

# Walden University

College of Health Sciences

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2019

Abstract

Living Arrangements, Referral Source and Young Adult Admissions to Drug Treatment

by

Daniel Samaila

MS, University of Florida Gainesville, 2016

MS, University of Nevada Las Vegas, 2004

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health – Epidemiology

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## Abstract

Abuse of painkiller drugs and non-medical use of drugs among young adults continues to be a public health crisis in the United States. Living arrangements and source of treatment referral were considered as the social context that could contribute to increased admissions to treatment for drug abuse. The purpose of this study was to examine the relationship between, independent living arrangement, the principal source of referral, and abuse of opioid, heroin, and cocaine. Steered by the conceptual framework of the biopsychosocial model, this study used the data from the 2015 Treatment Episode Data Set: Admissions managed by the Substance Abuse and Mental Health Services Administration. Multiple logistic regression analyses were performed to test the hypotheses regarding a predictive relationship between independent living arrangement, the principal source of treatment referral, and admissions to treatment for abuse of opioid, heroin, and cocaine. The results showed a significant association between the source of treatment referrals and independent living arrangement, and the increased odds of admissions for prescription opioids use disorder, heroin use disorder, and cocaine use disorder among adults aged 18-34 living in the United States. The implication for positive social change included a need for a targeted treatment and other intervention programs for young adults' users with associated higher-risk treatment referral categories and exposed to neighborhoods factors and health-risk behaviors in reducing the crisis of drug abuse in the United States.

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## Dedication

I dedicated this dissertation to my late father Mr. Samaila Mari Hena, and mother Mrs. Rebecca Samaila Hena, who first instilled in me the value of education. And to my darling wife Hyeladzira that inspired me throughout this journey.

Also, I dedicated to all who struggle with substance abuse. There is always hope.

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## Part 1: Overview

### **Introduction**

Abuse of prescription pain relievers and nonmedical drugs has been a primary public health concern in the United States since 2002. From 2014 through 2017, abuse of prescription opioids, heroin, and cocaine/crack (among young adults transitioning to adulthood) has increased significantly in the United States (National Institute on Drug Abuse [NIDA], 2018; Substance Abuse and Mental Health Services Administration [SAMHSA], 2017; Rudd, Seth, David, & Scholl, 2016). In 2015, an estimated rate of 17.8 per 100 persons in the United States used or abused prescription opioids, heroin or cocaine in the past year (CDC National Center for Injury Prevention and Control, 2017). Types of prescription opioids abused include fentanyl, buprenorphine, codeine, hydrocodone, hydromorphone, meperidine, morphine, opium, oxycodone, pentazocine, propoxyphene, and tramadol (NIDA, 2018). The National Survey on Drug Use and Health (NSDUH, 2016) reported that about 28.6 million Americans, ages 12 years and above, abuse prescription pain relievers, cocaine, heroin, and other illicit drugs (SAMHSA, 2017). Data from 2016 NSDUH showed that the prevalence of abuse of prescription and nonmedical drug among young adult age 18 to 25 years for cocaine is 552,000, heroin is 227,000, and prescription opioids is 2.5 million (SAMHSA, 2017). The prevalence of heroin initiation and rate of overdose death is highest among young adults with a history of abuse of prescription opioids (Muhuri, Gfroerer, & Davies, 2013).

The extended use of prescription opioids, heroin, and cocaine can have lasting effects on the body. Short-term health effects include mood swings, restlessness, stroke,

fatigue, psychosis, respiratory depression, euphoria, changes in heart rate, blood pressure and body temperature, and overdose that could result to death (NIDA, 2017). The long-term abuse of prescription opioids, heroin, or cocaine can damage the normal function of several organs in the body such as the brain, heart, and lungs (NIDA, 2017). The effects of long-term abuse of prescription opioids, heroin, or cocaine on standard brain functions include changes to the aptitude for controlling stress levels, learning or memories, pleasures for sex or food, and difficulty in stopping the abuse of drugs (addiction) despite the adverse health effects (NIDA 2017). Abusing prescription opioids, heroin, or cocaine can also result to the long-term impact of drug addiction, which eventually impacts decision-making skills, social skills, and the biological and psychological status of an individual (NIDA, 2017).

### **Problem Statement**

The increase in abuse of prescription and nonmedical drugs among young adults in the United States has reached an epidemic level (Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2015). Abuse of prescription and nonmedical drugs is highest among young adults aged 18-25 years, with 1 in 4 young adults reporting abuse of prescription pain relievers, cocaine, heroin, and other illicit drugs (SAMHSA, 2017). Because of several drug abuse risk factors among young adults that are distinct from those of other age groups, young adults have a higher chance of abuse of several classes of drugs such as prescription pain relievers, heroin, and cocaine (Johnston et al., 2015).

Transitioning from parental supervision to living independently without any supervision could present many challenges to young adults. Young adults transitioning

from the security of their parents may be at higher risk of abuse of prescription and nonmedical drug, mainly due to social, psychological and physical challenges (SAMHSA 2015; Johnston, O'Malley, Miech, Bachman & Schulenberg, 2016). Adverse outcomes from abuse of prescription pain relievers, heroin, cocaine and other nonmedical drugs may be found in employment status, education level, criminal justice involvement, housing condition, and relationship with peers or others (NIDA 2017).

In this study, independent living arrangements without supervision and high risk sources of treatment referral were indicators of the social context of the young adult that might influence the risk of being admitted to treatment for drug abuse because both offers more opportunities for drug use than more supervised living arrangements and low risk sources of treatment referral (Rigg & Monnat, 2015; Karriker-Jaffe, 2013; Johnston et al., 2015). There is a knowledge gap in the literature that existed regarding the significance of independent living arrangements and sources of treatment referral as possible predictors of young adults abuse of particular classes of drugs.

### **Purpose of this Study**

More young adult Americans are struggling with problematic abuse of prescription opioids, heroin, and cocaine. Many researchers have reported several risk factors that contributed to young adults increased abuse of prescription opioids, cocaine, and heroin drugs (Panthee et al., 2017; Newcomb, Birkett, Corliss & Mustanski, 2014). Using the biopsychosocial model in these three quantitative studies, I used the national dataset from SAMHSA to examine whether there are predictive relationships between admissions to prescription opioid abuse, cocaine abuse and heroin abuse, and the two



under-studied independent variables: independent living arrangement and clients' principal sources of treatment referral among young adult in the United States. The findings from these studies helped provide understanding regarding the significance of independent living arrangements and high-risk treatment referral categories as possible predictors of abusing particular classes of drugs among young adults.

### **Social Impact**

This study facilitated my understanding of the association between the independent predictors (independent living arrangement and principal source of referral) and health outcomes variables (prescription opioids, heroin, and cocaine abuse) variables, and covariates of age, race, psychological problems, prior treatments, employment status, education, and ethnicity. Being aware of these two potential independent risk factors can help policymakers, public health researchers, health professional, families, peers of drug abusers, schools, communities, and substance abuse treatment centers in identifying, reducing and eliminating risk factors through prevention and treatment programs that improve protective factors. Targeting outreach and prevention efforts in independent living arrangements and high-risk sources of treatment referral has not been standardized. The results of this study might stimulate the development of new strategies.

### **Conceptual Framework**

Although researchers have used many psychosocial and behavioral models to describe drug use, abuse, dependence, and progression from initiation to abuse, no single model captures all aspects of areas related to drug abuse among researchers (Groshkova, 2010; Buchman, Skinner & Illes, 2010; Pandina & Johnson, 1999). The biopsychosocial

model accentuates the interrelated influences of biological, psychological, and socioenvironmental factors on behavioral health patterns and health outcomes (Kusnanto, Agustian & Hilmanto, 2018; Buchman, Skinner & Illes, 2010; Borrell-Carrió, Suchman & Epstein, 2004). Engel (1980) noted that the onset, course, and treatment of physical illness are all connected and best understood as involving each of these levels of analysis (Buchman, Skinner & Illes, 2010; Borrell-Carrió, Suchman, & Epstein, 2004).

Psychological factors including childhood influences, depression, anxiety, psychosis and self-awareness influenced the physical state and health outcomes of an individual (Buchman, Skinner & Illes, 2010). Rigg and Monnat (2015) used the biopsychosocial model for investigating risk factors that contributed to variation in prescription opioid abuse among residents in rural versus urban communities (Rigg and Monnat, 2015). Newcomb, Birkett, Corliss, and Mustanski (2014) used the biopsychosocial model to examine the role of sexual orientation, race, and gender, in illicit drug use (Newcomb, Birkett, Corliss, & Mustanski, 2014).

The biopsychosocial model facilitated my understanding of the association between independent living arrangements, the principal source of treatment referral, and the abuse of prescription opioids, heroin, and cocaine among the young adults (Buchman, Skinner & Illes, 2010; Borrell-Carrió, Suchman & Epstein, 2004; Smith & Nicassio, 1995). Age and gender affect the biology of drug addiction (Newcomb et al., 2014). Race and educational level may change the psychology and sociology of drug use (Newcomb et al., 2014; Otiniano et al., 2014). Living arrangement is an indicator of the young adult's social context and may influence the risk of drug abuse because less supervised

arrangements offer more opportunities for drug use than more supervised living arrangements (Rigg & Monnat, 2015; Karriker-Jaffe, 2013). The source of treatment referral is an indicator of social context because it reflects points at which the young adult interfaces with a concerned social network that can refer for treatment.

## **Background**

### **Historical Findings**

The economic burden of substance abuse in the United States is about \$740 billion per annum in costs that impact health care, work productivity, and criminal justice (NIDA, 2017). Abuse of prescription opioids, heroin, and cocaine, constitute a significant part of the current increase in drug abuse in the United States that directly and indirectly affect family, friends, communities, and society as a whole (NIDA, 2018; SAMHSA, 2017). Thirty-four percent of young adults Americans under the age of 24 are at higher risk of homelessness due to family conflict, the juvenile justice system, poverty, substance use disorders, joblessness, and lack of education (SAMHSA, 2014). Young adults, when compared to all aged groups in America, are more likely to exhibit risky behaviors towards abuse of prescription and nonmedical drugs, and less concerned about the health outcomes (Johnston et al., 2015). In 2016, young adults were shown to exhibit a higher rate of abuse of prescription opioids, heroin, and cocaine when compared to adolescence and older adults (see Table 1; SAMHSA, 2017).

Table 1

*2016 Current Users of Prescription Opioids, Heroin, and Cocaine*

Age group	12 to 17 years	18 to 25 years	26 years above
Prescription opioids	1.0%	1.8%	1.2%
Heroin	0.1%	0.3%	0.2%
Cocaine	0.1%	1.6%	0.6%

*Note. From “2016 National Survey on Drug Use and Health,” by SAMHSA, 2017*

**Drug Abuse Risks Factors**

Researchers have reported many risk factors that contributed to young adults increased abuse of prescription opioid, cocaine, and heroin drugs such as age and gender (Newcomb et al., 2014), race and ethnicity (Otiniano, Verissimo, Grella, Amaro, & Gee, 2014), income and employment (Karriker-Jaffe, 2013; Nuttbrock, Bockting, Rosenblum, Hwahng, Mason, Macri, Becker, 2014 ), community stress and alcohol abuse (Seth, Murray, Braxton & DiClemente, 2013), peer influence (Panthee, Panthee, Gyawali, & Kawakami, 2017), marital status (Edwards, Larsson Lönn, Sundquist, Kendler, Sundquist, 2017), and demographic characteristics (Rigg Monnat, 2015).

In a cross-sectional study, Newcomb et al. (2014) examined the association of race, gender, and sexual orientation as predictive risk factors for the prevalence of illicit drugs in a sample of 49,307 high school students using multivariate logistic regression. Newcomb et al. showed that age, as a predictor of drug abuse, increased the odds of abuse of cocaine (OR = 1.09) but lowered the odds of heroin abuse (OR = 0.89) in young adults. Gender is also a significant predictor of drug abuse among young adults with

young male adults exhibiting higher odds of abuse of cocaine (OR = 1.67), heroin (OR = 3.24), methamphetamine (OR = 2.18), and marijuana (OR = 1.14) than young adult female, except for abuse of inhalant (OR = 0.97) with no gender difference (Newcomb et al., 2014). Newcomb et al.'s study was a significant contribution to scholarly understanding of the risk of developing drug abuse. However, the researchers' use of self-reporting for all measures and not controlling for confounding factors such as environmental factors and personality traits may have introduced bias that affected the predictive effects of age, gender, and sexual orientation and the risk of drug abuse (Newcomb et al., 2014).

In another cross-sectional study involving 6,294 Latino adults, nativity, ethnicity, discrimination, and gender increased the risk of drug or alcohol abuse (Otiniano et al., 2014). Using logistic regression, Otiniano et al. (2014) showed that discrimination based on race or nativity is a significant predictor of drug abuse that increases the odds of abuse of alcohol (OR = 1.32) and illicit drugs (including heroin, cocaine, opiates, cannabis, sedatives, amphetamine, solvents, sedatives, and tranquilizers; OR = 1.46). But the sample size of 325 may have limited generalizability and the external validity of these findings (Otiniano et al., 2014).

Stress is also a risk factor or predictor of drug abuse. In a cross-sectional study, Seth, Murray, Braxton, and DiClemente (2013) found that, among a sample of 96 young unmarried African-American men living in an urban area, urban or city stress was a predictive risk factors for alcohol or illicit drug abuse (i.e., heroin, cocaine, marijuana, ecstasy, or methamphetamine). Multiple logistic regression showed city stress increases

the likelihood of abuse of illicit drug (AOR = 3.34), marijuana (AOR = 5.19), and alcohol abuse (AOR= 4.98,  $p = .01$ ) in young African-American adults after controlling for age (Seth et al., 2013). Generalizability of the findings by Seth et al. is affected by the small sample size and recall bias among participants.

In a different cross-sectional study, researchers found that neighborhood socioeconomic factors (income, education, and unemployment) increased the risk of drug abuse among adults living in low-populated states in the United States (Karriker-Jaffe, 2013). Using logistic regression and a sample of 14,531 participants including African-American, Hispanics, Caucasians and other races residing in low-populated states, the researcher found that lack of education (OR = 2.06), unemployment (OR = 1.72), and income (OR = 1.29) were significant predictors of drug abuse, alcohol abuse, and tobacco use (Karriker-Jaffe, 2013). Since the duration of living in a neighborhood is considered a determinant of an individual's social, physical, and economic status and the likelihood of drug abuse, not accounting for participants' length of living in the target neighborhoods may have led to underestimate or overestimate of the risk of substance abuse (Karriker-Jaffe, 2013).

Living in rural communities or urban communities increases the risk of abuse of prescription opioids. Rigg and Monnat (2015) examined the association of prescription opioids abuse and the imminent threat of living in rural communities versus urban communities among 47, 440 adults. Using binary logistic regression and adjusting for demographic factors (marital status, age, race/ethnicity, employment status, family income, and educational attainment), they found that residing in urban areas increases the

odds of developing abuse of prescription drugs (OR = 0.85) when compared to those living in rural areas (OR = 0.77; Rigg & Monnat, 2015). Peer influence, alcohol drinking, and cigarette smoking are risk factors for substance abuse. Panthee, Panthee, Gyawali, and Kawakami (2017) conducted a cross-sectional study to examine the predictive risk factors of peer influence, alcohol drinking, and cigarette smoking and their associations to substance abuse (prescription opiates, heroin, pain medicine, and cannabis) among 407 young women healthcare students. After adjusting for demographic variables, the logistic regression analysis showed cigarette smoking (OR = 10.33), peer influence when offered drug (OR = 5.77) and when provided alcohol drinks (OR = 4.28), and alcohol abuse (OR= 2.69) significantly increases the odds of substance abuse (Panthee et al., 2017). Despite the significant findings of predictive effects of peer influenced alcohol abuse and cigarette smoking on risk of substance abuse, results cannot be generalized to male audiences (Panthee et al., 2017).

### **Risk of Drug Abuse Among Young Adults**

Multiple risk factors have been reported to contribute to substance abuse in young adults. Accessibility of prescription pain relievers and non-medical drugs within the school, neighborhood, and community, household member drug use, peer pressure, stress, and family environment increases the chance of abuse of prescription pain relievers and non-medical drugs among young adults (NIDA, 2014). Studies that focus on identifying risk and protective factors for abuse of prescription opioids, heroin, and cocaine can provide new strategies, initiatives, and policies that target outreach prevention programs specific for the target population. Previous researchers have used psychosocial and

behavioral models to identify the age at first use, employment, education, income, peer influence, and family history as risk factors for drug abuse among all age groups (SAMHSA, 2017). Young adults engaging in prescription opioid, cocaine, and heroin abuse are at a higher risk of cancer, mental illness, HIV/AIDS, hepatitis, heart disease, lung disease, mental illness, substance abuse disorder, mood disorder, addiction, suicide, and accidental overdose death (NIDA, 2017; Schulte & Hser, 2014). Non-Hispanic Whites, compared to African-American or Hispanics, have a higher risk of developing abuse of prescription opioids, heroin, and cocaine (Welty et al., 2016).

### **Overview of the Manuscripts**

Unsupervised living arrangement is an indicator of the social context of the young adult and may influence the risk of drug abuse because it offers more opportunities for drug use than more supervised living arrangements (Rigg & Monnat, 2015; Karriker-Jaffe, 2013). The principal source of referral to treatment program is an indicator of social context because it reflects the point at which the young adult interfaces with a concerned social network that can refer her or him for treatment. To address the knowledge gap in the literature concerning the degree to which particular living arrangements and specific principal source of referral contribute to increases in prescription opioids, heroin, and cocaine abuse among young adults in the United States, I first examined predictive relationships between prescription opioids abuse by young adults, and independent living arrangement and the principal source of referral to treatment. Secondly, I examined predictive relationships between heroin abuse by young adults, and independent living arrangement and the principal source of referral to



treatment. Thirdly, I examined predictive relationships between cocaine/crack abuse by young adults, and independent living arrangement and the principal source of referral to treatment.

### **Manuscript 1: Independent Living Arrangements and Client Principal Source of Referral as Risk Factors for Prescription Opioids Abuse in Young Adults**

In this quantitative study, I examined the relationship between independent living arrangement and principal source of referral, and their association with prescription opioids abuse in young adults, as reported during admissions to treatment programs in the United States.

#### **Research Question**

The research question for this study was: What is the relationship between independent living arrangement, and principal source of referral associated with prescription opioids abuse in the young adult population, controlling for age at first use, gender, race, ethnicity, employment, educational status, number of prior treatments, and psychiatric problems in addition to drug problem?

#### **Nature of the Study**

I used retrospective secondary data from SAMHSA, an agency in U.S. Department of Health and Human Services that archive national health statistics data from all 50 states in the United States, including the District of Columbia. Quantitative understanding of prescription opioids abuse and predictive associated risk factors is critical for effective intervention strategies. Findings from this quantitative study will provide knowledge about the significant relationship between independent living

arrangement and high-risk treatment referral categories as risk factors for prescription opioids abuse in the young adult population at the national level.

### **Study variables**

Independent living arrangement and the principal source of referral were the independent nominal variables and prescription opioids (i.e., other opiates and amphetamine abuse) is the categorical the outcome variables. The covariate nominal variables for this study included age at first use, race, ethnicity, gender, employment, educational status, number of prior treatments, and psychiatric problem in addition to drug problem.

I use the following definition of terms and variables from the TEDS-A codebook:

*Age:* Clients' estimated date of birth and date of admission. Subcategorized further into 12 different groups (TEDS-A, 2015). Age was categorized into 12 subcategories from 12 years to 55 years of age and above. In this study, the population of interest was young adult admissions (18 to 34 years) and measured as a nominal variable (TEDS-A, 2015).

*Age at first use:* Clients' age of the first intoxication for alcohol and clients' age at first use of the substance of abuse (TEDS-A, 2015). TEDS-A further categorized age at first use into 12 subgroups representing every specific age group ranging from under 11 years to 55 years of age and above (TEDS-A, 2015). This was measured as a nominal variable.

*Education:* Clients' highest school level (based on years in school) subcategorized into five subgroups (TEDS-A, 2015). Subgroups represent numbers of school years

completed by clients at the time of admission. This was measured as a categorical variable

*Employment:* Clients' employment status during admission or transfer, subcategorized into four subgroups including full time (35 hours or more each week), part-time (less than 35 hours a week), unemployed and not in labor force (TEDS-A, 2015). This was measured as a categorical variable.

*Ethnicity:* Clients' specific origin Hispanic origin, categorized into six subgroups. Subgroups for this study were Hispanic, not of Hispanic origin, and Hispanic-not otherwise specified (TEDS-A, 2015).

*Gender:* Clients' gender identifies either as male or female (TEDS-A, 2015). TEDS-A measured gender as a binary variable with number 1 represents male clients, and number 2 represents female clients at the time of admission (TEDS-A, 2015).

*Independent living:* Defined as clients 'living on his or her own or with others or parents without any supervision (TEDS-A, 2015). This was measured as a nominal variable.

*Living arrangement:* Defined clients as homeless, living with parents, supervised living or independent living without supervision. Subgroup for this study is independent living (TEDS-A, 2015). This was measured as a nominal variable.

