the initiatives include, Miss Virginia and was able to share a Health and Safety Activity Book to 39 elementary schools, provide a peer-led program for underage substance use called Youth Alcohol and Drug Abuse Prevention Program, and developed a Virginia Higher Education Substance Use Advisory Committee trying to get prevention and intervention programs in public and private institutions. The Department of Criminal Justice has also worked on prevention of alcohol, opiates, and other drugs in public schools and in colleges (VOSAP, 2018).

VOSAP (2018) has been able to come up with a variety of initiatives to target different age populations and people of different backgrounds. However, there is a gap of prevention initiatives for people beyond high school if people do not attend college, which could eliminate people who do not attend college. Since people between 30 and 35 have some of the highest substance abuse admission rates, it is important to target the

community, in general, to provide prevention to as many people as possible, especially young adults who do not attend college. A lot of times not targeting the communities could leave out people in low SES, which could be a systemic problem. Since people who live in low SES typically cannot afford college and are more likely to be minorities not having initiatives in the community could lead to increased risk of substance use problems. VA would benefit from applying prevention methods to the community level as well. Providing information sessions or community courses on substance use prevention work could help reduce the use in a population that does not typically get help until after the use has already started.

Appendices

Appendix 1

Virginia Race								
	2000	2001	2002	2003	2004	2005	2006	2007
Alaska Native	14 (.1%)	19 (.1%)	15 (.0%)	21 (.0%)	36 (.1%)	13 (.0%)	13 (.0%)	14 (.0%)
American Indian	90 (.4%)	105 (.4%)	127 (.4%)	196 (.4%)	223 (.4%)	111 (.3%)	119 (.3%)	102 (.3%)
Asian or Pacific Islander	197 (.8%)	259 (1%)	253 (.7%)	396 (.8%)	371 (.7%)	240 (.7%)	205 (.6%)	71 (.2%)
Black or African American	8,225 (35.4%)	8,954 (34%)	11,299 (33.4%)	16,273 (32.5%)	18,309 (32.5%)	11,326 (31.3%)	10,460 (30.6%)	9,256 (30.1%)
White	13,445 (57.9%)	15,442 (58.6%)	20,348 (60.2%)	30,513 (60.9%)	34,437 (61.1%)	22,274 (61.6%)	20,796 (60.8%)	18,682 (60.7%)
Asian	1 (.0%)	1 (.0%)		18 (.0%)	55 (.1%)	53 (.1%)	65 (.2%)	138 (.4%)
Other Single Race	1,234 (5.3%)	1,561 (5.9%)	1,754 (5.2%)	2,691 (5.4%)	2,886 (5.1%)	2,038 (5.6%)	2,126 (6.2%)	2,071 (6.7%)
Native Hawaiian or Other Pacific Islander		1 (.0%)	4 (.0%)	2 (.0%)	7 (.0%)	6 (.0%)	9 (.0%)	15 (.0%)
Two or more races						113 (.3%)	385 (1.1%)	404 (1.3%)
	2008	2009	2010	2011	2012	2013	2014	2015
Alaska Native	14 (.0%)	19 (.1%)	18 (.1%)	284 (1%)	15 (.1%)	12 (.0%)	4 (.0%)	4 (.0%)
American Indian	90 (.3%)	109 (.4%)	69 (.3%)	87 (.3%)	82 (.3%)	54 (.2%)	58 (.2%)	57 (.2%)
Asian or Pacific Islander								
Black or African American	9,570 (29.3%)	8,650 (29.1%)	7,653 (28.9%)	8,045 (29.1%)	7,857 (28.3%)	6,780 (27.1%)	6,464 (25.9%)	5,869 (25.6%)
White	20,030 (61.3%)	18,214 (61.4%)	16,327 (61.7%)	16,367 (59.1%)	16,308 (58.8%)	14,879 (59.4%)	15,379 (61.7%)	14,608 (63.8%)
Asian	281 (.9%)	244 (.8%)	195 (.7%)	259 (.9%)	243 (.9%)	174 (.7%)	182 (.7%)	118 (.5%)
Other Single Race	2,195 (6.7%)	1,924 (6.5%)	1,654 (6.3%)	1,880 (6.8%)	1,388 (5%)	1,324 (5.3%)	1,273 (5.1%)	949 (4.1%)
Native Hawaiian or Other Pacific Islander	26 (.1%)	20 (.1%)	23 (.1%)	12 (.0%)	24 (.1%)	15 (.1%)	9 (.0%)	15 (.1%)
Two or more races	490 (1.5%)	499 (1.7%)	513 (1.9%)	608 (2.2%)	836 (3%)	892 (3.6%)	878 (3.5%)	809 (3.55%)