*Number of prior treatment episodes:* Defined as number of client's previous treatment episodes received in any drug or alcohol programs (TEDS-A, 2015). Transfers were not counted as prior episodes. This was categorized into five subcategories where a

value of 0 represented no prior treatment episodes, and a value of 5 represented five or more prior treatment episodes (TEDS-A, 2015).

*Prescription drug abuse:* Defined as the clients' primary substance of abuse (who reported other opiates and synthetics abuse - including buprenorphine, codeine, hydrocodone, hydromorphone, meperidine, morphine, opium, oxycodone, pentazocine, propoxyphene, tramadol, and any other drug with morphine-like effects) at the time of admission to treatment program (TEDS-A 2015). TEDS-A measured prescription opioids (other opiates and or synthetics) abuse as a binary variable, with a value of one suggesting prescription opioids (other opiates and or synthetics) reported at the time of admission as main substance of abuse, and a value of zero indicating no prescription opioids (other opiate and or synthetics) abuse reported at the time of entry (TEDS-A, 2015).

*Psychiatric problem in addition to drug or alcohol problem:* Defined as whether there is psychiatric problem in addition to drug or alcohol problem of client (TEDS-A, 2015). This was measured as a nominal binary variable, where a value 1 represent client psychiatric problem and a value of 0 represent no psychiatric problem (TEDS-A, 2015).

*The principal source of referral:* Defined as the person or the agency that refers the client with substance abuse to a substance abuse treatment program (TEDS-A, 2015). The principal source of referral is subcategorized into seven groups including individual or self-referral; drug abuse licensed care providers; other licensed health care providers or programs, school; employee or EAP; other community referral, and court or criminal justice referral or DUI/DWI (TEDS-A, 2015).

*Race*: Defines race as racial identity of clients at the time of admission, measured as a nominal variable categorized into nine subgroups (TEDS-A, 2015). In this study, only Black or African-America and non-Hispanic Whites will be included (TEDS-A 2015).

### **Statistical analysis**

I used SPSS software for data analysis. The independent predictor variables in this study included independent living arrangement and the principal source of referral. The outcome variables were prescription opioids abuse (i.e., other opiates and synthetics abuse), coded with a value of 1 representing clients' prescription opioids abuse and 0 for no drug abuse indicated at the time of admission to a treatment program. The covariate variables for these studies include age, age at first use, race, gender, employment, educational status, prior treatment episodes and psychiatric problems in addition to drug problem. Data analysis in this study consisted of descriptive statistics, chi-square, and multivariate logistic regression.

Descriptive statistics were carried out for selected covariate variables and other variables of interest. A chi-square analysis was conducted to examine the relationship between covariate variables include age, age at first use, race, gender, employment, and educational status and the dependent variable, prescription opioids abuse.

I conducted multiple logistic regression analysis to examine whether there was an association between independent living arrangement and the principal source of referral with prescription opioids abuse as reported at the time of admission to treatment programs by young adults.

**Data Source**

I used secondary data from the SAMHSA TEDS-A (2015), which includes demographic information and substance abuse characteristics of those admitted to treatment facilities for alcohol and drug abuse (SAMHSA, 2015). TEDS-A data is certified or licensed by state regulatory agencies or from treatment programs that receive federal funding (including federal block grants; SAMHSA, 2015).

**Power Analysis**

TEDS-A data collection is through admissions reports provided by states' substance abuse treatment programs. The unit of measurement is the number of admissions reported by states to TEDS-A. I estimated sample size for this study with power analysis using G\*Power 3 software. In this study, I used a two-tailed, z-test, an alpha level of .05, a power of 0.80 and 0.90, and logistic regression. The required sample size for this study is 721 (80% power) and 926 (90% power) with an effect size (odds ratio) of 1.3. A sample size of 745,915 admission data from TEDS-A 2015 dataset will be measured. The power analysis with odds ratio of 1.3 selected was from previously conducted studies on substance abuse (Goldberg, Strutz, Herring, & Halpern, 2013; Kendler, Ohlsson, Sundquist, Suundquist, & Sundquist, 2014; Moran, Coffey, Romaniuk, Degenhardt, Borschmann, & Patton, 2015).

**Study Population**

The target participants for this study were young adults admitted to state-funded substance abuse treatment programs in the United States. All substance abuse agencies receiving public funds must submit data for client alcohol or drug abuse treatment

admissions to TEDS-A. TEDS-A consist of a minimum dataset submitted by 49 states, Washington DC and Puerto Rico. Information from TEDS-A includes clients' substance of abuse, the frequency of use, route of administration, treatment episodes, demographic characteristics, the source of treatment referral, service types, and age at first use (SAMHSA, 2015; 2017).

In 2015, TEDS-A received a total of 1,537, 025 admissions data for substance abuse treatment from 49 states in USA including Washington DC and Puerto Rico, out of which 745, 915 substance abuse treatment admissions were for adults, age group 18 to 34 years. Most of the clients for TEDS-A were Blacks or African-American, non-Hispanic Whites, and Hispanic. Male constituted 66.4% of the reported admissions and 33.6% were female. For this study, admissions data for prescription opioids were defined by TEDS-A as other opiates and synthetics abuse (including buprenorphine, codeine, hydrocodone, hydromorphone, meperidine, morphine, opium, oxycodone, pentazocine, propoxyphene, tramadol, and any other drug with morphine-like effects; TEDS-A 2015).

### **Sampling Strategy**

The TEDS-A system collects admission data from each state to monitor their substance abuse treatment programs. The received data is converted into a standardized format that is uniform across all primary-funded participating states. The nationally collected data is based on public admissions instead of persons because an individual could be admitted more than once for substance abuse treatment (SAMSHA, 2015). The TEDS-A sampling strategy is non-randomization because TEDS-A counts admission and not individuals, and it can result in oversampling if a single client has multiple

admissions (SAMHSA, 2015). These are potential threats to external validity. I addressed these potential threats through statistical analysis, and accurate estimate of population parameters and standard errors in logistic regression (see Dowd, Greene, & Norton, 2014; Sperandei, 2014).

In this study examined, TEDS-A data on independent living arrangement and the principal source of referral, and their association with prescription opioids abuse in young adult. Data on client admissions for the age group between 18 to 34 years were used only for this study. Excluded in this study are client admissions for age group less than 18 years old or greater than 34 years old.

**Manuscript 2: Heroin Use Disorder among U.S. Adults Ages 18-34 and the role of Living Arrangement and Source of Drug Treatment Program Referrals**

This study examined the relationship between independent living arrangement and the principal source of referral, and their association with heroin abuse in young adult, aged 18 to 34 years, as reported by admissions to treatment programs in the United States.

**Research Question**

The research question for this study was: What is the relationship between independent living arrangement, and principal source of referral associated with heroin abuse in the young adult population, controlling for age at first use, gender, race, ethnicity, employment, educational status, number of prior treatments, and psychiatric problems in addition to drug problem?

**Nature of the Study**



I used retrospective secondary data from SAMHSA, an agency in U.S. Department of Health and Human Services that archive national health statistics data from all 50 states in the United States, including the District of Columbia. Quantitative understanding of heroin abuse and predictive associated risk factors is critical in intervention strategy. Findings from this quantitative study will provide knowledge in the significant relationship between independent living arrangement and the principal source of referral both as risk factors for heroin abuse in the young adult population at the national level.

### **Study variables**

Independent living arrangement and the principal source of referral were the independent nominal variables, and heroin abuse is the categorical the outcome variables. The covariates nominal variables for these studies include age at first use, race, ethnicity, gender, employment, educational status, number of prior treatments, and psychiatric problem in addition to drug problem.

I use the following definition of terms and variables from the TEDS-A codebook:

*Age:* Clients' estimated date of birth and date of admission. Subcategorized further into 12 different groups (TEDS-A, 2015). Age was categorized into 12 subcategories from 12 years to 55 years of age and above. In this study, the population of interest was young adult admissions (18 to 34 years) and measured as a nominal variable (TEDS-A, 2015).

*Age at first use:* Clients' age of the first intoxication for alcohol and clients' age at first use of the substance of abuse (TEDS-A, 2015). TEDS-A further categorized age at

first use into 12 subgroups representing every specific age group ranging from under 11 years to 55 years of age and above (TEDS-A, 2015). This was measured as a nominal variable.

*Education:* Clients' highest school level (based on years in school) subcategorized into five subgroups (TEDS-A, 2015). Subgroups represent numbers of school years completed by clients at the time of admission. This was measured as a categorical variable

*Employment:* Clients' employment status during admission or transfer, subcategorized into four subgroups including full time (35 hours or more each week), part-time (less than 35 hours a week), unemployed and not in labor force (TEDS-A, 2015). This was measured as a categorical variable.

*Ethnicity:* Clients' specific origin Hispanic origin, categorized into six subgroups. Subgroups for this study were Hispanic, not of Hispanic origin, and Hispanic-not otherwise specified (TEDS-A, 2015).

*Gender:* Clients' gender identifies either as male or female (TEDS-A, 2015). TEDS-A measured gender as a binary variable with number 1 represents male clients, and number 2 represents female clients at the time of admission (TEDS-A, 2015).

*Heroin drug abuse:* Defined as the clients' primary substance of abuse reported at the time of admission to treatment program (TEDS-A, 2015). TEDS-A measured heroin abuse as a binary variable, with a value of one suggesting heroin abuse reported at the time of admission as main substance of abuse, and a value of zero indicating no heroin abuse reported at the time of entry (TEDS-A, 2015).

*Independent living:* Defined as clients 'living on his or her own or with others or parents without any supervision (TEDS-A, 2015). This was measured as a nominal variable.

*Living arrangement:* Defined clients as homeless, living with parents, supervised living or independent living without supervision. Subgroup for this study is independent living (TEDS-A, 2015). This was measured as a nominal variable.

*Number of prior treatment episodes:* Defined as number of client's previous treatment episodes received in any drug or alcohol programs (TEDS-A, 2015). Transfers were not counted as prior episodes. This was categorized into five subcategories where a value of 0 represented no prior treatment episodes, and a value of 5 represented five or more prior treatment episodes (TEDS-A, 2015).

*Psychiatric problem in addition to drug or alcohol problem:* Defined as whether there is psychiatric problem in addition to drug or alcohol problem of client (TEDS-A, 2015). This was measured as a nominal binary variable, where a value 1 represent client psychiatric problem and a value of 0 represent no psychiatric problem (TEDS-A, 2015).

*The principal source of referral:* Defined as the person or the agency that refers the client with substance abuse to a substance abuse treatment program (TEDS-A, 2015). The principal source of referral is subcategorized into seven groups including individual or self-referral; drug abuse licensed care providers; other licensed health care providers or programs, school; employee or EAP; other community referral, and court or criminal justice referral or DUI/DWI (TEDS-A, 2015).

*Race*: Defined race as racial identity of clients at the time of admission, measured as a nominal variable categorized into nine subgroups (TEDS-A, 2015). In this study, only Black or African-America and non-Hispanic Whites will be included (TEDS-A 2015).

### **Statistical analysis**

I used SPSS software for data analysis. The independent predictor variables in this study included independent living arrangement and the principal source of referral. The outcome variable is heroin abuse, coded with a value of 1 representing clients' heroin abuse and 0 for no drug abuse indicated at the time of admission to a treatment program. The covariate variables for these studies include age, age at first use, race, gender, employment, educational status, number of prior treatment episodes and psychiatric problems in addition to drug problem. Data analysis in this study consisted of descriptive statistics, chi-square, and multivariate logistic regression.

Descriptive statistics were carried out for selected covariate variables and other variables of interest. A chi-square analysis was conducted to examine the relationship between covariate variables include age, age at first use, race, gender, employment, and educational status and the dependent variable, heroin abuse.

I conducted multiple logistic regression analysis to examine whether there was an association between independent living arrangement and the principal source of referral with heroin abuse as reported at the time of admission to treatment programs by young adults.

### **Data Source**

I used secondary data from the SAMHSA TEDS-A (2015), which includes demographic information and substance abuse characteristics of those admitted to treatment facilities for alcohol and drug abuse (SAMHSA, 2015). TEDS-A data is certified or licensed by state regulatory agencies or from treatment programs that receive federal funding (including federal block grants; SAMHSA, 2015).

### **Power Analysis**

TEDS-A data collection is through admissions reports provided by states' substance abuse treatment programs. The unit of measurement is the number of admissions reported by states to TEDS-A. I estimated sample size for this study with power analysis using G\*Power 3 software. In this study, I used a two-tailed, z-test, an alpha level of .05, a power of 0.80 and 0.90, and logistic regression. The required sample size for this study is 721 (80% power) and 926 (90% power) with an effect size (odds ratio) of 1.3. A sample size of 745,915 admission data from TEDS-A 2015 dataset will be measured. The power analysis with odds ratio of 1.3 selected was from previously conducted studies on substance abuse (Goldberg, Strutz, Herring, & Halpern, 2013; Kendler, Ohlsson, Sundquist, Suundquist, & Sundquist, 2014; Moran, Coffey, Romaniuk, Degenhardt, Borschmann, & Patton, 2015).

### **Study Population**

The target participants for this study were young adults admitted to state-funded substance abuse treatment programs in the United States. All substance abuse agencies receiving public funds must submit data for client alcohol or drug abuse treatment admissions to TEDS-A. TEDS-A consist of a minimum dataset submitted by 49 states,

Washington DC and Puerto Rico. Information from TEDS-A includes clients' substance of abuse, the frequency of use, route of administration, treatment episodes, demographic characteristics, the source of treatment referral, service types, and age at first use (SAMHSA, 2015; 2017).

In 2015, TEDS-A received a total of 1,537, 025 admissions data for substance abuse treatment from 49 states in USA including Washington DC and Puerto Rico, out of which 745, 915 substance abuse treatment admissions were for adults, age group 18 to 34 years. Most of the clients for TEDS-A were Blacks or African-American, non-Hispanic Whites, and Hispanic. Male constituted 66.4% of the reported admissions and 33.6% were female. For this study, admissions data for heroin abuse serves as the outcome variable (TEDS-A 2015).

### **Sampling Strategy**

The TEDS-A system collects admission data from each state to monitor their substance abuse treatment programs. The received data is converted into a standardized format that is uniform across all primary-funded participating states. The nationally collected data is based on public admissions instead of persons because an individual could be admitted more than once for substance abuse treatment (SAMSHA, 2015). The TEDS-A sampling strategy is non-randomization because TEDS-A counts admission and not individuals, and it can result in oversampling if a single client has multiple admissions (SAMHSA, 2015). These are potential threats to external validity. I addressed these potential threats through statistical analysis, and accurate estimate of population

parameters and standard errors in logistic regression (see Dowd, Greene, & Norton, 2014; Sperandei, 2014).

In this study examined, TEDS-A data on independent living arrangement and the principal source of referral, and their association with heroin abuse in young adult. Data on client admissions for the age group between 18 to 34 years were used only for this study. Excluded in this study are client admissions for age group less than 18 years old or greater than 34 years old.

**Manuscript 3: Cocaine/Crack Use Disorder in a National Sample of U.S. Adults  
Ages 18-34 and the role of Living Arrangements and the Source of Referrals to  
Treatment Programs**

In this quantitative study, I examined the relationship between independent living arrangement and principal source of referral, and their association with cocaine/crack abuse in young adults, as reported by admissions to treatment programs in the United States.

**Research Question**

The research question for this study was: What is the relationship between independent living arrangement, and principal source of referral associated with cocaine/crack abuse in the young adult population, controlling for age at first use, gender, race, ethnicity, employment, educational status, number of prior treatments, and psychiatric problems in addition to drug problem?

**Nature of the Study**

I used retrospective secondary data from SAMHSA, an agency in U.S. Department of Health and Human Services that archive national health statistics data from all 50 states in the United States, including the District of Columbia. Quantitative understanding of cocaine/crack abuse and predictive associated risk factors is critical in intervention strategy. Findings from this quantitative study will provide knowledge in the significant relationship between independent living arrangement and the principal source of referral both as risk factors for cocaine/crack abuse in the young adult population at the national level.

### **Study variables**

Independent living arrangement and the principal source of referral were the independent nominal variables, and cocaine/crack abuse is the categorical the outcome variables. The covariates nominal variables for these studies include age at first use, race, ethnicity, gender, employment, educational status, number of prior treatments, and psychiatric problem in addition to drug problem.

I use the following definition of terms and variables from the TEDS-A codebook:

*Age:* Clients' estimated date of birth and date of admission. Subcategorized further into 12 different groups (TEDS-A, 2015). Age was categorized into 12 subcategories from 12 years to 55 years of age and above. In this study, the population of interest was young adult admissions (18 to 34 years) and measured as a nominal variable (TEDS-A, 2015).

*Age at first use:* Clients' age of the first intoxication for alcohol and clients' age at first use of the substance of abuse (TEDS-A, 2015). TEDS-A further categorized age at



first use into 12 subgroups representing every specific age group ranging from under 11 years to 55 years of age and above (TEDS-A, 2015). This was measured as a nominal variable.

*Cocaine drug abuse:* Defines as the clients' primary substance of abuse reported at the time of admission to treatment program (TEDS-A, 2015). TEDS-A measured cocaine abuse as a binary variable, with a value of one suggesting cocaine/crack abuse reported at the time of admission as main substance of abuse, and a value of zero indicating no heroin abuse reported at the time of entry (TEDS-A, 2015).

*Education:* Clients' highest school level (based on years in school) subcategorized into five subgroups (TEDS-A, 2015). Subgroups represent numbers of school years completed by clients at the time of admission. This was measured as a categorical variable

*Employment:* Clients' employment status during admission or transfer, subcategorized into four subgroups including full time (35 hours or more each week), part-time (less than 35 hours a week), unemployed and not in labor force (TEDS-A, 2015). This was measured as a categorical variable.

*Ethnicity:* Clients' specific origin Hispanic origin, categorized into six subgroups. Subgroups for this study were Hispanic, not of Hispanic origin, and Hispanic-not otherwise specified (TEDS-A, 2015).

*Gender:* Clients' gender identifies either as male or female (TEDS-A, 2015). TEDS-A measured gender as a binary variable with number 1 represents male clients, and number 2 represents female clients at the time of admission (TEDS-A, 2015).

*Independent living:* Defined as clients 'living on his or her own or with others or parents without any supervision (TEDS-A, 2015). This was measured as a nominal variable.

*Living arrangement:* Defined clients as homeless, living with parents, supervised living or independent living without supervision. Subgroup for this study is independent living (TEDS-A, 2015). This was measured as a nominal variable.

*Number of prior treatment episodes:* Defined as number of client's previous treatment episodes received in any drug or alcohol programs (TEDS-A, 2015). Transfers were not counted as prior episodes. This was categorized into five subcategories where a value of 0 represented no prior treatment episodes, and a value of 5 represented five or more prior treatment episodes (TEDS-A, 2015).

*Psychiatric problem in addition to drug or alcohol problem:* Defined as whether there is psychiatric problem in addition to drug or alcohol problem of client (TEDS-A, 2015). This was measured as a nominal binary variable, where a value 1 represent client psychiatric problem and a value of 0 represent no psychiatric problem (TEDS-A, 2015).

*The principal source of referral:* Defined as the person or the agency that refers the client with substance abuse to a substance abuse treatment program (TEDS-A, 2015). The principal source of referral is subcategorized into seven groups including individual or self-referral; drug abuse licensed care providers; other licensed health care providers or programs, school; employee or EAP; other community referral, and court or criminal justice referral or DUI/DWI (TEDS-A, 2015).

*Race*: Defined race as racial identity of clients at the time of admission, measured as a nominal variable categorized into nine subgroups (TEDS-A, 2015). In this study, only Black or African-America and non-Hispanic Whites will be included (TEDS-A 2015).

### **Statistical analysis**

I used SPSS software for data analysis. The independent predictor variables in this study included independent living arrangement and the principal source of referral. The outcome variable is cocaine/crack abuse, coded with a value of 1 representing clients` heroin abuse and 0 for no drug abuse indicated at the time of admission to a treatment program. The covariate variables for these studies include age, age at first use, race, gender, employment, educational status, number of prior treatment episodes and psychiatric problems in addition to drug problem. Data analysis in this study consisted of descriptive statistics, chi-square, and multivariate logistic regression.

Descriptive statistics were carried out for selected covariate variables and other variables of interest. A chi-square analysis was conducted to examine the relationship between covariate variables include age, age at first use, race, gender, employment, and educational status and the dependent variable, cocaine/crack abuse.

I conducted multiple logistic regression analysis to examine whether there was an association between independent living arrangement and the principal source of referral with cocaine/crack abuse as reported at the time of admission to treatment programs by young adults.

### **Data Source**

I used secondary data from the SAMHSA TEDS-A (2015), which includes demographic information and substance abuse characteristics of those admitted to treatment facilities for alcohol and drug abuse (SAMHSA, 2015). TEDS-A data is certified or licensed by state regulatory agencies or from treatment programs that receive federal funding (including federal block grants; SAMHSA, 2015).