Appendix 2

Virginia Gender								
	2000	2001	2002	2003	2004	2005	2006	2007
Male	16,303 (69.5%)	18,451 (69.5%)	23,690 (69.4%)	34,556 (68.4%)	38,516 (67.6%)	24,736 (67.5%)	23,774 (68.1%)	21,332 (67.9%)
Female	7,152 (30.5%)	8,108 (30.5%)	10,442 (30.5%)	15,992 (31.6%)	18,441 (32.4%)	11,834 (32.4%)	11,120 (31.9%)	10,084 (32.15)
	2008	2009	2010	2011	2012	2013	2014	2015
Male	22,881 (67.9%)	20,312 (67.8%)	17,885 (67.1%)	18,613 (67.2%)	18,206 (65.6%)	16,397 (65.5%)	16,148 (64.7%)	14,291 (62.4%)
Female	10,799 (32.1%)	9,664 (32.2%)	8,766 (32.9%)	9,027 (32.6%)	9,496 (34.2%)	8,622 (34.4%)	8,790 (35.2%)	8,617 (37.6%)

Appendix 3

Virginia by Age								
	2000	2001	2002	2003	2004	2005	2006	2007
12-14	507 (2.2%)	613 (2.3%)	811 (2.4%)	1,234 (2.4%)	1,125 (2%)	651 (1.8%)	609 (1.7%)	475 (1.5%)
15-17	1,721 (7.3%)	2,360 (8.9%)	2,985 (8.7%)	4,099 (8.1%)	4,318 (7.6%)	2,684 (7.3%)	2,991 (8.6%)	2,350 (7.5%)
18-20	1,750 (7.4%)	2,007 (7.5%)	2,686 (7.9%)	3,506 (6.9%)	3,753 (6.6%)	2,589 (7.1%)	2,518 (7.2%)	2,301 (7.3%)
21-24	2,438 (10.4%)	3,042 (11.4%)	3,938 (11.5%)	5,915 (11.7%)	6,372 (11.2%)	4,246 (11.6%)	4,192 (12%)	3,816 (12.1%)
25-29	2,937 (12.5%)	3,205 (12%)	3,976 (11.6 %)	6,220 (12.3%)	7,074 (12.4%)	4,999 (13.6%)	4,999 (14.3%)	4,805 (15.3%)
30-34	3,527 (15%)	3,654 (13.7%)	4,622 (13.5%)	6,644 (13.1%)	7,585 (13.3%)	4,520 (12.3%)	4,040 (11.9%)	3,525 (11.2%)
35-39	4,198 (17.9%)	4,337 (16.3%)	5,290 (15.5%)	7,483 (14.8%)	8,169 (14.3%)	4,829 (13.2%)	4,501 (12.9%)	3,830 (12.2%)
40-44	3,177 (13.5%)	3,562 (13.4%)	4,660 (13.6%)	7,234 (14.3%)	8,373 (14.7%)	5,264 (14.4%)	4,677 (13.4%)	4,065 (12.9%)
45-49	1,766 (7.5%)	2,182 (8.2%)	2,902 (8.5%)	4,578 (9%)	5,736 (10.1%)	3,782 (10.3%)	3,473 (9.9%)	3,275 (10.4%)
50-54	864 (3.7%)	961 (3.6%)	1,405 (4.1%)	2,256 (4.5%)	2,869 (5%)	1,882 (5.1%)	1,797 (5.1%)	1,892 (6%)
55 and older	606 (2.6%)	680 (2.6%)	940 (2.7%)	1,458 (2.9%)	1,668 (2.9%)	1,201 (3.3%)	1,158 (3.3%)	1,154 (3.7%)
	2008	2009	2010	2011	2012	2013	2014	2015
12-14	372 (1.1%)	333 (1.1%)	280 (1%)	284 (1%)	306 (1.1%)	222 (.9%)	191 (.8%)	131 (.6%)
15-17	2,165 (6.4%)	2,205 (7.3%)	1,728 (6.5%)	1,984 (7.2%)	1,966 (7.1%)	1,493 (6%)	1,102 (4.4%)	995 (4.3%)
18-20	2,406 (7.1%)	2,212 (7.4%)	1,873 (7%)	1,960 (7.1%)	1,850 (6.7%)	1,525 (6.1%)	1,350 (5.4%)	1,124 (4.9%)
21-24	4,299 (12.7%)	3,781 (12.6%)	3,449 (12.9%)	3,350 (12.1%)	3,357 (12.1%)	3,073 (12.3%)	2,936 (11.8%)	2,544 (11.1%)
25-29	5,157 (15.3%)	4,685 (15.6%)	4,316 (16.2%)	4,544 (16.4%)	4,517 (16.3%)	4,094 (16.4%)	4,406 (17.7%)	4,196 (18.3%)
30-34	3,970 (11.8%)	3,654 (12.2%)	3,441 (12.9%)	3,629 (13.1%)	3,775 (13.6%)	3,789 (15.1%)	3,791 (15.2%)	3,719 (16.2%)
35-39	3,984 (11.7%)	3,272 (10.9%)	2,809 (10.5%)	2,748 (9.9%)	2,889 (10.4%)	2,497 (10%)	2,789 (11.2%)	2,600 (11.3%)
40-44	4,183 (12.4%)	3,465 (11.5%)	2,795 (10.5%)	2,825 (10.2%)	2,596 (9.4%)	2,377 (9.5%)	2,305 (9.2%)	2,066 (9%)
45-49	3,594 (10.6%)	3,225 (10.7%)	2,834 (10.6%)	2,829 (10.2%)	2,633 (9.5%)	2,353 (9.4%)	2,258 (9.1%)	2,032 (8.9%)
50-54	2,239 (6.6%)	1,869 (6.2%)	1,836 (6.9%)	2,047 (7.4%)	2,073 (7.5%)	1,902 (7.6%)	2,078 (8.3%)	1,811 (7.9%)
55 and older	1,392 (4.1%)	1,322 (4.4%)	1,328 (5%)	1,484 (5.4%)	1,778 (6.4%)	1,708 (6.8%)	1,736 (7%)	1,692 (7.4%)