### **Power Analysis**

TEDS-A data collection is through admissions reports provided by states' substance abuse treatment programs. The unit of measurement is the number of admissions reported by states to TEDS-A. I estimated sample size for this study with power analysis using G\*Power 3 software. In this study, I used a two-tailed, z-test, an alpha level of .05, a power of 0.80 and 0.90, and logistic regression. The required sample size for this study is 721 (80% power) and 926 (90% power) with an effect size (odds ratio) of 1.3. A sample size of 745,915 admission data from TEDS-A 2015 dataset will be measured. The power analysis with odds ratio of 1.3 selected was from previously conducted studies on substance abuse (Goldberg, Strutz, Herring, & Halpern, 2013; Kendler, Ohlsson, Sundquist, Suundquist, & Sundquist, 2014; Moran, Coffey, Romaniuk, Degenhardt, Borschmann, & Patton, 2015).

### **Study Population**

The target participants for this study were young adults admitted to state-funded substance abuse treatment programs in the United States. All substance abuse agencies receiving public funds must submit data for client alcohol or drug abuse treatment admissions to TEDS-A. TEDS-A consist of a minimum dataset submitted by 49 states in

the USA including Washington DC and Puerto Rico. Information from TEDS-A includes clients` substance of abuse, the frequency of use, route of administration, treatment episodes, demographic characteristics, the source of treatment referral, service types, and age at first use (SAMHSA, 2015; 2017).

In 2015, TEDS-A received a total of 1,537, 025 admissions data for substance abuse treatment from 49 states in USA including Washington DC and Puerto Rico, out of which 745, 915 substance abuse treatment admissions were for adults, age group 18 to 34 years. Most of the clients for TEDS-A were Blacks or African-American, non-Hispanic Whites, and Hispanic. Male constituted 66.4% of the reported admissions and 33.6% were female. For this study, admissions data for heroin abuse serves as the outcome variable (TEDS-A 2015).

### **Sampling Strategy**

The TEDS-A system collects admission data from each state to monitor their substance abuse treatment programs. The received data is converted into a standardized format that is uniform across all primary-funded participating states. The nationally collected data is based on public admissions instead of persons because an individual could be admitted more than once for substance abuse treatment (SAMSHA, 2015). The TEDS-A sampling strategy is non-randomization because TEDS-A counts admission and not individuals, and it can result in oversampling if a single client has multiple admissions (SAMHSA, 2015). These are potential threats to external validity. I addressed these potential threats through statistical analysis, and accurate estimate of population

parameters and standard errors in logistic regression (see Dowd, Greene, & Norton, 2014; Sperandei, 2014).

In this study examined, TEDS-A data on independent living arrangement and the principal source of referral, and their association with cocaine/crack abuse in young adult. Data on client admissions for the age group between 18 to 34 years were used only for this study. Excluded in this study are client admissions for age group less than 18 years old or greater than 34 years old.

### **Significance**

The study intends to make an original contribution by filling a knowledge gap in the literature regarding the importance of living arrangements and principal source of treatment referral as possible predictors of abusing particular classes of drugs. The uniqueness of this study lies in testing to two under-studied predictors (living arrangements and source of referral) and doing so with abuse of three different types of drugs (prescription medications, heroin, and cocaine) among young adults in the United States. Also, findings from this study will attempt to address the drug abuse epidemic that is different from that pursued by various states department of health in the United States. Standard approaches implemented by multiple states department of health includes increasing access to treatment centers, criminal policies for users, monitoring of pain killer's prescription, antidote dispensing, and public campaign on drug abuse (SAMHSA, 2014b). The goal of this study is to make an original contribution by filling a knowledge gap in the literature regarding the importance of living arrangements and principal source

of treatment referral as potential predictors of abusing prescription opioids, heroin, and cocaine in young adult Americans (18 to 34 years).

### **Summary**

This chapter provides an overview of the epidemiology of abuse of prescription opioids, heroin, and cocaine among young adults predispose to high-risk factors. This chapter provides a knowledge gap that exists in the literature concerning about the degree to which particular living arrangements and specific referral sources contribute to increases in prescription opioids, heroin, and cocaine drug abuse among young adults (18 - 34 years) in the United States. The purpose of this study is first to discover whether there are predictive relationships between (a) prescription opioid abuse; (b) heroin abuse; and (c) cocaine abuse by young adults in the United States and two under-studied independent variables: independent living arrangement and clients' principal source of treatment referral.

Part 2: Manuscripts

**Manuscript 1: Independent Living Arrangements and Client Principal Source of Referral as Risk Factors for Prescription Opioids Abuse in Young Adults**

Daniel Samaila

Walden University



### **Outlet for Manuscript**

I submitted this manuscript to the Journal of Substance Abuse Treatment (JSAT; <https://www.journals.elsevier.com/journal-of-substance-abuse-treatment>). The journal requires that manuscript be approximately 16 to 25 double-spaced pages, not including abstract, references, tables, or figures. Submission guidelines require the manuscript to have an abstract and a structure that consists of Introduction, Material and Methods, Results, Discussion, Conclusions, and Appendices sections.

The manuscript formatting requirements include:

Title page: should consist of a manuscript title, author's names and affiliations, and corresponding author. Indicate author given and family names, author's association with the lowercase superscript letter after author's names and in front of the author's addresses, a full postal address of each affiliation, and the e-mail address of each author.

Abstract: should state the purpose of the research, the principal results, and conclusions

Abbreviations and acronyms: Maximum of 6 keywords for indexing purpose. Avoid abbreviations and acronyms. When acronyms or an abbreviation is considered essential, clearly define after first use in the text. Footnotes should be numbered and used separately at the end of the article.

Acknowledgments: Do not include or as a footnote in the title page.

Collate acknowledgments should be presented in a separate section at the end of an article before references.

Tables: Should be presented separately as editable text with captions comprising of a brief title and can be placed either next to the relevant passage in the article or on separate pages at the end. Tables should be numbered consecutively following the appearance in the text, and any table notes should be below the table body (Table A.1; Fig.A.1). Avoid vertical rules and shading in the table cells.

References: Any citation in the text, any references cited in the abstract must be in full. Use of DOI highly encouraged for article reference. Full URL and date for web references are required. Data references should include authors name, dataset title, data repository, version, year, and persistent global identifier. Add dataset before reference. The reference style must follow the American Psychological Association Manual Sixth Edition.

### **History of Manuscript Submission and Reviewer Feedback**

LaTrice Montgomery (Journal of Substance Abuse Treatment)  
<Evisesupport@elsevier.com>

Sat 10/20/2018, 12:15 PM  
Daniel Samaila

Ref: JSAT\_2018\_381

Title: Independent living arrangement and client principal source of referral as risk factors for prescription opioid use disorder in young adults  
Journal: Journal of Substance Abuse Treatment

Dear Mr. SAMAILA,

Thank you for submitting your manuscript to Journal of Substance Abuse Treatment. I regret to inform you that reviewers have advised against publishing your manuscript, and we must therefore reject it.

Please refer to the comments listed at the end of this letter for details of why I reached this decision.

We appreciate your submitting your manuscript to this journal and for giving us the opportunity to consider your work.

Kind regards,

LaTrice Montgomery, Ph.D.  
Editorial Fellow  
Journal of Substance Abuse Treatment

## Comments From the Editors and Reviewers

### Reviewer 1

This paper sought to understand the relationship of living arrangement and primary source of referral to opioid use disorder involving prescription opioids. However, a number of fundamental flaws exist that must be addressed before this study can be considered appropriate for a scientific journal.

#### Introduction

1. The introduction bounces between prescription opioid abuse data relevant to young adults and national data.
2. The terminology of abuse and non-medical use is confusing. Non-medical use can include abuse and should be the sole term used throughout.
3. Risky behaviors of young adults are not described, and some data on these behaviors, particularly non-oral use should be included.
4. Similarly, neighborhood factors should include data on how they increase risk.
5. The information on living arrangements and referral sources has no flow and is difficult to follow why these are being considered for further analysis, not only alone (because they have been examined in the past), but together. The relationship between these two pieces is not well described.

#### Methods

1. In the study population, who is being considered "young adults"? Later on it is defined as the 18-34 range, but those in their thirties are not technically young adults as defined by other data sources noted in the introduction (e.g., 18-25). Why is this upper range included? Both living arrangements and referral sources include a college population which blurs the lines of these data (which for the youngest age range included 70% referral from 'School').
2. Does other opioids include fentanyl, whether it be illicit or prescription? Given the rapid rise of overdoses and use of illicit fentanyl, it is important to know how this fits into the TEDS dataset and might confound the purpose of understanding "prescription opioid" abuse.
3. The p-value of 0.05 is inappropriate for such a large sample size. Essentially, nearly every statistical test will turn out significant with a group this size, which impacts results and subsequent discussion of what are represented as "significant" findings.

#### Results

1. The purpose of the study is to understand prescription opioid abuse, living arrangements and source of referral. Table 1 and Table 2 are not necessary. Table 2 should just include the data on other opioid/synthetic users. Comparisons to the non-

opioid users is not part of the research question. It seems in the discussion, the author discusses differences in substance use between various living arrangement and referral categories. But that is a different research question than what the introduction states (This study intends to evaluate a national dataset from SAMHSA on young adults admitted to treatment facilities who reported other opiates and synthetics).

#### Discussion

1. The discussion is simply a rehashing of the results with no relevant discussion of implications of the results or how they could be used.

#### **Have questions or need assistance?**

For further assistance, please visit our [Customer Support](#) site. Here you can search for solutions on a range of topics, find answers to frequently asked questions, and learn more about EVISE® via interactive tutorials. You can also talk 24/5 to our customer support team by phone and 24/7 by live chat and email.

#### **Reviewer 2**

Steven Shoptaw <esserver@eesmail.elsevier.com>

Fri 11/2/2018, 10:10 AM

Daniel Samaila;

Ref.: Ms. No. ST-18-0409

Independent living arrangements and client primary source of treatment referral predicts non-medical use of prescription opioids among U.S. population ages 18-34  
Drug and Alcohol Dependence

Dear Mr. DANIEL SAMAILA,

Thank you for submitting your paper to Drug and Alcohol Dependence. Unfortunately I shall not be considering it further for publication.

I read your manuscript with interest, but after reading this, there is an overall lack of theoretical focus to guide the analyses conducted. There may be an important story in these data, but the unfocused data analyses make it very difficult to understand whether the significant differences reported were expected or whether they were simply the result of having a very large sample and corresponding high levels of power. A framed set of hypotheses that follow from a theory would help to build some confidence that significant findings are not simply the result of multiple testing in a very large dataset.

As well, it is very difficult to understand what is depicted in Table 3 as it does not appear that living arrangement is captured in these findings.

The organization of your manuscript is also not in keeping with most research reports in epidemiology. For example, there is no Table 1 listed (which I believe should be your

"Table 2.0"). There are other structural and grammatical problems with your manuscript that interfere with understanding.

I refer you to internet sites established by the International Society of Addiction Journal Editors

(<https://na01.safelinks.protection.outlook.com/?url=www.parint.org&data=02%7C01%7Cdaniel.samaila%40waldenu.edu%7Cbb03de2f70b24187b76708d640cce508%7C7e53ec4ad32542289e0ea55a6b8892d5%7C0%7C0%7C636767646094243982&sddata=%2FGt7ebjrdAYE8GwFBV7mA2xybdTP%2Fbi1Gq3Q3nmKFTc%3D&reserved=0>)and Substance Abuse Librarians and Information Specialists

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Yours sincerely,

Steven Shoptaw, PhD  
Associate Editor  
Drug and Alcohol Dependence

### **Abstract**

Since 2014, the non-medical use of prescription opioids has reached an epidemic level among U.S. population ages 18-34 in the United States. The purpose of this study is to determine the relationship between opioids use disorder among adults aged 18-34, and the involvement of their living arrangements and referral sources to treatment programs as risk factors for non-medical use of prescription opioids using the 2015 Treatment Episode Data Set-Admissions. Chi-square tests and multiple logistic regression analysis were used to test the relationship. Young adult admissions that reported other opiates and synthetics as the primary drug of abuse at the time of entry to a treatment program met study criteria. Results revealed increased odds of admissions to treatment for the non-medical use of prescription opioids among young adults living in an independent setting compared to peers living in parental homes or homeless. Study findings show 1.8 times increased odds of admissions to treatment for non-medical use of prescription opioids when young adults were referred to treatment programs by other licensed providers, and 1.6 times when either self-referred or referred by licensed drug abuse providers when compared to court or criminal justice referral. I also observed 2.3 times the odds of admissions to treatment for non-medical use of prescription opioids among young adult whites when compared to non-whites peers. New U.S. policy initiatives and treatment programs that target high-risk referral sources and independent living settings with negative neighborhood indicators have the potential to aid in the decline of prescription opioids use disorder among young adults.

## Highlights

- Living arrangement and the principal source of referral to treatment were predictors of admissions to treatment for non-medical use of prescription opioids in U.S. adult population.
- High prevalence of admissions to treatment for non-medical use of prescription opioids among young adults living unsupervised than homeless peers.
- High risk treatment referral categories including self, licensed drug abuse providers, and other licensed providers referrals increases odds of being admitted to treatment for abuse of opioids.
- Non-medical use of prescription opioids policy and treatment programs should target unsupervised young adults with high risk referrals and previous treatment episodes.



## 1.0 Introduction

The non-medical use of prescription opioids is a growing problem in the United States that continue to affect the lives of millions of young adults (Han, Compton, Blanco, Crane, Lee, & Jones, 2017; Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2015; Volkow, Frieden, Hyde, & Cha, 2014). From 2014 through 2017, the non-medical use of prescription opioids in the United States, primarily among adult users aged 18-34 has reached an epidemic level (Rudd, Seth, David, & Scholl, 2016; Martins et al., 2017; Han et al., 2017; Substance Abuse and Mental Health Services Administration [SAMHSA], 2017). In 2016, about 2.5 million young adults in adults in the United States use prescription opioids for non-medical purpose (SAMHSA, 2017), an estimated rate of 17.8 per 100 persons in 2015 abuse prescription opioids (CDC National Center for Injury Prevention and Control, 2017, and between 2014 and 2015 non-medical use of prescription opioids increased to 1.4 million in the United States (Center for Behavioral Health Statistics and Quality [CBHSQ], 2015). In 2017, the president of the United States declared prescription opioids crisis as a public health emergency to address the widespread non-medical use of prescription opioids (The White House, 2018).

Young adults compared to all age groups in the United States have the highest prevalence of non-medical use of prescription opioids that is attributed to their worse health risk behaviors and neighborhood factors (Johnston et al., 2015; Johnston et al., 2014; Eaton et al., 2012; Goldberg, Strutz, Herring & Halpern, 2013; Hu, Griesler, Wall, & Kandel, 2017). Some of the health-risk behaviors among young adults include alcohol consumption, illicit drug use, tobacco use, risky sexual behaviors, lack of self-control,

sensitive to peer pressure, unhealthy lifestyle, and unintentional injuries to self (Johnston et al., 2015; Johnston et al., 2014; Eaton et al., 2012; Goldberg et al., 2013). About 1 in 10 young adults non-medically used prescription opioids due to peer pressure or parents (McCabe, Cranford, Boyd & Teter, 2006). Most young adult engaged in heavy episodes of alcohol consumption and 14% of emergency department reported visits for non-medical use of prescription opioids involved alcohol (SAMHSA, 2010). Approximately 80% of young adults with the heroin use disorder had earlier non-medical use of prescription opioids (Cerdá, Santaella, Marshall, Kim, & Martins, 2015), and 66.7% of young adults with the substance use disorder were current tobacco smokers (Smith, Mazure & McKee, 2014).

Researchers have found that neighborhood factors including poverty, unemployment, and poor safety, education, and housing increase the risk of non-medical use of prescription opioids among young adults living in the United States (Dasgupta, Beletsky, & Ciccarone, 2018; Karriker-Jaffe, 2013; Rigg & Monnat, 2015; Bonnie, Stroud, & Breiner, 2015). Young adults living in rural areas reported having 25% lower chance of non-medical use of prescription opioids compared to those residing in urban areas based on educational status (Rigg & Monnat, 2015). The lack of established socioeconomic pathways and the presence of social inequality in neighborhoods contributes to young adults' poor decision-making that leads to joblessness, unstable housing, binge drinking, high crime rates, drug dealings, and non-medical use of prescription opioids (Johnston et al., 2014; Bonnie et al., 2015). Types of prescription opioids used for the non-medical purposes include fentanyl, tramadol, oxycodone,

buprenorphine, codeine, hydrocodone, hydromorphone, meperidine, morphine, opium, pentazocine, and propoxyphene (National Institute on Drug Abuse [NIDA], 2018).

Several risk and protective factors can contribute to exposure to the non-medical use of prescription opioids in the young adult population (SAMHSA, 2014, 2015).

Transitioning from the security of their parents supervised living arrangements to living independently without any supervision could present many challenges to young adults.

Findings from other studies have shown a relationship between risky behaviors, living without parental control, and substance use disorder among adolescents and those transitioning to young adulthood (Han, Compton, Blanco, Crane, Lee & Jones, 2017).

Because of social, psychological, and physical difficulties of young adults transitioning to unsupervised living arrangements can be at higher risk of prescription opioids as well as non-medical use (SAMHSA 2015; Johnston, O'Malley, Miech, Bachman & Schulenberg, 2016). Accessibility of prescription opioids in the school, neighborhood, community, household member drug use, and unstable family environment increase the risk of abuse of prescription opioids among young adults (NIDA, 2014, 2017). The types of referral sources further complicate the living arrangement of young adults' population to treatment programs (NIDA, 2014, 2017). The kind of referral sources to drug abuse treatment programs could have potential behavioral consequences for young adults and their relationships with their peers, neighborhoods, communities and broader society (SAMHSA, 2015).

Independent living arrangements without supervision and high risk referral sources were indicators of the young adults' social context that might influence the risk

of non-medical use of prescription opioids because it offers more opportunities for drug use than more supervised living arrangements and social networking (Rigg & Monnat, 2015; Johnston et al., 2015; Kendler, Ohlsson, Sundquist, & Sundquist, 2014; Karriker-Jaffe, 2013). Social and behavioral scholars have described young adults social functioning to include leaving the parental home, completing of school, being employed, starting romantic relationships, and transitioning to parenthood (Schulenberg & Schoon, 2012). These social functioning factors influence the young adults' independent living decision-making process and are less affected by recommendation regarding their health behavior (Bonnie, Stroud, & Breiner, 2015).

A knowledge gap in the literature exists regarding the significance of independent living arrangements and treatment referral categories as possible predictors of non-medical use of prescription opioids among young adults age 18-34 (Hu et al., 2017; Martins et al., 2016). In this study, I sought to determine the relationship of living arrangement and treatment referral categories as risk factors involving admissions to treatment for the non-medical use of prescription opioids among the U.S. population aged 18-34. Understanding how these social functioning factors relate to non-medical prescription opioid use will improve scholarly knowledge of the degree to which they both contribute to the non-medical use of prescription opioids among young adults. Being aware of these two potential independent risk factors can help policymakers, public health researchers, health professionals, families, peers of drug abusers, schools, communities, and substance abuse treatment centers in identifying, reducing, and eliminating risk factors of non-medical use of prescription opioids.

In this study, I used the national self-reported dataset from SAMHSA on young adults' admissions aged 18-34. I evaluated demographic characteristics, living arrangements, and the principal source of referral to treatment and non-medical use of prescription opioids reported as the primary drug of abuse during entry to treatment. Non-medical use of prescription opioids defined as other opiates and synthetics abuse.

## **2.0 Methods**

### **2.1. Data source**

The Treatment Episode Data Set – Admissions (TEDS-A) is a national data scheme that collects annual information on admissions to both public and private substance abuse treatment facilities that is funded by public funds (Substance Abuse and Mental Health Services Administration (SAMHSA), 2015). TEDS-A is licensed by government regulatory agencies or treatment programs that provide demographic characteristics information for individuals admitted to treatment facilities for abuse of drug or alcohol. TEDS-A 2015 dataset represent 2015 national records on the number of admissions demographics and drug or alcohol abuse characteristics from 49 states treatment facilities in the United States including the District of Columbia, and Puerto Rico. The TEDS-A 2015 is a publicly available dataset that was uploaded from SAMSHA website and used for this study after approval by the Walden University Institutional Review Board.

### **2.2. Study population**

TEDS is a representation of admissions data to substance abuse treatment facilities instead of a person without differentiation between treatment admissions and

readmissions. The study population was 745,915 young adults that achieved study criteria for prescription opioids abuse treatment recorded at the time of entries. Most of the young adults admitted to treatment facilities for opioids abuse were Whites, Blacks or African-American and Hispanic. TEDS admissions data for non-medical use of prescription opioids abuse defined as other opiates and synthetics abuse.

### 2.3. Drug use and demographic characteristics

TEDS-A data constitutes individual self-reported primary drug of abuse at the time of admission to substance abuse treatment facilities. Drug abuse evaluated in this study is TEDS defines prescription opioid disorder, also known as prescription opioid abuse as other opiates and synthetics abuse that includes opium, buprenorphine, oxycodone, codeine, hydrocodone, tramadol, hydromorphone, meperidine, morphine, pentazocine, propoxyphene, and any other drug with morphine-like effects reported as the primary drug of abuse. TEDS-A did not mention fentanyl among other opiates and synthetics but stated any other drug with morphine-like effects were included (TEDS-A, 2015). Other opiates and synthetics abuse at the time of admission recorded as other opiates and or synthetics reported as the primary drug of abuse (TEDS-A, 2015).

Demographic characteristics evaluated in this study include self-reported gender (male, female), age at first use (in years) of primary drug of abuse (18-20, 21-24, 25-29, 30-34), age in years (11 and under, 12-14, 15-17, 18-20, 21-24, 25-29, 30 and over), race (Whites, Blacks or African-American), ethnicity (Hispanic, Non-Hispanic), employment status (full time, part-time, unemployed, not in labor force), education (elementary/middle school education, some high school education, high school diploma,

associate degree, college degree), number of prior treatment episodes (one, one, two, three, four, five and more), and psychiatric problems in addition to drug problems (yes, no).

#### 2.4. Predictors characteristics

Self-reported living arrangement (homeless, independent living, dependent living) and the principal source of referral (self/individual, drug abuse licensed providers, other licensed providers, school, employment, community, court/criminal justice) assessed in this study as independent variables. TEDS defines homeless as lacking fixed address or living in shelters, independent living as unsupervised settings, and dependent living as supervised setting including residential. TEDS defines the principal source of referral of persons at the time of admission to treatment facilities as the person or the agency that refers individually with a drug abuse problem to treatment programs.

#### 2.5. Statistical analysis

I assessed variation and relationship between demographic variables (i.e. age, age at first use, race, gender, employment, and educational status), predictor variables (i.e., living arrangement and the principal source of referral) and the dichotomous outcome variable prescription opioids use disorder (i.e., other opiates and synthetics abuse) using Chi-square test. I conducted multiple logistic regression analyses to examine whether there is an independent association between the independent living arrangement and the principal source of referral with other opiates and synthetics abuse as reported at the time of admission to treatment programs by young adults. Demographic covariates controlled during multiple logistic regression analysis, and reference variables during study were

30-34 years (age group), 30 and over (age at first use), female (gender), non-white (race), non-Hispanic (ethnicity), college degree (education), not in labor force (employment status), five or more (number of prior treatment episodes), and no psychiatric problem in addition to drug problem. A significance level of  $p < 0.01$  set as statistical significance outcome due to large sample size. Results interpreted as odds ratios with corresponding 95% confidence interval. The present study used the IBM SPSS statistical software for all statistical analyses.

### 3.0 Results

Chi-square analyses revealed a statistical significant association between other opiates and or synthetics abuse (Table 1.0), living arrangements (Table 2.0), the principal source of referral (Table 3.0) and young adults demographic characteristics ( i.e. age, age at first use, race, ethnicity, gender, employment status, education, number of prior treatment episodes, and psychiatric problem in addition to drug problem). Young adult female admissions (21.3%) compared to their male counterparts (15.6%) were more likely to report abuse of other opiates and or synthetics at the time of treatment entry (Table 1.0). Young adult admissions living independently without any supervision (19.3%) were more likely to report abusing opiates and or synthetics compared to dependent living (16.8%) and homeless (11.4%) setting (Table 1.0). White young adult admissions were more likely to report other opiates and or synthetics abuse (21.0%) compared to non-Whites (9.4%), and Hispanics (9.0%) counterparts (Table 1.0). There is variation in the principal source of referral association leading to treatment facilities for abuse of other opiates and or synthetics among young adult's admissions, with other licensed providers



(23.0%) being the most source of referral (Table 1.0). Adolescent adults admissions aged 25-29 were more likely to report abuse of other opiates and synthetic compared to other age groups (Table 1.0). About 20.1% of young adult admissions reported having a psychiatric problem in addition to abuse of other opiates and synthetics problem (Table 1.0).

Results showed 74.7% of young adult Whites admissions with opiates and or synthetics as the primary drug of abuse lived in an independent setting compared to non-Whites (25.3%) and Hispanics (13.1%) counterparts (Table 2.0). Most of the young adults' admissions living in an independent setting were unemployed (38.9%), and have a high school diploma (47.7%) compared to those who are homeless or lived in a dependent setting (Table 2.0). The statistically significant association existed between the principal source of referral and young adults' admissions demographic characteristic (Table 3.0). Results of treatment referral categories revealed young adults men admissions were referred more to treatment programs than their women peers (Table 3.0). Young adult Hispanic admissions treatment program referrals were less than non-Hispanic (Table 3.0). There are more school referrals for young adult admissions than self-referred or referred by drug abuse providers, other licensed providers, employer, community or court (Table 3.0). Young adult Whites male admissions compared to female counters were referred more to treatment facilities with opiates and or synthetics as the primary drug of abuse (Table 3.0). There are more young adult admissions referrals to treatment programs without any prior treatment episodes than those with one or more prior treatment episodes (Table 3.0).

There were significant differences showing living arrangements and the type of referral sources contributed to increases in other opiates and or synthetic abuse among young adult admissions (Table 4.0). Results showed the odds of being admitted for treatment is lower in young men (OR = 0.826, CI = 0.814 - 0.838) when compared to young female (Table 4.0). The odds of admissions to treatment for the abuse of other opiates and synthetics is lower among young adults who start abusing drug at the age of 11 and under (OR = 0.319, CI: 0.300 - 0.339), 12-14 (OR=0.376, CI = 0.359-0.393), and 15-17 (OR = 0.450, CI=0.431- 0.470) when compared to other age groups (Table 4.0). There is a significant difference between race and prescription opioids abuse, and the result showed the odds of admissions to treatment for other opiates and synthetics abuse is higher among young adult Whites (OR = 2.260, CI = 2.214-2.308) than Non-Whites (Table 4.0). The odds of admissions to treatment for abuse of other opiates and synthetics was lower among young Hispanic adults compared to Non-Hispanic peers (Table 3.0). The odds of admissions to treatment for other opiates and synthetics abuse is higher with one prior treatment episodes (OR = 1.779, CI=1.732 - 1.826), two (OR = 1.794, CI = 1.743 - 1.846), and three prior treatment episodes (OR = 1.683, CI = 1.629 - 1.739) than four or more prior treatment episodes (Table 4.0). The odds of admissions to treatment for prescription opioids abuse is twice higher for independent living arrangement than homeless cases (OR=1.057, CI=1.036-1.079). Referral sources to treatment programs increased the odds of admissions to treatment for prescription opioids abuse among young adults (self: OR = 1.638, CI = 1.608-1.668; drug abuse providers: OR = 1.608, CI = 1.567-1.65; other licensed providers: OR = 1.896, CI= 1.836-1.958) when compared to

referral by court/criminal justice department (Table 4.0). Education or employment status did not influence the odds of admissions to treatment for prescription opioids abuse among young adults admission to treatment programs (Table 4.0).

## Tables

Table 1

*Descriptive characteristics of young adult admissions with opiates and or synthetic (prescription opioids) abuse as primary drug problem, TEDS-A, 2018*

Demographics		Opiate/Synthetics Abuse	
		(%)	$X^2$ (p)
Age (Years) (n=745,915)	18-20	11.5	.000
	21-24	16.6	
	25-29	19.2	
	30-34	18.7	
Gender (n=745,680)	Male	15.6	.000
	Female	21.3	
Age at First Use (Years) (n=715,763)	11 and Under	9.9	.000
	12-14	11.7	
	15-17	14.3	
	18-20	19.0	
	21-24	24.4	
	25-29	29.1	
	30 and Over	29.2	
Living Arrangements (n=726,542)	Homeless	11.4	.000
	Dependent Living	16.8	
	Independent Living	19.3	
Principal Source of Referral (n=732,079)	Self/Individual	21.6	.000
	Drug Abuse Providers	20.7	
	Other Licensed Providers	23.0	
	School	6.1	
	Employer	17.0	
	Community	16.8	
	Court/Criminal Justice	12.4	

Race (n=729,610)	Whites	21.0	.000
	Non-Whites	9.4	
Ethnicity (n=734,149)	Hispanic	9.0	.000
	Non-Hispanic	19.2	
Employment Status (n=715,763)	Full Time	16.0	.000
	Part Time	16.8	
	Unemployed	19.6	
	Not in Labor Force	17.3	
Education (n=710,131)	Elem/Middle Sch Ed.	13.9	.000
	Some High Sch Ed.	15.8	
	High Sch Diploma	17.8	
	Associate Degree	19.9	
	College Degree	20.0	
Psychiatric Problem (n=620,251)	Yes	20.0	.000
	No	16.4	
Number of Prior Treatment (n=715,763)	None	17.0	.000
	One	19.5	
	Two	20.1	
	Three	19.9	
	Four	18.9	
	Five or More	14.2	

Table 2

*Descriptive characteristics of living arrangements of young adult admissions with opiates and or synthetics as primary drug of abuse, TEDS-A, 2015*

Demographics		Living Arrangements			$X^2$ (p)
		Homeless (%)	Dependent (%)	Independent (%)	
Age (Years)	18-20	5.4	11.6	8.3	.000
	21-24	20.1	24.3	23.0	
	25-29	37.5	35.0	36.6	
	30-34	36.9	29.2	32.1	
Gender	Male	63.4	63.6	61.9	.000
	Female	36.5	36.4	38.1	

Age at First Use (Years)	11 and Under	5.2	4.9	3.9	.000
	12-14	18.5	19.6	16.7	
	15-17	26.4	28.9	28.6	
	18-20	21.6	21.8	22.7	
	21-24	15.4	14.3	15.9	
	25-29	10.2	8.4	9.6	
	30 and Over	2.7	2.1	2.6	
Race	Whites	69.7	70.5	74.7	.000
	Non-Whites	30.3	29.5	25.3	
Ethnicity	Hispanic	16.2	18.6	13.1	.000
	Non-Hispanic	83.1	80.4	85.6	
Employment Status	Full Time	4.9	10.6	23.7	.000
	Part Time	3.6	7.0	10.9	
	Unemployed	46.6	42.1	38.9	
	Not in Labor Force	44.9	40.3	26.5	
Education	Elem/Middle Sch Ed.	7.2	4.2	5.4	.000
	Some High Sch Ed.	24.9	26.3	20.5	
	High Sch Diploma	47.6	49.0	47.7	
	Associate Degree	17.2	17.2	20.5	
	College Degree	3.1	3.3	5.9	
Psychiatric Problem	Yes	41.8	33.8	38.0	.000
	No	52.2	66.2	62.0	
Number of Prior Treatment	None	29.9	36.8	39.7	.000
	One	20.1	23.6	24.4	
	Two	12.9	13.4	12.7	
	Three	8.7	8.7	7.4	
	Four	5.5	5.2	4.2	
	Five or More	23.0	12.3	11.7	

Table 3

*Descriptive characteristics of principal source of referral of young adult admissions with opiates and or synthetics as primary drug of abuse, TEDS-A, 2015*

Demographics	Principal Source of Referral						
	Self/	Drug	Other	Sch	Empl	Commu-	Court/

		Indv	Abuse	Licensed		nity	Criminal	
		(%)	Provider	Providers	(%)	(%)	Justice	
		(%)	(%)	(%)	(%)	(%)	(%)	
Age (Years)	18-20	6.8	7.1	8.0	70.7	6.3	7.9	11.0
	21-24	20.9	22.1	20.5	14.2	20.7	22.9	25.7
	25-29	37.8	38.0	35.9	8.3	36.0	36.8	34.4
	30-34	34.5	32.8	35.6	6.7	37.0	32.4	28.9
Gender	Male	60.2	60.7	57.2	67.9	80.9	46.7	71.4
	Female	39.7	39.3	42.7	32.1	19.1	53.3	28.6
Age at First Use (Years)	11 and Under	3.0	3.0	4.7	8.6	3.0	5.0	5.6
	12-14	13.8	14.5	18.3	31.3	16.5	19.6	21.5
	15-17	25.1	25.6	27.8	44.1	31.7	28.7	32.9
	18-20	24.0	23.3	22.2	11.1	22.6	20.8	20.9
	21-24	18.5	18.7	14.6	3.3	15.1	14.5	11.8
	25-29	12.2	12.0	9.5	1.3	7.8	8.7	5.9
	30 and Over	3.3	2.9	2.9	0.2	3.3	2.6	1.4
Race	Whites	79.2	79.1	77.1	52.9	72.5	68.1	66.2
	Non-Whites	20.8	20.9	22.9	47.1	27.5	31.9	33.8
Ethnicity	Hispanic	12.3	10.5	11.5	32.1	12.4	15.4	17.6
	Non-Hispanic	86.4	88.3	87.1	66.0	86.6	82.5	80.9
Employment Status	Full Time	15.3	9.8	13.1	7.0	68.9	16.7	27.2
	Part Time	8.0	5.6	7.9	14.6	7.0	9.9	11.7
	Unemployed	43.0	38.5	45.5	17.6	12.2	44.8	36.4
	Not in Labor Force	33.7	46.1	33.5	60.8	11.9	29.2	24.7
Education	Elem/Mid Sch Ed	6.1	5.8	5.3	5.3	1.9	5.2	4.7
	Some High Sch Ed	19.1	18.0	20.0	52.1	9.2	27.7	25.1
	High Sch Diploma	48.4	47.8	46.6	25.6	44.8	45.1	48.8
	Associate Degree	20.6	22.8	21.7	14.8	32.9	17.4	17.4
	College Degree	5.8	5.5	6.4	2.2	11.2	4.6	4.0
Psychiatric Problem	Yes	39.0	46.3	59.9	24.0	24.5	40.1	29.4
	No	61.0	53.7	40.1	76.0	75.5	59.9	70.5
Number of Prior Treatment	None	35.9	18.7	40.4	69.9	57.5	42.4	44.0
	One	22.0	21.6	22.7	18.5	21.5	25.4	25.7
	Two	13.1	15.1	12.0	4.4	9.7	12.6	12.1

Three	8.0	11.2	7.2	2.4	4.3	7.1	6.9
Four	4.8	7.4	4.4	1.4	2.1	3.9	3.7
Five or More	16.2	26.0	13.3	3.5	4.9	8.7	7.7

\*\* $X^2$  ( $p$ ) = .000

Table 4.0

*Odds ratios for the association between other opiates and or synthetics abuse, and living arrangement and principal source of referral among young adult admissions with prescription opioids as main drug problem after controlling for covariates (N=537,379), TEDS-A, 2015.*

Variables		Odds Ratio (OR)	95% CI (Lower – Upper)	P
Age (Years)	18-20	0.791	(0.765-0.818)	.000
	21-24	1.018	(0.996-1.039)	.111
	25-29	1.073	(1.045-1.092)	.000
	30-34	Reference		
Age at First Use (Years)	11 and Under	0.319	(0.300-0.339)	.000
	12-14	0.376	(0.359-0.393)	.000
	15-17	0.450	(0.431-0.470)	.000
	18-20	0.591	(0.566-0.617)	.000
	21-24	0.781	(0.748-0.816)	.000
	25-29	0.965	(0.924-1.008)	.114
Gender	30 and Over	Reference		
	Male	0.826	(0.814-0.838)	.000
Race	Female	Reference		
	Whites	2.260	(2.214-2.308)	.000
Ethnicity	Non-Whites	Reference		
	Hispanic	0.588	(0.572-0.604)	.000
Education	Non-Hispanic	Reference		
	Elem/Middle Sch Ed	0.966	(0.922-1.012)	.000
	Some High Sch Ed	1.193	(1.150-1.237)	.000
	High Sch Diploma	1.141	(1.103-1.180)	.000
	Associate Degree	1.159	(1.119-1.201)	.000
Employment Status	College Degree	Reference		
	Full Time	0.958	(0.936-0.980)	.000
	Part Time	0.719	(0.968-1.023)	.719
	Unemployed	1.163	(1.143-1.183)	.000
Number of Prior Treatment	Not in Labor Force	Reference		
	None	1.179	(1.676-1.763)	.000
	One	1.779	(1.732-1.826)	.000

	Two	1.794	(1.743-1.846)	.000
	Three	1.683	(1.629-1.739)	.000
	Four	1.517	(1.459-1.577)	.000
	Five or More	Reference		
Psychiatric Problem	Yes	1.205	(1.186-1.223)	.000
	No	Reference		
Living Arrangements	Homeless	0.556	(0.539-0.573)	.000
	Dependent Living	1.057	(1.036-1.079)	.000
	Independent Living	Reference		
Principal Source of Referral	Self/Individual	1.638	(1.608-1.668)	.000
	Drug Abuse Providers	1.608	(1.567-1.651)	.000
	Other Licensed Providers	1.896	(1.836-1.958)	.000
	School	0.811	(0.625-1.051)	.000
	Employer	1.410	(1.234-1.612)	.000
	Community	1.282	(1.248-1.317)	.000
	Court/Criminal Justice	Reference		

#### 4.0 Discussion

The main findings of this study revealed the U.S. adult population aged 18-34 have an increased probability of admissions to treatment for non-medical use of prescription opioids especially when living in an independent setting away from their parental homes, completion of school, being employed, starting romantic relationships, and transitioning to parenthood; increasing trend when referred to treatment by high risk categories; 2.3 times increase in the odds of admissions to treatment for non-medical use of prescription opioids among young Whites adults compared to non-Whites peers; and an early exposure to non-medical use of prescription opioids during adolescent period lowers their probability of admissions to treatment for non-medical use of prescription opioids during adulthood.

Findings from this study correlate with public health apprehension of epidemic level of non-medical use of prescription opioids and its association with living arrangement (Rigg & Monnat, 2015), race (Otiniano, Verissimo, Grella, Amaro, & Gee,



2014), age at first use (Miech, Johnston, O'Malley, Keyes, & Heard, 2015), neighborhood factors (Dasgupta, Beletsky, & Ciccarone, 2018). In this current study, analysis of the national data demonstrates that young adults initiation of non-medical use of prescription opioids at ages 11 through 17 reduces their odds of admissions to treatment for non-medical use of prescription opioids during their adulthood. Referral to drug treatment programs by individual or self, drug abuse licensed providers and other licensed providers revealed a significantly associated with opiates and other synthetics abuse as reported by young adults' admissions to drug treatment programs. Previous studies also agreed with our findings of discrimination based on race increases admissions to treatment for non-medical use of prescription opioids among young users (Otiniano, Verissimo, Grella, Amaro, & Gee, 2014).

Social functioning factors concerning living arrangement and treatment referral categories is a significant problem among U.S. adult population aged 18-34 with opioids use disorder. Consistent with the U.S. general population, young adults living independent in a neighborhood without employment, housing instability, high crime environment, and health risky behavior are at high risk of non-medical use of prescription opioids and many episodes of prior treatments (Johnston et al., 2016; Johnston et al., 2015; Bonnie, Stroud, & Breiner, 2015). Results from this study show trends of previous treatment episodes among young adults significantly increase their odds of admissions to treatment for abuse of other opiates and synthetics. Significant increases in relapsed to treatment programs for non-medical use of prescription opioids found among young adults who have one or more previous episodes of treatment for drug

abuse. This finding is in agreement with the increases in the prevalence of admissions to treatment for non-medical use of prescription opioids among young adults in schools, living in disfranchise neighborhood, and unhealthy lifestyle due to peer pressure (NIDA, 2014, 2017; McCabe, Cranford, Boyd & Teter, 2006; Han et al., 2017 ).

Despite the comprehensive results and findings from the national dataset analyzed in this present study that provides insight for new policy and target outreach that address the risk of particular living arrangements and specific referral sources to treatment programs that contributed to the non-medical use of prescription opioids, it is important to note four limitations of this study. First, duplication of client's data reported to TEDS can occur because treatment readmissions are not differentiated. However, TEDS data is formatted in percentage distribution, and additional admissions are unlikely to have a significant effect. Second, results interpretation should take into consideration that only primary drug of abuse reported by young adults' admissions at the time of entry to treatment programs meets this study criterion, and there is secondary and tertiary client's drug of abuse reported at the time of admissions. Third, the psychiatric problem in addition to the drug problem is a possible causative factor and controlled during the logistic regression analysis. Fourth, the TEDS admissions data does not include all national data on substance abuse treatment admissions because it collects data on substance abuse from states that received federal funds. However, TEDS admissions data represents more than 80% of national treatment admissions obtained in the United States. Fifth, the results of this study cannot be generalized to the general population beyond the age group 18-34. Also, it important to note that prescription fentanyl not listed among

other opiates and synthetics drug in the national data which could confound the outcome of this study. However, future research should examine patterns of non-medical use of prescription opioids prevalence among other age groups to better understood indicators of living arrangement and treatment referrals risk.

### **5.0 Conclusion**

The analysis of TEDS-A national dataset provides new evidence showing the odds of admissions to treatment for abuse of prescription opioids among the young adult population is significantly associated with living independently where there is no parental supervision and when they are referred to treatment programs by drug abuse licensed providers, other licensed providers or involving themselves individually. This present study shows the association of different referrals sources to treatment programs and young adults' prevalence of admissions to treatment for drug abuse. It also highlights young adults who are not under their parental supervision are more likely to report admissions to treatment for other opiates and synthetics as their primary drug problem. While there are increasing efforts to lowering non-medical use of prescription opioids abuse through improving treatment interventions, findings from this study emphasized a need for a target treatment and other interventions programs among young adults' users with associated higher risk referral categories and exposed to neighborhoods factors, and health-risk behaviors in reducing opioids use disorder crisis.