Bibliography

Alegria, M., Carson, N.J., Goncalves, M., Keefe, K., (2011). Disparities in treatment for substance use disorders and co-occurring disorders for ethnic/racial minority youth. *Journal of the American Academy of Child and Adolescent Psychiatry, 50*(1). DOI:10.1016/j.jaac.2010.10.005.

Amaro, H., Blake, S.M., Schwartz, P.M., and Flinchbaugh, L.J., (2001). Developing theory-based substance abuse prevention programs for young adolescent girls. *Journal of Early Adolescence, 21*(3).

American Academy of Pediatrics, (2015). Substance Use and Screening Intervention Implementation Guide. *Funded by the Centers for Disease Control and Prevention (Cooperative Agreement Number 5 U38 OT000167-03).*

Carliner, H., Delker, E., Fink, D.S., Keyes, K.M., and Hasin, D.S., (2016). Racial discrimination, socioeconomic position, and illicit drug use among US Blacks. *Society of Psychiatry Psychiatric Epidemiology, 51*. DOI 10.1007/s00127-016-1174-y.

Chen, C., Hardle, W., and Unwin, A., (2008). Handbook of data visualization. Berlin, Germany. Springer-Verlag Berlin Heidelberg. DOI: 10.1007/978-3-540-33037-0.

Chen, P., and Jacobson, K.C., (2012). Developmental trajectories of substance use from early adolescence to young adulthood: Gender and racial/ethnic differences. *Journal of Adolescence Health, 50.* DOI:10.1016/j.jadohealth.2011.05.013.

Chhatre, S., Cook, R., Mallik, E., and Jayadevappa, R., (2017). Trends in substance use admissions among older adults. *BMC Health Services Research, 17:584.* doi:10.1186/s12913-017-2538-z.