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**Manuscript 2: Heroin Use Disorder among U.S. Adults Ages 18-34 and the Role of  
Living Arrangement and Source of Drug Treatment Program Referrals**

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### **Outlet for Manuscript**

The target journal for this manuscript is the Journal of Substance Abuse Treatment (JSAT; <https://www.journals.elsevier.com/journal-of-substance-abuse-treatment>). The journal requires that manuscript be approximately 16 to 25 double-spaced pages, not including abstract, references, tables, or figures. Submission guidelines require the manuscript to have an abstract and a structure that consists of Introduction, Material and Methods, Results, Discussion, Conclusions, and Appendices sections.

The manuscript formatting requirements include:

Title page: should consist of a manuscript title, author's names and affiliations, and corresponding author. Indicate author given and family names, author's association with the lowercase superscript letter after author's names and in front of the author's addresses, a full postal address of each affiliation, and the e-mail address of each author.

Abstract: should state the purpose of the research, the principal results, and conclusions

Abbreviations and acronyms: Maximum of 6 keywords for indexing purpose. Avoid abbreviations and acronyms. When acronyms or an abbreviation is considered essential, clearly define after first use in the text. Footnotes should be numbered and used separately at the end of the article.

Acknowledgments: Do not include or as a footnote in the title page.

Collate acknowledgments should be presented in a separate section at the end of an article before references.

This manuscript has not been submitted to target journal for publication.

### **Abstract**

Heroin abuse is increasing quickly among young adults and has created a significant public health concern across the United States. Understanding this trend through investigation of critical indicators of living arrangement and categories of treatment programs referrals among adults aged 18-34 is essential in the addressing heroin use disorder epidemic. For this study, I used 2015 national archival dataset from the Treatment Episode Data Set-Admissions to examine if there was an association between abuse of heroin as the primary drug of abuse among U.S. adult males and females ages 18-34, and the contribution of living independently without any form of parental supervision and the type of referrals to treatment programs. I used multiple logistic regression analysis to examine this association and test hypothesis. Results revealed young adult males have 3.692 times (CI=3.615-3.771) the odds of admission to treatment heroin abuse when self-referred and 3.246 times (3.149 – 3.347) when referred to treatment facilities by licensed drug use healthcare providers. However, the odds of admissions to treatment for heroin abuse are 1.044 times when young adults are living without any form of parental supervision. I also observed 2.704 times (CI=2.630-2.779) increased odds of admissions to treatment for heroin abuse for young adult females that self-referred themselves, 2.515 times (CI=2.421-2.613) when referred by licensed drug use healthcare providers, and 1.022 times when living without parental supervision. If many people referred for drug treatment from these sources, then the implications are that outreach should target this group. Effective prevention programs are needed that are aimed at young adults with substance abuse disorder.

## Highlights

- Risk of heroin use disorder higher among young adult men than women.
- Knowing the source of treatment referrals to substance abuse treatment programs for young adult admissions could lower prevalence.
- Men and women admissions to treatment for heroin abuse at higher risk of relapse and treatment episodes when self or referred by drug use healthcare providers.
- Young adult men and women have the same increased odds of admissions to treatment for heroin abuse when living homeless or with or without parental supervision.

## 1.0 Introduction

The epidemic of heroin use disorder continues to spread at an alarming rate across the entire United States. Several previous epidemiological studies have reported the availability of prescription opioids and opioids use disorder as primary risk factors for initiating abuse of heroin among adult users in the United States (Cicero, Ellis, Surratt & Kurtz, 2014; Compton, Jones & Baldwin, 2016; Jones, 2013; Kendler, Ohlsson, Sundquist & Sundquist, 2014). Other research has shown that pronounced negative neighborhood and socioeconomic factors are possible predictive determinants of heroin use disorder (Jones, Logan, Gladden, & Bohm, 2015; Schulte & Hser, 2014; Williams & Latkin, 2007). Significant adverse health outcomes associated with the heroin use disorder have widely reported among the young adult population of first-time heroin users (Jones, Logan, Gladden, & Bohm, 2015; National Institute on Drug Abuse [NIDA], 2018; Substance Abuse and Mental Health Services Administration [SAMHSA], 2017). Between 2002 and 2016 the number of people enrolled in substance abuse treatment for heroin use has increased about 37.5%, compared to 17.5% for prescription pain use disorder (SAMHSA, 2017).

Understanding the role of living arrangements and categories of treatment referrals for heroin use disorder, as justified by the gender of the user, is an essential step in addressing the growing risk among the U.S. adult population aged 18-34. Previous studies have shown women exhibit different risky behaviors than men. The observed significant risky behaviors include excessive alcohol consumption, cigarette use and craving for non-pharmaceutical drugs (Hitschfeld et al, 2015; Kennedy, Epstein, Phillips,

& Preston, 2013; Johnston, O'Malley, Miech, Bachman & Schulenberg, 2016; 2014; Center for Behavioral Health Statistics and Quality [CBHSQ], 2017). These risky behaviors increase the risk of cancer, HIV/AIDS, hepatitis, heart disease, lung disease, mental illness, mood disorder, suicide and accidental overdose (NIDA, 2017; Schulte & Hser, 2014).

Neighborhood environmental factors influence living arrangements and categories of treatment referrals of U.S. adults ages 18-34 admitted to substance abuse treatment programs. Factors such as housing, inequality, poverty, discrimination, lack of employment, insecurity, and social networking that increase accessibility of illicit drugs influence decision making process of young adults living without parental guidance (Dasgupta, Beletsky, & Ciccarone, 2018; Linton et al., 2017; Karriker-Jaffe, 2013; Bonnie, Stroud, & Breiner, 2015). Limited resources and absence of established socioeconomic pathways in neighborhoods have been reported to play a role in young adults' poor decision-making that leads to drug exposure, abuse of drug for non-medical purpose and relapsed to substance abuse treatment recommendations (Novak et al., 2016; Johnston et al., 2014; Bonnie, Stroud, & Breiner, 2015). In this study, I assessed the effects of these two important risk factors – the source of treatment referrals and living arrangement and their ties to heroin use disorder prevalence among U.S adult population ages 18-34.

There is a knowledge gap in the literature regarding the significance of the type of living arrangements and categories of treatment referrals as possible predictors of heroin abuse among young adults. I evaluated gender difference in heroin abuse for the U.S.



adult population aged 18-34 using the SAMHSA national dataset records for substance abuse admissions. The biopsychosocial model served as the theoretical model I used in this study to understand and describe drug use disorder. In this study, I sought to answer the following research question: What is the relationship between type of living arrangement and source of treatment referrals, and reported heroin use in male and female adult admissions to treatment programs in the United States after controlling for age at first use, gender, race, ethnicity, employment, educational status, number of prior treatments, and psychiatric problem in addition to drug problems? The continued increase in accessibility and affordability of heroin marks the urgent need for addressing heroin use disorder's impact on young adult male and female treatment admissions (Drug Enforcement Administration, 2015).

## **2.0 Methods**

### **2.1. Source of Data**

The Treatment Episode Data Set – Admissions (TEDS-A) is a publicly funded census system on substance abuse admissions that is regulated by the United States government agencies or substance abuse treatment programs (SAMHSA, 2015). TEDS-A annually acquires information on persons with alcohol or drug problems admitted to either public or private substance abuse treatment services that collected federal funds. The annually reported minimum TEDS-A data set contains information provided by the 49 states treatment facilities in the United States including the District of Columbia, and Puerto Rico that includes demographic and supplemental characteristics information for those admitted to treatment facilities for either drug or alcohol abuse. For this study, I

used the 2015 TEDS-A national dataset records on demographics and heroin use disorder characteristics reported by states. I conducted this study only after securing approval from the Walden University Institutional Review Board. I uploaded the TEDS-A dataset, which is available to the public, from SAMSHA's website.

## 2.2. Study population

A total of 745,915 young adults' admissions to publicly funded treatment facilities reported by participating states met study criteria for treatment for heroin use disorder recorded at the time of entries. Young adults admitted to heroin abuse treatment programs recoded as Whites, non-Whites, Hispanics, and Non-Hispanics. TEDS admissions data for heroin use disorder defined as heroin abuse recorded at the time of entry. Admission data collected by TEDS is without differentiation for admissions or readmissions for drug use disorder.

## 2.3. Heroin use disorder and demographic characteristics

TEDS-A data represent heroin use disorder admissions filed by individuals admitted to substance abuse treatment programs as the primary drug of abuse. TEDS defines heroin use disorder as heroin abuse reported at the time of admission as the leading drug problem. Heroin use disorder admissions was a dichotomous variable represented as either yes or no for heroin abuse as the leading drug of abuse (TEDS-A, 2015). TEDS-A admission data are self-reported.

Young adult admissions demographic variables that I assessed included self-reported age at first use (in years) of primary drug of abuse (11 and under, 12-14, 15-17, 18-20, 21-24, 25-29, 30 and over), race (Whites, non-Whites), age in years for heroin

abuse (18-20, 21-24, 25-29, 30-34), education (1st – 8th grade, 9th – 11th grade, 12th grade, associate degree, and college degree), employment status (employed, unemployed), sex (male, female), psychiatric problems in addition to drug problems (yes, no), ethnicity (Hispanic, Non-Hispanic), and the number of prior treatment episodes (none, one, two, three, four, five and more).

#### 2.4. Independent variables

The predictive risk factors I investigated in this study include the types of treatment referrals (self/individual, drug abuse licensed providers, other licensed providers, school, employer, community, court/criminal justice) and living conditions (homeless, independent living, dependent living). TEDS-A defines homelessness as individuals reported residing in shelters or deficient of a fixed address, independent living as an unsupervised living condition, and dependent living as a supervised living condition including foster care or residential institution (TEDS-A, 2015). TEDS-A defines the types of treatment referrals as the individual or agency referring person with heroin use disorder to treatment programs.

#### 2.5. Statistical analysis

I used a chi-square test to compare the association and difference between the dependent variable (heroin use disorder), independent variables (living conditions and the source of treatment referrals), and participants demographic variables (age at first use, race, age, education, employment status, ethnicity, and gender). I used multiple logistic regression analyses used to test the hypotheses regarding (a): whether an independent living arrangement is significantly associated with heroin use disorder as reported by

young adult admissions to treatment programs after controlling for covariates; and (b) whether source of treatment referrals are associated substantially with heroin use disorder as indicated by young adult admissions to treatment programs after controlling for covariates. Covariates controlled for during multiple logistic regression analysis included age at first use, education, employment status, age, race, gender, number of prior treatments, a psychiatric problem in addition to heroin abuse, and ethnicity. Selected reference variables for multiple logistic regression analysis included 30 and over (age at first use), non-white (race), non-Hispanic (ethnicity), 30-34 years (age group), female (gender), unemployed (employment status), college degree (education), five or more (number of prior treatment episodes), no psychiatric problem in addition to drug problem, homeless (living conditions), and court/criminal justice (source of treatment referrals). The strength of association between predictor variables and outcome variables was measured using Phi and Cramer's. An alpha value set at  $p < 0.01$  for statistical significance association, and I used an odds ratio with corresponding 95% confidence interval for result interpretation. I used IBM SPSS Version 25 for all statistical analyses.

### **3.0 Results**

A total of 745, 915 young adult admission data that met study criteria, and only 265,519 admissions reported heroin as the primary drug of abuse at the time of entry to treatment programs (Table 1). Demographically, a total of 464, 928 admissions were young adult males, and 280,752 were young adult female aged 18-34 at the time of entry to treatment programs for heroin use disorder (Table 2).

According to my hypotheses, independent living arrangement and source of treatment referrals are significantly associated with heroin use disorder as reported by young adult admissions to treatment programs after controlling for covariates. Chi-square result showed a significant association between living arrangement ( $\chi^2 (2) = 401.436$ ,  $p = .000$ ) and the source of treatment referrals ( $\chi^2 (6) = 21826.123$ ,  $p = .000$ ), and the prevalence of heroin use disorder among young female admissions (Table 2). Findings also showed a significant association between living arrangement ( $\chi^2 (2) = 2787.063$ ,  $p = .000$ ) and the source of treatment referrals ( $\chi^2 (6) = 59206.351$ ,  $p = .000$ ), and the prevalence of heroin use disorder among young male admissions (Table 2). I also observed significant association ( $p = .000$ ) between young adults admitted for heroin use disorder and their demographic characteristic including age at first use of primary drugs of abuse, gender, age group, race, education, ethnicity, employment status, amount of prior treatment episodes, and psychiatric issue in addition to their drug abuse (Table 2).

Analyses of demographic variables including age at first use of drug showed young adult males with heroin use disorder (67.4%) were more likely to be exposed to drug use at an early age than their female counterparts (58.3%, see Table 2). Young adult females ages 18-24 were more likely than their male peers to report heroin use disorder as the primary drug problem (Table 2). The study showed that educational status predicts young female admissions from 9th-grade level through college degree level, with females more likely to report heroin use disorder than their male counterparts (Table 2). Race plays a role with heroin use disorder with White young adult males (41.8%) or females (42.6%) more likely to report heroin use disorder compared to non-Whites males

(18.5%), and females (19.8%; Table 2). Joblessness showed significant association with the prevalence of abuse of heroin among young adults' admissions. Young adult male admissions (40.6%) and female admissions (40.3%) who are unemployed have a higher chance of reporting heroin use disorder compared to their employed counterparts (male = 23.2%, female = 26.5%; Table 2). The likelihood of report heroin use disorder among drug users increases as the number of prior treatment episode for drug use disorder increases among both young adult male and female admissions (Table 2.0). Young adult female admissions (52.3%) with previous treatment episodes were more likely to report heroin use disorder than male admissions (45.7%; Table 2).

The study showed a significant relationship between the living condition, the type of treatment referrals, and young adults' demographic characteristics (Table 2). Young adults males that are homeless (44.7%) were more likely to be exposed to heroin use disorder than their female counterparts (41.8%; Table 2). However, young adult males that reside without any parental supervision were less likely to report heroin use disorder (34.1%) than their female counters (35.1%; Table 2). Young adult males who are living under their parental supervision were less like to report heroin use disorder (32.2%) when compared to their female counterparts (37.1%; Table 2). Analyses of the source of treatment referrals showed variation in the reporting of heroin use disorder between young adult males and females admitted to treatment facilities (Table 2). Young adult males showed more likelihood of heroin use disorder when they self-referred themselves to treatment program (52.5%) or when they are referred by drug abuse healthcare providers (54.4%) when compared to their female counterparts (Table 2). However,

referrals to treatment facilities by other licensed providers (29.9%) or court/criminal justice (23.3%) showed a high likelihood of reporting heroin used disorder among young adult females compared to their male counterparts (Table 2).

Multiple logistic regression analyses showed a significant difference in relationship between the source of treatment referrals and the increased in heroin abuse among young adult males and females admissions admitted to treatment facilities (Table 3; Table 4). I observed an increase odds of admissions to treatment for abuse of heroin in young adult females (18-20 (OR = 3.139, CI=2.995 – 3.289; 21-24(OR=2.816, CI=2.727-2.907; 25-29(OR=1.714, CI=1.668 – 1.761, see Table 4) compared to their male counterparts (18-20 (OR = 1.473, CI=1.417-1.530; 21-24(OR=1.988, CI=1.937-2.040); 25-29(OR=1.532, CI=1.499-1.566, see Table 3). Analyses of age at first use of drug showed lower odds admissions to treatment for abuse of heroin among both young adult males (11 and under (OR=0.031; CI: 0.028-0.033); 12-14 (OR=0.048, CI=0.045-0.051); 15-17 (OR=0.111, CI=0.104-0.118; 18-20 (OR = 0.270, CI=0.254-0.287; 21-24(OR=0.482, CI=0.453-0.513, see Table 3), and young adult females (11 and under (OR=0.049; CI: 0.044-0.054); 12-14 (OR=0.067, CI=0.062-0.071); 15-17 (OR=0.137, CI=0.128-0.146; 18-20 (OR = 0.279, CI=0.262-0.297; 21-24(OR=0.466, CI=0.438-0.496, see Table 4). I also observed a lower odds of admissions for treatment for heroin abuse among young adult White males (OR=0.340, CI=0.332- 0.348, see Table 3) and females (OR=0.348, CI=0.338 - 0.358, see Table 4) compared to their reference non-Whites counterparts. Ethnicity analysis revealed higher odds of being admitted to treatment for

heroin abuse among young adult Hispanics males is 1.047 (CI=1.018-1.076, see Table 3) when compared to young adult female (OR=0.793, CI=0.765-0.823, see Table 4).

Educational level analyses showed increased odds of admissions to treatment for heroin abuse in young adult males compared to female counterparts (Table 3; Table 4). In this study, I observed young adult males from 1st grade through 12th grade have a higher odds of abuse of heroin (1st-8th grade: OR=2.474, CI: 2.36-2.620; 9th – 11th grade: OR=1.597, CI=1.523-1.675; 12th grade: OR=1.671, CI=1.599-1.748, see Table 3) compared to their female counterparts (1st-8th grade: OR=1.498, CI: 1.401-1.601; 9th – 11th grade: OR=1.095, CI=1.038-1.154; 12th grade: OR=1.245, CI=1.184-1.308, see Table 4). Analyses of young adult previous treatment episodes showed a young adult male with one to two treatment episodes have a lower odds of being admitted to treatment for heroin abuse (OR = 0.373, CI = 0.361-0.385; Table 3). For young adult females, I observed the same outcome where young adults with two or three previous treatment episodes have a lower odds of being admitted to treatment for heroin abuse (OR = 0.370, CI = 0.356-0.385; Table 4).

Analyses of the source of treatment referrals to young adults admitted to treatment facilities are associated with the increased odds of admissions to treatment for heroin abuse (Table 3; Table 4). I observed young adult males who self-referred themselves or being referred by licensed healthcare professionals to treatment facilities have an increased odds of being admitted to treatment for heroin abuse (self-referred: OR=3.692, CI=3.615-3.771; licensed provider-referrals: OR=3.246, CI=3.149-3.347, see Table 3) than their female counterparts (self-referred: OR=2.704, CI=2.630-2.779, provider-



referred: OR=2.515, CI=2.421-2.613, see Table 4). However, I observed lower odds admissions to treatment for heroin abuse for other sources of treatment referrals to treatment facilities such as school, employer and community (Table 3; Table 4). Living condition analyses showed the odds of admissions to treatment for heroin abuse among young adults ether male or female is the same if they lived either under the supervision of their parents or not with homelessness as the reference variable (Table 3; Table 4). The odds of being admitted to treatment for heroin abuse for a young adult female living without parental supervision was observed to be the same with their counterparts that are homeless (OR=1.022, CI=0.982-1.063, see Table 4). For young adult males who are living independently of their parental supervision have the same odds of being admitted to treatment for heroin abuse when compared with their homeless counterparts (OR=1.044, CI=1.011-1.078, see Table 3).

## Tables

Table 1

*Descriptive characteristics of young adult admissions for heroin use disorder, TEDS-A, 2015*

Dependent	Variable	%	N
Heroin Reported at Admission	No	64.4	480,369
	Yes	35.8	265,519

Table 2

*Demographic characteristics by gender for young adult admissions to treatment facilities with heroin use disorder as the main drug problem, TEDS-A, 2015*

**Variables (%)	Male (N=464928)	Female (N=280752)
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		Heroin Abuse (%)	Heroin Abuse (%)
Age (Years)	18-20	19.1	32.5
	21-24	34.4	40.7
	25-29	39.0	38.8
	30-34	34.7	33.4
Age at First Use (Years)	11 and Under	9.4	13.3
	12-14	13.4	16.8
	15-17	24.7	27.8
	18-20	44.3	43.5
	21-24	58.4	52.4
	25-29	67.4	58.3
	30 and Over	65.9	56.4
Living Arrangements	Independent	34.1	35.1
	Dependent	32.2	37.1
	Homeless	44.7	41.8
Principal Source of Referral	Self/Individual	52.5	49.8
	Drug Abuse Providers	54.4	52.7
	Other Licensed Providers	27.7	29.9
	School	5.8	9.4
	Employer	14.6	18.6
	Community	23.9	21.6
	Court/Criminal Justice	16.9	23.3
Race	Whites	41.8	42.6
	Non-Whites	18.5	19.8
Ethnicity	Hispanic	26.4	25.2
	Non-Hispanic	36.5	38.8
Employment Status	Employed	23.3	26.5
	Unemployed	40.6	40.3
Education	1 <sup>st</sup> – 8 <sup>th</sup> Grade	43.2	42.7
	9 <sup>th</sup> -11 <sup>th</sup> Grade	28.9	31.3
	12 <sup>th</sup> Grade	37.0	38.9
	Associate Degree	37.0	40.2
	College Degree	30.8	35.3

Psychiatric Problem	Yes	39.7	41.8
	No	32.5	34.2
Number of Prior Treatment	None	20.1	23.0
	One	28.1	32.3
	Two	38.3	41.8
	Three	45.7	52.3
	Four	51.9	51.6
	Five or More	63.9	64.0

\*\* $\chi^2 (p) = 00$

\*\* Young male admissions: Living arrangement ( $\chi^2 (2) = 2787.063, p = .000$ ); Treatment referrals ( $\chi^2 (6) = 59206.351, p = .000$ ),

\*\* Young female admissions: Living arrangement ( $\chi^2 (2) = 401.436, p = .000$ ); Treatment referrals ( $\chi^2 (6) = 21826.123, p = .000$ ),

Table 3

*Multivariate logistic regression for odds ratio of heroin use disorder among young adult males admissions with primary heroin abuse after controlling for covariates, TEDS-A, 2015.*

Variables		Male (N=335,737)		
		OR	95% CI of OR	p-value
Age (Years)	18-20	1.473	1.417-1.530	.000
	21-24	1.988	1.937-2.040	.000
	25-29	1.532	1.499-1.566	.000
	30-34	Reference		
Age at First Use (Years)	11 and Under	0.031	0.028-0.033	.000
	12-14	0.048	0.045-0.051	.000
	15-17	0.111	0.104-0.118	.000
	18-20	0.270	0.254-0.287	.000
	21-24	0.482	0.453-0.513	.000
	25-29	0.828	0.777-0.882	.000
	30 and Over	Reference		
Race	Whites	0.340	0.332-0.348	.000
	Non-Whites	Reference		
Ethnicity	Hispanic	1.047	1.018-1.076	.001
	Non-Hispanic	Reference		
Education	1 <sup>st</sup> – 8 <sup>th</sup> Grade	2.474	2.336-2.620	.000

	9 <sup>th</sup> -11 <sup>th</sup> Grade	1.597	1.523-1.675	.000
	12 <sup>th</sup> Grade	1.671	1.599-1.748	.000
	Associate Degree	1.321	1.260-1.385	.000
	College Degree	Reference		
Employment Status	Employed	0.567	0.556-0.579	.000
	Unemployed	Reference		
Number of Prior Treatment	None	0.136	0.133-0.140	.000
	One	0.236	0.229-0.243	.000
	Two	0.373	0.361-0.385	.000
	Three	0.510	0.491-0.529	.000
	Four	0.641	0.613-0.669	.000
	Five or More	Reference		
Psychiatric Problem	Yes	1.010	0.991-1.030	.000
	No	Reference		
Living Arrangements	Independent	1.044	1.011-1.078	.008
	Dependent	0.960	0.934-0.986	.002
	Homeless	Reference		
Principal Source of Referral	Self/Individual	3.692	3.615-3.771	.000
	Drug Abuse Providers	3.246	3.149-3.347	.000
	Other Licensed Providers	1.244	1.191-1.299	.000
	School	0.520	0.363-0.743	.000
	Employer	0.982	0.829-1.164	.838
	Community	1.313	1.258-1.360	.000
	Court/Criminal Justice	Reference		

Table 4

*Multivariate logistic regression for odds ratio of heroin use disorder among young adult female admissions with primary heroin abuse after controlling for covariates, TEDS-A, 2015.*

Variables		Female (N=280,752)		
		OR	95% CI of OR	p-value
Age (Years)	18-20	3.139	2.995-3.289	.000
	21-24	2.816	2.727-2.907	.000
	25-29	1.714	1.668-1.761	.000
	30-34	Reference		

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Age at First Use (Years)	11 and Under	0.049	0.044-0.054	.000
	12-14	0.067	0.062-0.071	.000
	15-17	0.137	0.128-0.146	.000
	18-20	0.279	0.262-0.297	.000
	21-24	0.466	0.438-0.496	.000
	25-29	0.772	0.725-0.823	.000
	30 and Over	Reference		
Race	Whites	0.348	0.338-0.358	.000
	Non-Whites	Reference		
Ethnicity	Hispanic	0.793	0.765-0.823	.000
	Non-Hispanic	Reference		
Education	1 <sup>st</sup> – 8 <sup>th</sup> Grade	1.401	1.401-1.601	.000
	9 <sup>th</sup> -11 <sup>th</sup> Grade	1.095	1.038-1.154	.001
	12 <sup>th</sup> Grade	1.245	1.184-1.308	.000
	Associate Degree	1.166	1.107-1.228	.000
	College Degree	Reference		
Employment Status	Employed	0.659	0.641-0.678	.000
	Unemployed	Reference		
Number of Prior Treatment	None	0.136	0.133-0.140	.000
	One	0.236	0.229-0.243	.000
	Two	0.370	0.361-0.385	.000
	Three	0.489	0.491-0.529	.000
	Four	0.588	0.613-0.669	.000
	Five or More	Reference		
Psychiatric Problem	Yes	1.099	1.075-1.124	.000
	No	Reference		
Living Arrangements	Independent	1.022	0.982-1.063	.288
	Dependent	0.981	0.949-1.04	.255
	Homeless	Reference		
Principal Source of Referral	Self/Individual	2.704	2.630-2.779	.000
	Drug Abuse Providers	2.515	2.421-2.613	.000
	Other Licensed Providers	1.177	1.120-1.236	.000
	School	0.565	0.373-0.857	.007
	Employer	0.932	0.684-1.270	.656
	Community	0.907	0.874-0.941	.000
	Court/Criminal Justice	Reference		

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#### 4.0 Discussion

Heroin use disorder continues to affect many young adults across the United States adversely and the present findings from this study adds to the growing body of knowledge that addresses heroin use disorder epidemic (NIDA, 2018; SAMHSA, 2017; Novak, Bluthenthal, Wenger, Chu & Kral, 2016; Jones et al., 2015). Understanding the source of treatment referrals to treatment facilities and their relationship with admissions to treatment for heroin abuse among young adult with drug problem could offer some useful insight that suggests the role of the source of treatment referrals in addressing heroin abuse. Analysis of 2015 TEDS-A admissions records for heroin abuse showed young adult males and females were referred to treatment facilities across the United States by different sources including self-referrals and referrals by drug use healthcare providers, other licensed healthcare providers, school, employer, court, and community sources. In this study, I observed a significant association existed between the source of treatment referrals for heroin abuse and the increased risk of being admitted to treatment for heroin use disorder among young adults aged 18-34 living in the United States ( $p < 0.01$ ). This finding was consistent with the proposed hypothesis that states: sources of treatment referrals were significantly associated with heroin use disorder as reported by young adult admissions to treatment programs after controlling for covariates.

Young adults with heroin use disorder usually experience challenges and barriers in treating their heroin use disorder before and after enrolling to substance abuse treatment programs (Schulte & Hser, 2014). In 2012, about 36% of young adult males

and females lived under the supervision of their parents in the United States, and the rest either lived without any parental control or homeless (Fry, 2013). For heroin use disorder, understanding the dynamics of the living condition of an individual drug user is essential for determining exposure, risky behaviors, and influence of neighborhood (Linton et al., 2017; Schulte & Hser, 2014; Novak et al., 2016). The analyses of TEDS-A national data showed a significant association between the living arrangement of young adult males and admissions to treatments for heroin use disorder. However, for young adult females admitted to treatment facilities, there was no significant association between their living arrangement and heroin use disorder observed ( $p > .01$ , see Table 4). There were mixed findings concerning the study hypothesis. For young adult males, there is a significant association between their living arrangement and heroin use disorder after controlling for covariates. The result is consistent with previous studies that associate neighborhood characteristic as primary determinants of heroin abuse (Linton et al., 2017; Schulte & Hser, 2014; Williams & Latkin, 2007). Another significant finding from this study showed young adult women aged 18-20 have twice the odds of being admitted to treatment for heroin abuse compared to men peers, however, young adult males have a higher risk of being admitted to treatment for heroin abuse from middle school through high school compared to their female counterparts.

To determine the strength of association that existed between heroin use disorder and young adults source of treatment referrals and living arrangement the effect size was determined. Findings showed mixed outcome for effect size between gender where: (a) a definite strength of association between the source of treatment referrals and heroin use

disorder among young males and females admissions; and (b) a weak strength of association between living arrangement and heroin use disorder. For young adult males, the odds of being admitted to treatment for heroin abuse are 3.682 times when self-referred and 3.246 times when referred to treatment facilities by licensed drug use healthcare providers. However, the odds of being admitted to treatment for heroin abuse are 1.044 times when living without parental supervision and 0.960 times when living under parental control. In the case of young adult females, the odds of being admitted to treatment for heroin abuse are 2.704 times when self-referred and 2.515 times when referred to treatment facilities by licensed drug use healthcare providers. However, the odds of being admitted to treatment for heroin abuse are 1.022 times when living without parental supervision and 0.981 times lower when living under parental control. Notably, a desirable relationship between the source of treatment referrals and the odds of admissions to treatment for heroin abuse exist but a fragile beneficial relationship for living arrangement and admissions to treatment for heroin abuse. Findings from this study showed the source of treatment referrals is a strong predictor of risk of admissions to treatment for abuse of heroin among males and females aged 18-34. This study has implications for abuse of heroin and the sources of treatment referrals that are designed to increase access to treatment facilities and in lowering heroin abuse epidemic among young adult aged 18-34.

This study has several limitations despite the compelling findings that will be useful to inform policy on addressing the heroin abuse epidemic. The duplication of admissions records is a possibility since TEDS-A national data on substance abuse does



not differentiate treatment readmissions for heroin use disorder. However, the new admissions effect on recorded data is unlikely because information gathered by TEDS-A is formatted in percentage distribution. Only the primary drug of abuse reported at admissions met study criteria, and users' psychiatric problem in addition to the drug problem could confound possible causative factor. The application of multiple logistic regression analysis in this study was used to control the effects of covariates. TEDS-A national data represent approximately 80% of the national data on substance abuse in the United States. The U.S. adult population continues to be at risk of heroin use disorder that exposes them to many other chronic health conditions including HIV/AIDS, cancer and cardiovascular diseases (NIDA, 2017; SAMHSA, 2017). While this study adds to the current knowledge in literature for heroin use disorder, research that focuses on understanding the aspects of young adult heroin users sources of referrals to treatment facilities and the risk of relapse before the development of target intervention and policy will be beneficial.

## **5.0 Conclusion**

There is a growing concern of heroin abuse epidemic among U.S. adult aged 18-34. This study makes an additional contribution to literature in understanding the epidemiology of heroin abuse based on gender difference among U.S. adult population ages 18-34 through investigation of target preventions at young adults who live in the high-risk settings and their sources of treatment referrals. Although many sources of treatment referrals to substance abuse treatment have been shown to be effective in addressing heroin use disorder, if many people referred for treatment from these sources,

then the implications are that some outreach or case finding should be targeted there.

Findings from this study showed a need for target intervention programs aimed at young adult users of heroin. Additional study in this area will provide more understanding regarding the role of the source of treatment referrals in lowering risk of young adults' heroin use disorder.

Conflict of Interest

None

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**Manuscript 3: Cocaine/Crack Use Disorder in a National Sample of U.S. Adults  
Ages 18-34 and the role of Living Arrangements and the Source of Referrals to  
Treatment Programs**

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Walden University



### **Outlet for Manuscript**

The target journal for this manuscript is the Journal of Substance Abuse Treatment (JSAT; <https://www.journals.elsevier.com/journal-of-substance-abuse-treatment>). The journal requires that manuscript be approximately 16 to 25 double-spaced pages, not including abstract, references, tables, or figures. Submission guidelines require the manuscript to have an abstract and a structure that consists of Introduction, Material and Methods, Results, Discussion, Conclusions, and Appendices sections.

The manuscript formatting requirements include:

Title page: should consist of a manuscript title, author's names and affiliations, and corresponding author. Indicate author given and family names, author's association with the lowercase superscript letter after author's names and in front of the author's addresses, a full postal address of each affiliation, and the e-mail address of each author.

Abstract: should state the purpose of the research, the principal results, and conclusions

Abbreviations and acronyms: Maximum of 6 keywords for indexing purpose. Avoid abbreviations and acronyms. When acronyms or an abbreviation is considered essential, clearly define after first use in the text. Footnotes should be numbered and used separately at the end of the article.

Acknowledgments: Do not include or as a footnote in the title page.

Collate acknowledgments should be presented in a separate section at the end of an article before references.

This manuscript has not been submitted to target journal for publication.

### Abstract

Cocaine is the second most abused drug in the United States and the third most addictive drug in the world. The United States continues to face the public health problem of the prevalence of cocaine use disorder among young adults with an estimated 5.1 million users. Researchers have found cocaine or crack-cocaine abuse is among the top three most common causes of drug overdose death during young adulthood. In this study, I used the 2015 Treatment Episode Data Set-Admissions on substance abuse to examine the relationship between individual living arrangement settings and the source of referrals to treatment programs and their association with the prevalence of admissions to treatment for cocaine/crack abuse among young adults ages 18-34. Hypotheses were tested using multiple logistic regression analyses. I used young adult males and females with cocaine/crack use disorder as their primary drug problem. Results showed young adult females with psychiatric problems in addition to their drug abuse issues have 1.829 times (CI=1.782-1.876,  $p<.01$ ) increased odds of admissions to treatment for cocaine/crack abuse and 1.606 times (CI=1.572-1.639,  $p<.01$ ) for young adult males compared to peers with no mental problem. I also observed lower odds of admissions to treatment for cocaine/crack abuse when young adults were referred to treatments by schools. Study findings show a significant association between the odds of admissions to treatment for abuse of cocaine/crack and living independently with no supervision and all categories of referrals to treatment facilities for young adult males. Target intervention and policy-making towards these higher-risk young adults referred by licensed drug abuse doctors or employers will help in lowering cocaine abuse crisis.

## Highlights

- Young adult women present a higher risk of reporting admissions to treatment for cocaine/crack use disorder than young adult men.
- Higher risk among those referred to treatment programs by licensed drug use healthcare professionals.
- Young adults living arrangements is not a significant predictor of risk of admissions to treatment for abuse of cocaine/crack.
- Young adults with cocaine/crack abuse problem in addition to psychiatric problems are at higher odds of admissions to treatment for cocaine/crack abuse than those without psychiatric problems.

## 1.0 Introduction

Cocaine is among the most abuse drugs in the United States that profoundly affects many young adults and the healthcare system resources. Approximately, \$600 billion is reportedly spent annually to address the substance abuse crisis in the United States (National Institute on Drug Abuse [NIDA], 2018). Cocaine is among the top three most abuse and addictive drugs in the United States (Substance Abuse and Mental Health Services Administration [SAMHSA], 2017; Seth, Scholl, Rudd & Bacon, 2018; NIDA, 2018). Findings by the World Drug Report showed the United States has the highest cases of abuse of cocaine globally with an estimated 5.1 million users (World Drug Report, 2016). In 2016, approximately 63, 632 drug overdose mortality was recorded in the United States with abuse of cocaine among the primary cause of overdose deaths (Seth et al., 2018). Other epidemiological studies have documented higher risk of exposure to cocaine or crack-cocaine among adults below the age of 37 years (NIDA, 2018; Karsinti et al., 2018; SAMHSA, 2017; Welty et al., 2016; Johnston, O'Malley, Miech, Bachman & Schulenberg, 2015; Van Ryzin, Fosco & Dishion, 2012). The accessibility and affordability of cocaine in the form of crack-cocaine and socio-environmental risk factors were reported as possible causes of increased exposure to the abuse of cocaine among young adults (United Nations Office on Drugs and Crime [UNODC], 2016; 2014; Degenhardt et al., 2014; Fischer et al., 2015 Johnston et al., 2015).

Researchers have shown a possible association between abuse of cocaine/crack and health complications. The risk for health complications increases with early exposure to abuse of drugs during adolescences that progress during adulthood (Schulte & Hser,

2014; Karriker-Jaffe, 2013). Chronic abuse of cocaine results in severe health outcomes in adulthood that includes suicidal ideation, psychotic effects, euphoria, cardiac and neurological problems and cognitive impairment (El-Bassel, Shaw, Dasgupta & Strathdee, 2014; Klevens, Hu, Jiles & Holmberg, 2012; NIDA, 2018 Karsinti et al., 2018). Several related studies have identified cocaine/crack use disorder to also increase the risk of contracting human immunodeficiency virus (HIV), hepatitis C, Tuberculosis and other blood diseases caused by users risky sexual behaviors, sharing injection equipment and impaired judgment (El-Bassel et al., 2014; Klevens et al., 2012; NIDA, 2018).

Understanding where young adult lives concerning leisure and job, and their social interaction with people in their communities will provide a context of risk factors that contribute to risky behaviors and cocaine abuse in their neighborhoods or communities. Some researchers have shown that socio-environmental and negative neighborhood factors continue to facilitate increased abuse of cocaine or crack-cocaine among young adults (Karriker-Jaffe, 2013; Sterk, Elifson & DePadilla, 2013; Badiani, & Spagnolo, 2013; Ahern & Galea, 2011). The various reported socio-environmental and negative neighborhood risk factors that contributed to high risk behaviors and cocaine/crack abuse among young adults including stress, deficient infrastructural resources, alcohol abuse, crime and developed social relationship with peers (Johnston et al., 2015; Sterk, Elifson & DePadilla, 2013; Van Ryzin, Fosco & Dishion, 2012). Both the negative neighborhood and socio-environmental factors may exacerbate increase cocaine/crack abuse among young adult prompted. In this study, I evaluated the

prevalence of abuse of cocaine/crack in the U.S. and the association of two significant predictive risk factors – living arrangement and the source of treatment referrals. The study population sample includes U.S. adult males and females ages 18-34 with cocaine/crack use disorder admitted to treatment programs.

In this present study, I sought to make a significant contribution to the knowledge gap in the literature that exists regarding the prevalence of cocaine/crack use disorder among U.S. adult population and the assessment of possible predictive risk factors of their living arrangements and their sources of substance abuse treatment referrals. In this study, I used the conceptual framework of the biopsychosocial model to understand cocaine/crack use disorder among both males and females aged 18-34 using the SAMHSA national data for substance abuse admissions. Research questions for this study were (a): What is the association between the structure of living arrangements and the prevalence of abuse of cocaine/crack among adult males and females in the United States, controlling for number of prior treatments, psychiatric problem in addition to drug problems, ethnicity age, race, age at first use, gender, education, and employment status? (b): What is the association between the source of treatment referrals to substance abuse facilities and the prevalence of admissions to treatment for abuse of cocaine/crack among adult males and females in the United States, controlling for number of prior treatments, psychiatric problem in addition to drug problems, ethnicity age, race, age at first use, gender, education, and employment status?

## 2.0 Methods

### 2.1. Source of Data

The Treatment Episode Data Set – Admissions (TEDS-A) is a Federal or State funded annual data system for substance abuse treatment admissions that is solely managed by the United States government agencies or treatment programs (SAMHSA, 2015). Participating 49 states treatment facilities in the United States including the District of Columbia, and Puerto Rico collect that collect public funds on substance abuse treatment programs annually submit individuals admissions records for alcohol or drug problems to TEDS-A. TEDS-A reported annual admissions data comprises of supplemental characteristics information for all admissions to alcohol or drug treatment programs. I used the 2015 TEDS-A annual national dataset for cocaine/crack use disorder and demographic characteristics provided by participating states. After acquiring approval from the Walden University Institutional Review Board to undertake this study, I uploaded the public accessible TEDS-A dataset from SAMSHA's website.

### 2.2. Population of study

A total sample of 745, 915 young adults with cocaine/crack use disorder admitted to various publicly funded substance abuse treatment facilities across the United States satisfied study criteria. The demographics of the study population for admissions to cocaine/crack use disorder were re-coded to Whites, non-Whites, Hispanics, and Non-Hispanics. TEDS-A data on abuse of cocaine/crack admissions is defined as cocaine/crack abuse reported when first admitted. TEDS-A admissions data for

cocaine/crack abuse is without differentiation between admissions records or readmissions records for substance abuse.

### 2.3. Cocaine use disorder and demographic characteristics

TEDS-A dataset constituted the recorded admissions to substance abuse treatment programs with cocaine/crack representing the primary substance of abuse. TEDS defines cocaine use disorder as cocaine/crack abuse reported as the leading drug problem at the time of admission. TEDS-A self-reported data on admission cocaine use disorder is a dichotomous variable recorded as either yes or no for cocaine/crack abuse as the primary substance of abuse (TEDS-A, 2015). The demographic variables of admitted young adult to substance abuse treatment facilities that I assessed in this study consisted of self-reported age at first use (in years) of primary drug of abuse (11 and under, 12-14, 15-17, 18-20, 21-24, 25-29, 30 and over), age in years for abuse of cocaine/crack (18-20, 21-24, 25-29, 30-34), employment status (employed, unemployed), ethnicity (Hispanic, Non-Hispanic), race (Whites, non-Whites), sex (male, female), educational level (1st – 8th grade, 9th – 11th grade, 12th grade, associate degree, and college degree), the number of prior treatment episodes (none, one, two, three, four, five and more), and psychiatric problems in addition to drug problems (yes, no).