Chow, J.C., Jaffee, K., and Snowden, L., (2003). Racial/ethnic disparities in the use of mental health services in poverty areas. *American Journal of Public Health, 93*(5).

Fox, J. and Weisberg, S., (2011). Cox proportional-hazards regression for survival data in R. An Appendix to *An R Companion to Applied Regression, Second Edition.*

Han, B., Gfroerer, J., and Colliver, J., (2009). An examination of trends in illicit drug use among adults aged 50 to 59 in the United States. *Office of Applied Studies: Data Review,* August 2009.

John, W.S., WU, L., (2017). Trends and correlates of cocaine use disorder in the United States from 2011 to 2015. *Drug and Alcohol Dependence, 180*. http://dx.doi.org/10.1016j.drugalcdep.2017.08.031.

Johnston, L. D., R. A., O'Malley, P. M., Bachman, J. G., Schulenberg, J. E., & Patrick, M. E., (2018). *Monitoring the Future national survey results on drug use: 1975-2017: Overview, key findings on adolescent drug use*. Ann Arbor: Institute for Social Research, The University of Michigan.

Kandel, D. B., and Logan, J. A., (1984). Patterns of drug use from adolescence to young adulthood: I. Periods of risk for initiation, continued use, and discontinuation. *American Journal of Public Health, 74*(7).

Kleinbaum, D.G., and Klein, M. (2012). Chapter 3: Survival analysis: A self-learning text, third edition.

Lofwall, M.R., Schuster, A., and Strain, E.C., (2008). Changing profile of abused substances by older persons entering treatment. *J Nerv Ment Dis. 196*(12), 898-905. doi:10.1097/NMD.0b013e31818ec7ee.

Lord, S., and Marsch, L., (2011). Emerging trends and innovations in the identification and management of drug use among adolescents and young adults. *Adolesc Med State Art Rev, 22*(3), 649-607.

Martin, C.E., Longinaker, N., and Terplan, M., (2015). Recent trends in treatment admissions for prescription opioid abuse during pregnancy. *J Subst Abuse Treatment, 48*(1), 37-42. doi:10.1016/j.jsat.2014.07.007.

McCabe, S.E., Morales, M., Cranford, J.A., Delva, J., and Boyd, C.J., (2007). Race/ethnicity and gender differences in drug use and abuse among college students. *J Ethn Subst Abuse, 6*(2).

McCarthy, F.H., McDermott, K.M., Kini, V., Gutsche, J.T., Wald, J.W., Xie, D., Szeto, W.Y., Bermudez, C.A., Atluri, P., Acker, M.A., and Desai, N.D., (2015). Trends in U.S. extracorporeal membrane oxygenation use and outcomes: 2002-2012. *Presented at the 2015 AATS, Seattle, WA, April 29, 2015.* http://dx.doi.org/10.1053/j.semtcvs.2015.07.005

McHugh, R.K., Votaw, V.R., Sugarman, D.E., and Greenfield, S.F., (2018). Sex and gender differences in substance use disorder. *Clinical Psychology Review, 66*. https://doi.org/10.1016/j.cpr.2017.10.012

Mutter, R., Ali, M. and Strashny, A., (2015). Profile of adolescent discharges from substance abuse treatment. *The CBHSQ Report, April 1, 2015.*

Nicholson, H.L., and Ford, J.A., (2019). Sociodemographic, neighborhood, psychosocial, and substance use correlates of cocaine use among black adults: Findings from a pooled analysis of national data. *Addictive Behaviors, 88.* https://doi.org/10.1016/j.addbeh.2018.08.042.

Nolen-Hoeksema, S., (2004). Gender differences in risk factors and consequences for alcohol use and problems. *Clinical Psychology Review, 24.* DOI: 10.1016/j.cpr.2004.08.003.

Odgers, C.L., Caspi, A., Nagin, D.S., Piquero, A.R., Slutske, W.S., Milne, B.J., Dickson, N., Poulton, R., and Moffitt, T.E., (2008). Is it important to prevent early exposure to drugs and alcohol among adolescents? *Psychol Sci, 19*(10), 1037-1044. doi:10.1111/j.1467-9280.2008.02196.x.