### 2.4. Predictive risk factors

In this study, I evaluated the predictive risk factors of abuse of cocaine/crack that include the sources of treatment referrals (self/individual, drug abuse licensed healthcare providers, other licensed healthcare providers, employer, court/criminal justice, school, community) and the living settings (homeless, independent living, dependent living) of



admitted young adults. TEDS-A defines each living environments of admitted young adults as follows: homelessness as young adults that reported living in shelters or without any fixed address; independent living as residing independently without any supervision from parents; and dependent living as a living arrangement under in either a foster care or residential institution with control (TEDS-A, 2015). TEDS-A defines the sources of treatment referrals as either the person or agency that responsible for referring the person with cocaine use disorder to substance abuse treatment facilities.

## 2.5. Statistical analysis

In this study, I utilized IBM SPSS Version 25 for all statistical analyses. Chi-square test was used in this study to assess the relationship and difference between the outcome variable (cocaine/crack use disorder), predictor variables (living settings and the source of substance abuse treatment referrals), and participants demographic variables (age at first use, age, gender, ethnicity, race, employment status, and educational level). To test all hypotheses, I used multiple logistic regression analyses. Hypotheses developed for this study were (a): whether reported cocaine use disorder among young adult admissions to substance abuse treatment facilities is significantly associated with their living arrangement after controlling for covariates; and (b) whether reported cocaine use disorder among young adult admissions to substance abuse treatment facilities is significantly associated with their source of treatment referrals after controlling for covariates. In this study, using multiple logistic regression, the following covariates were controlled: age, age at first use, educational level, a psychiatric problem in addition to heroin abuse, gender, ethnicity, race, and employment status. Reference variables chosen

for multiple logistic regression analyses included female (sex), unemployed (employment status), college degree (education), no psychiatric problem in addition to drug problem, court/criminal justice (source of treatment referrals), homeless (living conditions), non-Hispanic (ethnicity), non-white (race), 30 and over (age at first use), 30-34 years (age group), and five or more (number of prior treatment episodes). Phi and Cramer's used for measurement of the strength of association between the predictor variables and outcome variables. In this study, I used a  $p < 0.01$  for the determination of statistical significance association. Odds ratio used for results interpretation with corresponding 95% confidence interval.

### 3.0 Results

Table 1 shows a total of 745, 915 young adults admitted to substance abuse treatment facilities with 62.3% as males and 37.6% were females (Table 1). There were only 106, 340 young adults who reported current abuse of cocaine/crack as the primary substance of abuse at the time of admission to substance abuse treatment program (Table 1).

In this study, I postulated that cocaine use disorder as recorded by young adult admissions at the time of entry to substance abuse treatment program significantly associated with their independent living arrangement and the source of treatment referrals after controlling for covariates. Using Chi-square test analysis, results show a significant association between the rate of cocaine/crack use disorder among young adult males and their independent living arrangement ( $\chi^2 (2) = 832.678, p = .000$ ) and the source of treatment referrals ( $\chi^2 (6) = 5010.742, p = .000$ ) (Table 2). The same result also found for

young adult females that show a significant association between the prevalence of abuse of cocaine and the association with their independent living arrangement ( $\chi^2 (2) = 401.436, p = .000$ ) and the source of treatment referrals ( $\chi^2 (6) = 21826.123, p = .000$ ) (Table 3). I observed a significant association between the rates of abuse of cocaine/crack and living arrangement among young adult males and females among (Table 2; Table 3). Results showed the likelihood of abuse of cocaine/crack for young adult males living independently with no supervision is 13.0% and 13.4% for young adult males living in a supervised home when compared to the reference category (Table 2). Also, the likelihood of reporting abuse of cocaine/crack for young adult females living independently with no supervision is 15.5% and for those living in a supervised home is 14.9% when compared to the reference category (Table 3).

This study also shows the source of referrals to substance abuse treatment facilities for young adult males or females were significantly related to cocaine/crack use disorder (Table 2; Table 3). The source of referrals to treatment facilities by self, licensed drug abuse healthcare professionals, other licensed healthcare professionals, schools, employer, and community were all significantly associated with the abuse of cocaine/crack among young adult males ( $p < 0.01$ , see Table 2) except for young adult females (Table 3). In this study, I found licensed drug abuse healthcare professionals-referred is strongly associated with the likelihood of abuse of cocaine/crack among adult males and females when compared to the reference category (Table 2; Table 3). As shown in Table 2 and 3, 22.1% of young adult males and 24.4% of young adult females reported cocaine use disorder when referred by licensed drug abuse healthcare

professionals (Table 2; Table 3). Analyses of other sources of referrals to treatment also shows young adult females when referred by other licensed healthcare professionals were more likely to report abuse of cocaine/crack use disorder (17.0%; Table 3) when compared to young adult males (15.7%; Table 2). In contrast, the prevalence of exposure to cocaine/crack use among young adult males (15.1%; Table 2) and females (15.9%; Table 3) that self-referred themselves to substance abuse treatment facilities is almost similar.

Findings from this study also showed demographic characteristics (age at first use of primary drugs of abuse, race, ethnicity, rate of previous treatment episodes, education, employment status, psychiatric issue in addition to their drug abuse problems, age, and gender) for both young adult males and females were significantly associated with the rate of cocaine/crack use disorder (Table 2; Table 3). As shown in this study, comparison of prevalence of cocaine/crack use disorder based on age group showed 30-34 age groups for both young adult males and females have the highest rate of abuse of cocaine/crack with higher exposure observed among young adult females (17.5%; Table 3) than males (16.0%; Table 2). Prevalence of age at first exposure to drug use, as shown in the analyses of demographic characteristics is a significant predictor of cocaine/crack use disorder among both young adult males and females (Table 2; Table3). I found that young adult males and females are mostly exposed to cocaine/crack abuse from an early age group of 25-29 through 30 and over (Table 2; Table3). However, 20.1% of young adult females were more exposed to abuse of cocaine/crack at an early age group of 25-29 compared to their male counterparts (18.8%; Table 2).

Results also showed the prevalence of cocaine/crack use disorder among young adults Whites and non-Whites males or females are similar regardless of their race. The likelihood of reporting abuse of cocaine/crack among young adult White males is 13.5% and for non-White males is 13.7% (Table 2). For young adult White females, 15.4% are more likely to report abuse of cocaine/crack which is similar to 15.5% of non-White females (Table 3). This study shows ethnicity is a significant predictor of abuse of cocaine/crack among young adult males and females. For young adult Hispanic males, 15.7% were more likely to report abuse of cocaine/crack compared to 13.2% of their non-Hispanic counterparts (Table 2). In contrast, young adult Hispanic females were less likely to report abuse of cocaine/crack (13.6%; Table 2) compared to non-Hispanic females (15.8%; Table 3). Educational status plays an essential role with abuse of cocaine/crack. I observed young adult males and females are more likely to be exposed to abuse of cocaine/crack from 1st grade through 8th grade compared to higher educational levels (Table 2; Table 3). Young adult females in 1st- 8th grade were more likely to report abuse of cocaine/crack (21.4%; Table 3) than their male counterparts (16.9%; Table 3).

Psychiatric problems in addition to drug abuse and the number of previous treatments episodes were found in his study to be a significant predictor of exposure to cocaine/crack use disorder among young adult users. I observed more young adult males and females with cocaine/crack use disorder and psychiatric problems were more likely to report abuse of cocaine/crack compared to their counterparts with no psychiatric problem (Table 2; Table 3). Young adult males with psychiatric problems in addition to

abuse of drugs have a higher likelihood of reporting abuse of cocaine/crack (18.2%; Table 2) compared to their counterparts with no psychiatric problems (10.8%; Table 2). I also found a similar outcome for among young adult females, where 20.6 % with psychiatric problem in addition to abuse of drugs present a higher likelihood of reporting abuse of cocaine/crack compared to those that have no psychiatric problem (10.9%; Table 3). Analyses of previous treatment episodes showed young adults with five or more prior substance abuse treatment episodes have a higher likelihood of being exposed to cocaine/crack use disorder (Males=21.8%, Table 2; Females=28.1%, Table 3) compared to their counterparts with less number of treatment episodes.

Results of multiple logistic regression analyses showed a statistically significant difference in the association between young adults' source of treatment referrals and the increased in the prevalence for admissions to treatment for cocaine/crack use disorder (Table 2; Table 3). In young adult males, I observed a significant difference in the association between the odds of admissions to treatment for abuse of cocaine/crack and the source of treatment referrals (Table 2). This study showed a higher odds of being admitted to treatment for abuse of cocaine/crack among young adult males who are referred to treatment programs by licensed drug abuse health professionals (OR=1.723, CI=1.68-1.780, see Table 2), and other licensed health professionals-referred (OR=1.217, CI=1.161-1.276, see Table 2) compared to reference category. I also observed similar outcomes of admissions to treatment for cocaine abuse for young adult females when referred by licensed drug abuse provider-referred (OR=1.611, CI=1.545-1.679) and other provider-referred (OR=1.205, CI=1.141-1.273) when compared to reference category.

However, I observed lower odds of being admitted to treatment for cocaine/crack abuse among young adult males (OR=0.478, CI=0.322-0.709, see Table 2) and females (OR=0.518, CI=0.311-0.865, see Table 3) when school-referred compared to reference category. Young adult males that self-referred themselves to treatment facilities have a significant higher odds of being admitted to treatment for cocaine/crack abuse (OR=1.18, CI=1.002-1.070;  $p=.00$ , see Table 2) compared to their female counterparts that showed no significant difference when they self-referred themselves to the same treatment programs (OR= 1.035, CI=1.002-1.070;  $p=0.162$ , see Table 3). Similarly, I observed a statistically significant difference in the increased odds of admissions to treatment for cocaine/crack abuse for young adult males when employer-referred (OR=1.510, CI=1.280-1.780;  $p=.000$ , Table 2) and community-referred (OR=1.129, CI=1.085-1.174,  $p=0$ , Table 2).

However, for young adult females, I observed not all source of treatment referrals showed a statistically significant difference in association with the prevalence of cocaine/crack use disorder (Table 3). This study showed that young adult females who are being referred to substance abuse treatment programs by licensed drug abuse healthcare providers and other licensed professionals have an increased odds of admissions for treatment for cocaine/crack abuse (licensed drug abuse healthcare providers: OR=1.611, CI=1.545-1.679,  $p=.000$ ; other licensed providers: OR= 1.205, CI =1.41-1.5273,  $p=.000$ , see Table 3). Other sources of treatment referrals for young adult females yielded no statistically significant difference in the relationship with the odds of being admitted to treatment for cocaine/crack abuse (self-referred:  $p=.039$ ; Employer:  $p=.107$ ; Community:  $p=.071$ , see Table 3).

The developed hypothesis for this study states whether reported cocaine use disorder among young adult admissions to substance abuse treatment facilities is significantly associated with their living arrangement after controlling for covariates. I observed the odds of admissions to treatment for cocaine/crack abuse among young adult male is 1.057 (CI=1.020-1.096,  $p=.002$ , see Table 2) compared to their female counterparts. However, for young adult females with independent living arrangement, there is no statistically significant difference in relationship with the odds of admissions to treatment for cocaine/crack use disorder (OR=1.033, CI=1.002-1.070,  $p=.162$ , see Table 3). Analyses of young adult males and females who are living under their parental supervision showed no statistically significant difference in association with the odds of being admitted to treatment for cocaine/crack abuse (males: OR=1.023, CI=0.933-1.054,  $p=.129$ , see Table 2; females: OR=1.012, CI=0.976-1.050,  $p=.526$ , see Table 3).

Analyses of demographic characteristics in this study showed a significant difference in the relationship between the odds of being admitted for cocaine/crack use disorder and age, educational status, race, psychiatric problems, and the number of previous treatment episodes for both young adult males and females (Table 2; Table 3). I observed highest odds of admissions to treatment for cocaine/crack abuse among young adult males and females age group 21-24 with young adult females having higher odds of being admitted for treatment for abuse of cocaine/crack (OR=2.816, CI=2.727-2.907, Table 3) compared to their male counterparts (OR=1.988, CI=1.93-2.040, Table 2). Similarly, young adult females with psychiatric problems in addition to their drug abuse were observed to have higher odds of being admitted to treatment for cocaine/crack abuse



(OR=1.829, CI=1.782-1.876, Table 3) than their male counterparts (OR=1.606, CI=1.572-1.639, Table 2). In this study, I also observed young adult females who are in 1st-8th have higher odds of admissions to treatment for cocaine/crack abuse (OR=1.501, CI=1.384-1.617, Table 3) compared to young adult males (OR=1.319, CI=1.237-1.407, Table 2).

For the association between race and odds of admissions to treatment for abuse of cocaine/crack, I observed an odds ratio of 1.047 for young adult White males (See Table 2) and 1.203 for young adult White females (See Table 3). Regarding ethnicity association with drug abuse, I observed an increased odds of being admitted to treatment for cocaine/crack abuse among young adult Hispanic males (OR=1.277, CI=1.240-1.315, see Table 2) than their female counterparts (OR=0.787, CI=0.754-0.822, see Table 3). Analyses of the number of previous treatment episodes showed young adults with none or one previous treatment episodes have higher odds of admissions to treatment for cocaine/crack abuse compared to those with more than one previous treatment episodes (Table 2; Table 3). I also observed young adult males and females both have lower odds of being admitted to treatment for abuse of cocaine/crack with no prior treatment episodes (males: OR=0.452, CI=0.438-0.466, Table 2; females: OR=0.339, CI=0.327-0.352, Table 3) or one prior treatment episodes (males: OR=0.550, CI=0.532-0.568, Table 2; females: OR=0.452, CI=0.435-0.470, Table 3).

## **Tables**

### Table 1

*Young adult admissions for cocaine use disorder - demographic characteristics, TEDS-A, 2015*

Cocaine/crack reported at admissions	14.3%	106,340 (N)
Cocaine/crack nor reported at admissions	86.7%	639,575 (N)

Table 2

*Characteristics and multivariate logistic regression analyses of young adults male admissions to treatment facilities with cocaine use disorder as the main drug of abuse (N=464928), TEDS-A, 2015*

**Variables (%)		Cocaine/Crack abuse			
		(%)	OR	95% CI of OR	<i>p-value</i>
Age (Years)	18-20	8.0	0.625	0.597-0.655	.000
	21-24	11.5	0.809	0.786-0.833	.000
	25-29	14.0	0.896	0.875-0.918	.000
	30-34 (Reference)	16.0			
Age at First Use (Years)	11 and Under	11.0	0.635	0.584-0.589	.000
	12-14	11.6	0.697	0.650-0.689	.000
	15-17	12.2	0.783	0.732-0.838	.000
	18-20	14.8	0.913	0.852-0.977	.009
	21-24	16.7	0.959	0.895-1.028	.237
	25-29	18.8	1.046	0.975-1.123	.213
	30 and Over (Reference)	18.4			
Living Arrangements	Independent	13.0	1.057	1.020-1.096	.002
	Dependent	13.4	1.023	0.993-1.054	.129
	Homeless (Reference)	17.5			
Principal Source of Referral	Self/Individual	15.1	1.118	1.090-1.146	.000
	Drug Abuse Providers	22.1	1.723	1.668-1.780	.000
	Other Licensed Providers	15.1	1.217	1.161-1.276	.000
	School	3.7	0.478	0.322-0.709	.000
	Employer	12.4	1.510	1.280-1.780	.000
	Community	12.0	1.129	1.085-1.174	.000
Race	Court/Criminal Justice (Ref)	10.2			
	Whites	13.5	1.047	1.022-1.073	.000
	Non-Whites (Reference)	13.7			

Ethnicity	Hispanic	15.7	1.277	1.240-1.315	.000
	Non-Hispanic (Reference)	13.2			
Employment Status	Employed	10.4	0.832	0.812-0.853	.000
	Unemployed (Reference)	15.2			
Education	1 <sup>st</sup> – 8 <sup>th</sup> Grade	16.9	1.319	1.237-1.407	.000
	9 <sup>th</sup> -11 <sup>th</sup> Grade	13.5	1.236	1.169-1.307	.000
	12 <sup>th</sup> Grade	13.5	1.155	1.095-1.217	.000
	Associate Degree	14.6	1.229	1.163-1.300	.000
	College Degree (Reference)	12.4			
Psychiatric Problem	Yes	18.2	1.606	1.572-1.639	.000
	No (Reference)	10.8			
Number of Prior Treatment	None	9.1	0.452	0.438-0.466	.000
	One	11.2	0.550	0.532-0.568	.000
	Two	14.7	0.699	0.675-0.724	.000
	Three	16.8	0.797	0.766-0.828	.000
	Four	18.8	0.899	0.859-0.940	.000
	Five or More (Reference)	21.8			

\*\* $\chi^2 (p) = 00; p < .01$

\*\* Young male admissions: Living arrangement ( $\chi^2 (2) = 832.678, p = .000$ ); Treatment referrals ( $\chi^2 (6) = 5010.742, p = .000$ ).

Table 3

*Characteristics and multivariate logistic regression analyses of young adults female admissions to treatment facilities with cocaine use disorder as the main drug of abuse (N= N=280,752), TEDS-A, 2015*

**Variables (%)		Cocaine/Crack abuse			
		(%)	OR	95% CI of OR	p-value
Age (Years)	18-20	11.0	0.839	0.792-0.888	.000
	21-24	13.1	0.836	0.805-0.867	.000
	25-29	15.9	0.942	0.914-0.971	.000
	30-34 (Reference)	17.5			
Age at First Use (Years)	11 and Under	13.0	0.571	0.515-0.632	.000
	12-14	13.0	0.600	0.557-0.646	.000
	15-17	13.8	0.691	0.643-0.742	.000
	18-20	16.3	0.834	0.776-0.896	.009

	21-24	18.4	0.926	0.861-0.995	.237
	25-29	20.1	0.976	0.907-1.050	.213
	30 and Over (Reference)	20.2			
Living Arrangements	Independent	15.5	1.033	1.002-1.070	.162
	Dependent	14.9	1.012	0.976-1.050	.526
	Homeless (Reference)	19.0			
Principal Source of Referral	Self/Individual	15.9	1.035	1.002-1.070	.039
	Drug Abuse Providers	24.4	1.611	1.545-1.679	.00
	Other Licensed Providers	17.0	1.205	1.411-1.273	.000
	School	4.6	0.518	0.311-0.865	.012
	Employer	14.2	1.312	0.943-1.825	.107
	Community	13.1	0.962	0.921-1.003	.071
	Court/Criminal Justice (Ref)	12.5			
Race	Whites	15.4	1.203	1.166-1.241	.000
	Non-Whites (Reference)	15.5			
Ethnicity	Hispanic	13.6	0.787	0.754-0.822	.000
	Non-Hispanic (Reference)	15.8			
Employment Status	Employed	10.5	0.725	0.700-0.751	.000
	Unemployed (Reference)	16.9			
Education	1 <sup>st</sup> – 8 <sup>th</sup> Grade	21.4	1.501	1.384-1.617	.000
	9 <sup>th</sup> -11 <sup>th</sup> Grade	15.6	1.219	1.144-1.299	.000
	12 <sup>th</sup> Grade	15.0	1.126	1.061-1.195	.000
	Associate Degree	16.6	1.201	1.129-1.277	.000
	College Degree (Reference)	14.3			
Psychiatric Problem	Yes	20.6	1.829	1.782-1.876	.000
	No (Reference)	10.9			
Number of Prior Treatment	None	9.7	0.339	0.327-0.352	.000
	One	13.0	0.452	0.435-0.470	.000
	Two	16.6	0.576	0.552-0.601	.000
	Three	19.6	0.680	0.649-0.713	.000
	Four	21.9	0.776	0.734-0.820	.000
	Five or More (Reference)	28.1			

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\*\* $\chi^2 (p) = 00; p < .001$

\*\*Young female admissions: Living arrangement ( $\chi^2 (2) = 401.436, p = .000$ ); Treatment referrals ( $\chi^2 (6) = 21826.123, p = .000$ ).

#### 4.0 Discussion

Cocaine/crack use disorder remains a significant public health problem in the United States and the current study findings contributed to the existed body of knowledge about the increasing rate of cocaine/crack use disorder among adult population (Karsinti et al., 2018; SAMHSA, 2017; Fischer et al., 2015; Karriker-Jaffe, 2013; Sterk, Elifson & DePadilla, 2013). Understanding how individual living arrangements or the various sources of referrals to substance abuse treatment facilities relates to the increased prevalence of admissions for cocaine/crack use disorder among adult males and females aged 18-34 could provide insight on how to address lower the incidence of cocaine/crack use disorder. To enhanced knowledge in the literature of these two crucial predictive risk factors, analysis of the 2015 TEDS-A admissions national archival records showed a significant relationship for the odds of admissions to treatment for abuse of cocaine/crack existed between all the sources of treatment referrals for young adult males ( $p < .01$ , see Table 2). However, for young adult females, a similar significant relationship between the odds of admissions to treatment for cocaine/crack abuse and the various sources of treatment referrals was observed only for licensed drug abuse healthcare providers and other licensed healthcare providers ( $p < .01$ , see Table 3). In this study, I found both young adult males and females whether the living in a homeless, independent or dependent setting showed no significant relationship with their odds admissions to treatment for abuse of cocaine/crack ( $p > .01$ , see Table 2; Table 3). These findings indicated a mixed relation to developed study hypothesis.