Resnicow, K., Soler, R., Braithwaite, R.L., Ahluwalia, J.S., and Butler, J., (2000). Cultural sensitivity in substance use prevention. *Journal of Community Psychology, 28*(3).

Schneider, K.E., Krawczyk, N., Xuan, Z., and Johnson, R.M., (2017). Past 15-year trends in lifetime cocaine use among US high school students. *Drug and Alcohol Dependence, 183*. http://doi.org/10.1016/j.drugalcdep.2017.10.028.

Schulden, J.D., Lopez, M.F., and Compton, W.M., (2009). Substance abuse in the United States: Findings from recent epidemiologic studies . Curr *Psychiatry Rep. 11*(5), 353-359.

Schulden, J.D., Lopez, M.F., and Compton, W.M., (2012). Clinical implications of drug abuse epidemiology. *Psychiatr Clin North Am. 35*(2), 411-423. doi:10.1016/j.psc.2012.03.007.

Shaffer, J., and Mather, F., (2008). Trend analysis for MCH outcomes. *Data Training Workshop for The Association of Maternal and Child Health Program, Centers for Disease Control and Prevention, Health Resources and Services Administration, and Maternal and Child Health Bureau.*

Substance Abuse and Mental Health Services Administration, (2014). Age of substance use initiation among treatment admissions aged 18 to 30. *The TEDS Report,* July 17 2014.

Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. *Treatment episode data set (TEDS): 2004-2014. State admissions to substance abuse treatment services.* BHDID Series S-85, HHS Publication No. (SMA) 16-4987. Rockville, MD: Substance Abuse and Mental Health Services Administration, 2015.

Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. *Treatment Episode Data Set (TEDS): 2005-2015. National Admissions to Substance Abuse Treatment Services.* BHSIS Series S-91, HHS Publication No. (SMA) 17-5037. Rockville, MD: Substance Abuse and Mental Health Services Administration, 2017.

Toumbourou, J.W., Stockwell, T., Neighbors, C., Marlatt, G.C., Sturge, J., and Rehm, J. (2007). Interventions to reduce harm associated with adolescent substance use. *The Lancet, 369.*

Tetrault, J.M., Desai, R.A., Becker, W.C., Fiellin, D.A., Concato, J., and Sullivan, L.E., (2007). Gender and non-medical use of prescription opioids: results from a national US survey. *Society for the Study of Addiction, 103.* DOI:10.111/j.1360-0443.2007.02056.x.

Age of substance use initiation among treatment admissions aged 19 to 30. (2014). *The TEDS Report, July 17th 2014.*

UNODC, World Drug Report 2010 (United Nations Publication, Sales No. E.10.XI.13).

Vega, W.A., Zimmerman, R.S., Warheit, G.J., Apospori, E., and Gil, A.G., (1993). Risk factors for early adolescent drug use in four ethnic and racial groups. *American Journal of Public Health, 83*(2).

Virginia Department of Behavioral Health & Developmental Services. *Biennial report on substance abuse services per code of Virginia: 37.2-310. To members of the Virginia General Assembly.* October 1, 2015.

Virginia Office for Substance Abuse Prevention Collaborative, (2018). 2018 Virginia office for substance abuse prevention annual report.

Yue, S., Pilon, P., and Cavadias, G., (2002). Power of the mann-kendall and spearman's rho tests for detecting monotonic trends in hydrological series. *Journal of Hydrology, 259.*

Yonkers, K.A., Forray, A., Nich, C., Carroll, K.M., Hine, C., Merry, B.C.,…Shaw, H., (2014). Progesterone reduces cocaine use in postpartum women with a cocaine use disorder: A randomized, double-blind study. *Lancet Psychiatry, 1*(5). DOI:10.1016/S2215-0366(14)70333-5

Zapolski, T.C., Baldwin, P., Banks, D.E., and Stump, T.E., (2017). Does a crossover age effect exist for African American and Hispanic binge drinkers? Findings from the 2010 to 2013 national study on drug use and health. *Alcoholism: Clinical and Experimental Research, 41*(6). DOI: 10.1111/acer.13380.