Multiple logistic regression analyses of demographic factors in this study showed young adults psychiatric problems in addition to drug abuse problems have higher odds of being admitted to treatment for abuse of cocaine/crack compared to their peers with no psychiatric problems. I observed young adult females with psychiatric problems in addition to their drug abuse issues have 1.829 times increased odds of admissions to treatment for cocaine/crack abuse compared to 1.606 times observed among young adult males. This finding is consistent with the study by Schulte and Hser (2014) that showed the health condition of an individual is associated with substance use.

The significant findings from this present study showed young adult males and females that are licensed drug abuse healthcare provider-referred, other licensed healthcare provider-referred and schools-referred have a significantly increased odds of admissions to treatment for cocaine/crack abuse. In this study, I observed the odds of being admitted to treatment for cocaine/crack abuse among young adult males is 1.723 times higher when licensed drug abuse healthcare provider-referred and 1.217 times when other licensed healthcare provider-referred. I also observed a similar outcome for young adult females with 1.611 times the odds of admissions to treatment for cocaine/crack abuse when licensed drug abuse healthcare provider-referred and 1.205 times when other licensed healthcare provider-referred. This study findings are consistent with developed study hypothesis showing reported cocaine use disorder among young adult admissions to substance abuse treatment facilities is significantly associated with their source of treatment referrals after controlling for covariates. Findings are also consistent with previous studies that reported the association between neighborhood

deprivation and the abuse of drugs in adulthood (Linton et al., 2017; Kennedy, Epstein, Phillips & Preston, 2013; Lander, Howsare & Byrne, 2013; Karriker-Jaffe, 2013).

However, lower odds of being admitted to treatment when school-referred for both young adult males (OR= 0.478, CI= 0.322-0.709) and females (OR= 0.518, CI=0.311-0.865).

Similar outcome of lower odds of being admitted to treatment was observed when young adult males and females have none or one prior treatment episodes (Table2; Table3).

Several researches have reported the challenges of young adults faced in their living setting that includes crime, alcohol abuse, peer pressure, social norms, security and the lack of infrastructural resources which all contributed in increasing their risky behaviors and exposure to substance abuse (Johnston et al., 2015; Degenhardt et al., 2014; Karriker-Jaffe, 2013; Sterk, Elifson & DePadilla, 2013; Badiani, & Spagnolo, 2013; Sterk, Elifson & DePadilla, 2013). I observed no significant odds of abuse of cocaine/crack among either young adult males or females admitted to treatment facilities based on their living arrangement conditions. This finding is not in agreement with the developed hypothesis that states that cocaine use disorder among adolescent adult admissions to substance abuse treatment facilities is significantly associated with their living arrangements after controlling for covariates. This finding is also in agreement with previous studies that reported crime, alcohol abuse, peer pressure, social norms, security and not individual living arrangements could contribute to increase odds of cocaine/crack use disorder among young adults (Degenhardt et al., 2014; Karriker-Jaffe, 2013; Sterk, Elifson & DePadilla, 2013). Implications from study findings are two-fold (a): that intervention that targets individual living arrangements, not neighborhood factors

in lowering cocaine/crack use disorder and (b): licensed healthcare professionals in reducing the epidemic of cocaine/crack use disorder among young adult aged 18-34.

Although this present study showed notable significant findings regarding two important risk factors – living arrangements and the source of treatment referrals that will contribute in the policy-making decision in combating cocaine/crack use disorder crisis, it is essential to mentioned study limitations. The following are the limitations (a): due to lack of separating treatment readmissions records by TEDS-A national data on substance abuse, there is the chance for duplication of treatment admissions records. However, TEDS-A utilized a formatted percentage distribution system for admissions; (b): Even though TEDS-A dataset presented primary, secondary and tertiary drug of abuse, in this study, young adults primary drug of abuse met study criteria; (c): Effects of confounders in research such as psychiatric problem in addition to the drug problem was controlled using multiple logistic regression. TEDS-A is the central national registry in the United States with about 80% of national archival data on substance abuse. A future study that examines the aspects of neighborhood factors instead of individual living arrangement and the system of treatment facilities before the policy-making decision for intervention among young adults cocaine/crack use disorder will be vital.

## **5.0 Conclusion**

Cocaine abuse was recently reported as the second most abused drugs in the United States and among the top five most addictive drugs in the world. This represents a global public health epidemic that continues to affects many vulnerable individuals and their families. The available preventive strategies and campaigns programs are still not



sufficient. In the United States, reported high-risk behaviors exhibited by young adults' increases their odds of being exposed to cocaine/crack use disorder during adulthood. Finding from this present study adds to the knowledge in literature in elucidating the epidemiology of cocaine/crack use disorder among young adult males and females ages 18-34 by assessing the role of who referred them to treatment facilities and the influence of their high-risk homes. The outcomes from this current study significantly showed referrals by licensed healthcare professionals and employers does increased the odds of admissions to treatment among targeted young adult. Target intervention and policy-making towards these higher-risk young adults particularly those referred by licensed drug abuse doctors will be beneficial in lowering prevalence of admissions to treatment for abuse of cocaine/crack and improve their health outcomes in their respective living arrangements.

#### Conflict of Interest

None

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### **Part 3: Summary**

The commonly abused drugs in the United States include prescription opioids, heroin, and cocaine. The rate of prescription opioids, heroin and cocaine use disorders in the United States have reached an epidemic level that profoundly affects users, their families, productivity, and society as a whole. It cost the United States approximately \$600 billion annually to address the public health crisis of substance use disorder (NIDA, 2018). An estimated 2.4 million people abuse prescription opioids in 2017 (SAMHSA, 2017), 37.5% increase in heroin abuse between 2002 and 2016 (SAMHSA, 2017), and 2.2 million people abuse cocaine/crack in 2017(SAMHSA, 2018). Several previous epidemiological findings have provided evidence that the availability of illicit drugs, negative neighborhood and social factors profoundly increases young adults risk of exposure to the abuse of prescription opioids, heroin and cocaine (Han et al., 2017; Hu, Griesler, Wall, & Kandel, 2017; Johnston et al., 2015; Cicero, Ellis, Surratt & Kurtz, 2014; Kendler, Ohlsson, Sundquist & Sundquist, 2014; Schulte & Hser, 2014; Karriker-Jaffe, 2013; Jones, 2013).

Risk factors including peer pressure, developed social relationship, sexual behavior, economic stress, insecurity, unemployment, housing, poverty, and limited resources influence the decision-making process of most young adults in the United States (Linton et al., 2017; Johnston et at., 2016; Hitschfeld et al., 2015; Kendler, Ohlsson, Sundquist & Sundquist, 2014; Karriker-Jaffe, 2013; Kennedy, Epstein, Phillips & Preston, 2013; Goldberg, Strutz, Herring & Halpern, 2013). The observed significant heavy episodes of alcohol intake (SAMHSA, 2010), the high rate emergency visits for

abuse of prescription opioids (SAMHSA, 2010; Cerdá et al., 2015), and tobacco use among young adults increase their risk for drug use disorder (Smith, Mazure & McKee, 2014). Sexual risk behaviors and worse health behaviors were also shown to increase the craving for the abuse of prescription opioids, heroin and cocaine among young adult that predisposes them to the risk of mental illness, cardiovascular diseases, accidental drug overdose, mood disorder, hepatitis, HIV/AIDS, cancer, and suicidal ideation (NIDA, 2017; Schulte & Hser, 2014). Therefore, understanding these risk factors and risky behaviors among young adults and their relation to their living setting and treatment programs referrals is a significant step in lowering the prevalence of prescription opioids, heroin and cocaine use disorder.

This study examined whether an independent living arrangement and the source of treatment referrals were significantly associated with (a): prescription opioids use disorder; (b): heroin use disorder; and (c): cocaine use disorder as reported by young adult admissions ages 18-34 to treatment programs after controlling for covariates. The categorical predictor variables investigated in these studies include young adults living arrangement and the source of treatment referrals. While the three dependent variables evaluated, include prescription opioids disorder, heroin use disorder, and cocaine use disorder. Covariates variables controlled in all these studies include age at first use, race, age, education, employment status, ethnicity, number of prior treatment episodes, psychiatric problems in addition to drug problems, and gender. In these studies, the secondary data were from the 2015 Treatment Episode Data Set – Admissions that is regulated by the United States government agencies or substance abuse treatment

programs. I used archival records of 2015 adults' admissions ages 18-34 who reported prescription opioids disorder, heroin use disorder, and cocaine use disorder as their primary drug problem at the time of entry to treatment facilities (N = 745, 915).

These studies aimed to fill a knowledge gap in the literature by answering the research questions: What is the relationship between the living arrangement and source of treatment referrals, and (a): reported non-medical use of prescription opioids among adults aged 18-34 admitted to treatment programs in the United States after controlling for covariates? (b): reported heroin abuse among adults aged 18-34 admitted to treatment programs in the United States after controlling for covariates? (c): reported cocaine abuse among adults aged 18-34 admitted to treatment programs in the United States after controlling for covariates? I hypothesized that independent living arrangement is significantly associated with (a): prescription opioids use disorder, (b) heroin use disorder and (c): cocaine/crack use disorder as reported by young adult admissions to treatment programs after controlling for covariates. The second hypothesis states that the source of treatment referrals is significantly associated with (a): prescription opioids use disorder, (b) heroin use disorder and (c): cocaine/crack use disorder as reported by young adult admissions to treatment programs after controlling for covariates. I used multiple logistic regression analyses to test these hypotheses.

In the first study for non-medical use of prescription opioids defined as other opiates and synthetics, I observed a statistically significant association between the odds of admissions to treatment for non-medical use of prescription opioids, and independent living arrangement and the source of treatment referrals after controlling for covariates



among adults ages 18-34( $p=.000$ ). Multiple logistic regression results showed the odds of being admitted to treatment for non-medical use of prescription opioids for young adults living in an independent setting without any parental supervision is 1.057(CI=1.036-1.079). This study also showed that young adults increased odds of admissions to treatment for abuse of prescription opioids increases when they self-referred themselves to treatment programs (OR = 1.638, CI = 1.608-1.668), by licensed drug abuse healthcare providers (OR = 1.608, CI = 1.567-1.65), by other licensed healthcare providers (OR = 1.896, CI= 1.836-1.958) when compared to reference group. Results also showed significant differences between admissions to treatment for abuse of prescription opioids and race ( $p<.01$ ). I found a higher odds of admissions to treatment for abuse of prescription opioids among young adult Whites (OR = 2.260, CI = 2.214-2.308) when compared to the reference young adult Non-Whites. Results also show a significantly associated between increased odds of admissions to treatment for abuse of prescription opioids and young adults' number of previous treatment episodes.

In the second study for abuse of heroin, I observed a statistically significant association between the odds of admissions to treatment for heroin abuse, and the source of treatment referrals (except for employer-referred:  $p=.656$ ) after controlling for covariates among adults ages 18-34 ( $p=.000$ ). However, no statistically significant association between independent living arrangement and the odds of admissions to treatment for heroin abuse ( $p=.288$ ). The results of multiple logistic regressions showed that young adult males (OR=3.692, CI=3.615-3.771) and females (OR=2.704, CI=2.630-2.779) both had increased odds of admissions to treatment for heroin abuse when they

referred themselves to treatment programs. I also observed an increased odds of admissions to treatment for heroin abuse among young adults when licensed drug abuse healthcare providers-referred (males: OR=3.246, CI=3.149-3.347; female: OR=2.515, CI=2.421-2.613). However, there were lower odds of admissions to treatment for heroin abuse when referred to treatment by other sources of referrals. I observed a lower odds of admissions to treatment for heroin abuse among young adult White males (OR=0.340, CI=0.332- 0.348) and females (OR=0.348, CI=0.338 - 0.358) compared to their reference non-Whites reference category. Multiple logistic regression results also showed a statistically significant difference between increased odds being admitted to treatment for heroin use disorder and young adult males and females' number of previous treatment episodes records ( $p<.01$ ).

In the third study for cocaine/crack use disorder, I observed a statistically significant association between the odds of admissions to treatment for cocaine/crack abuse and all types of treatment referrals for young adult males ( $p<.01$ ). I also observed a statistically significant relationship existed between the odds of admissions to treatment for abuse of cocaine/crack and the various types of treatment referrals - the licensed drug abuse healthcare providers-referred, other licensed healthcare providers-referred, and school-referred ( $p<.01$ ). Results of multiple logistic regression revealed an increased odds of admissions to treatment for cocaine/crack abuse among young adult males (OR=1.723, CI=1.68-1.780) and females (OR=1.611, CI=1.545-1.679) who are referred to treatment programs by licensed drug abuse health professionals. In this study, I also observed a lower odds of being admitted to treatment for cocaine/crack abuse when young adults

where school-referred (males: OR=0.478, CI=0.322-0.709; female: OR=0.518, CI=0.311-0.86). However, other types of treatment referrals for young adult females showed no statistically significant association with the odds of admissions to treatment for abuse of cocaine/crack for self-referred ( $p=.039$ ), employer-referred ( $p=.107$ ), and community-referred ( $p=.071$ ). Results of multiple logistic regression analyses of living arrangement also revealed no statistically significant difference in the association between the odds of admissions to treatment for abuse of cocaine/crack among young adult males and females who are living under their parental supervision ( $p>.01$ ).

I also observed a statistically significant difference between the number of prior treatment episodes and the increased odds of admissions to treatment for cocaine/crack use disorder among young adult males and females ( $p<.01$ ). Similarly, young adult males (OR=1.606, CI=1.572-1.639) females (OR=1.829, CI=1.782-1.876) with psychiatric problems in addition to their drug abuse problem were observed to have higher odds of admissions to treatment for cocaine/crack abuse. This association between young adults psychiatric problems in addition to their drug abuse problem and increased odds of admissions to treatment for abuse of cocaine/crack not found with abuse of prescription opioids and heroin. Race is not a significant predictor of the odds of admissions to treatment for cocaine/crack use disorder among young adults as observed with the studies for prescription opioids use disorder and heroin use disorder.

### **Interpretations of findings**

One of the significant concepts of the Biopsychosocial Model created by George Engel stated the onset, course, and treatment of physical illness of an individual are

related and that the psychological factors including childhood early exposure, health conditions, and self-awareness influenced the physical state of individual and plays a role in health pattern on drugs (Kusnanto, Agustian & Hilmanto, 2018; Buchman, Skinner & Illes, 2010; Borrell-Carrió, Suchman & Epstein, 2004). This theoretical model helps in facilitating the findings in this studies that showed a significant association between independent living arrangement and the principal source of referral and admissions to treatment for the abuse of prescription opioids, heroin, and cocaine among the young adult audience ages 18-34 living in the United States.

The results across the three studies of testing the first hypothesis showed (a): a significant association between independent living arrangement without any parental supervision and the increased risk of admissions to treatment for prescription opioids abuse among young adults aged 18-34 living in the United States; (b): a significant association between independent living arrangement without any parental supervision and the increased risk of admissions to treatment for heroin abuse observed only among young adults males aged 18-34 living in the United States; and (c): a significant association between independent living arrangement without any parental supervision and the increased risk of admissions to treatment for cocaine/crack abuse observed only among young adults males aged 18-34 living in the United States. These findings were consistent with the proposed hypothesis. Results also highlight young adult males and females who are in a living setting that lack any parental supervision are more likely to report admissions to treatment for abuse of prescription opioids, heroin, and cocaine/crack. These findings also aligned with several studies results that showed

understanding the dynamics of the living condition of a person with drug use disorder is essential for determining the influence of neighborhood in lowering the risk of exposure (Linton et al., 2017; Schulte & Hser, 2014; Novak et al., 2016).

However, there were mixed outcomes concerning the first hypothesis for heroin use disorder and cocaine/crack use disorder. No significant association existed between the independent living arrangement and the increased odds of admissions to treatment for abuse of heroin and cocaine/crack among young adult females aged 18-34 living in the United States. These findings were not in agreement with the developed hypothesis that states increased odds of admissions to treatment for abuse of heroin and cocaine/crack was significantly associated with their living arrangements after controlling for covariates. This finding was also in agreement with other prior studies that found that increase odds of substance use disorder among young adults is contributed by peer pressure, insecurity, social norms, alcohol abuse, early exposure, and not individual living arrangements (Degenhardt et al., 2014; Karriker-Jaffe, 2013; Sterk, Elifson & DePadilla, 2013).

Testing the second hypothesis showed a significant association between the source of treatment referrals and the increased risk of admissions to treatment for abuse of prescription opioids, heroin, and cocaine/crack among young adults aged 18-34 living in the United States. These results were consistent with the second formulated hypothesis. I observed young adult males and females aged 18-34 living in the United States that are licensed drug abuse healthcare providers-referred and other licensed healthcare providers-referred have a significantly increased odds of admissions to treatments for

abuse of prescription opioids, heroin, and cocaine/crack. I also observed a significantly increased in the odds of admissions to treatment for abuse of prescription opioids, and heroin among young adult males and females aged 18-34 living in the United States that self-referred themselves to treatment facilities. However, young adult males and females who self-referred themselves to treatment programs are not at risk of increased odds of admissions to treatment for cocaine/crack use disorder. I observed these findings were consistent with other prior studies that reported the association between neighborhood deprivation and the abuse of drugs in adulthood (Linton et al., 2017; Kennedy, Epstein, Phillips & Preston, 2013; Lander, Howsare & Byrne, 2013; Karriker-Jaffe, 2013). In these studies, I observed lower odds of admissions to treatment for all three drugs when young adults were referred to treatment programs by other sources of treatment referrals including employer, community, and school.

Analysis of the controlled covariates in these studies was found to be related to increasing the odds of admissions to treatment for prescription opioids use disorder, heroin use disorder, and cocaine/crack use disorder. The results show age at first use of the drug of abuse is not an essential predictive risk factor for the odds of admissions to treatment for non-medical use of prescription opioids. In this study, I observed lower probability for admissions to treatment for non-medical use of prescription opioids when they are initiated with non-medical use of prescription opioids during adolescent at ages 11 through 17 (Miech et al., 2015). For heroin use disorder, I also found similar results for young adult males and females when exposed to drugs at an early age. This finding is in contrast with previous study that showed individuals exposed to non-medical use of

prescription opioids at an early age have an increased heroin use risk behaviors (Jones, 2013).

In these studies, I also found the race of an individual to be significantly associated with odds of admissions to treatment for abuse of prescription opioids, heroin and cocaine/crack among young adults. White young adults were found to have increased odds of admissions to treatment for non-medical use of prescription opioids and abuse of cocaine cocaine/crack than non-White peers. However, lower odds of being admitted for treatment for abuse of heroin was observed among white young adults. Also, results showed non-Hispanic young adults were less likely to report admissions to treatments for abuse of cocaine/crack than their reference to Hispanic peers. This outcome confirms the findings by Otiniano and colleagues (2014) that nativity and ethnicity play an important role in substance use disorder (Otiniano et al., 2014).

Additionally, I observed a significant association between the number of young adults' previous treatment episodes and the odds of admissions to treatment for non-medical use of prescription opioids, heroin and cocaine/crack abuse among young adults. Young adults with one or more prior treatment episodes for drug use disorder have an increased odds of admissions to treatment for non-medical use of prescription opioids, heroin and cocaine/crack abuse. This results correlated with findings by Schulte and Hser (2014) that showed the association between the health conditions of individuals with substance use disorder and the prevalence of substance use (Schulte & Hser, 2014).

Lastly, I observed a significant association between psychiatric problems in addition to their drug abuse issues among young adults and the odds of admissions to

treatment for non-medical use of prescription opioids, abuse of heroin and cocaine/crack. Young adults with psychiatric problems in addition to their drug abuse problems have increased odds of admissions to treatment for abuse of cocaine/crack. This finding is also consistent with the previous study that revealed the association between substance use disorder and the health condition of a drug user (Schulte & Hser, 2014).

### **Limitations of the Study**

Despite the compelling findings in all the three studies in addressing prescription opioids use disorder, heroin use disorder and cocaine/crack use disorder among young adults' ages 18-34 living in the United States, there are several limitations identified. There is a possibility of duplication of client's admissions records to TEDS because TEDS-A national data on substance abuse does not differentiate the client's treatment readmissions. However, the new admissions effect on TEDS recorded data is unlikely because information collected by TEDS-A national data is formatted in percentage distribution that eliminates the possible effect of any additional admissions. The results interpretation should take into account that these studies used the only primary drug of abuse reported by young adults' admissions at the time of entry to treatment programs that meet this study criterion. There is secondary and tertiary client's drug of abuse reported at the time of admissions. The psychiatric problem in addition to the drug problem is a possible causative factor and was controlled using multiple logistic regression analysis. The archival TEDS admissions data is on substance abuse from states that received federal funds and not all national information on substance abuse treatment admissions were included. However, TEDS admissions data is a representation of more



than 80% of national treatment admissions obtained in the United States. The results of this study are limited to the adult population ages 18-34 and cannot be generalized to the general population outside this age group. Lastly, prescription fentanyl not part of other opiates and synthetics drug in the TEDS national data which could confound the outcome of prescription opioids use disorder study. However, future research should examine patterns of non-medical use of prescription opioids prevalence among other age groups to better-understood indicators of living arrangement and treatment referrals risk.

### **Recommendation for Future Research**

These quantitative studies examined the predictive relationships between odds of admissions to treatments for (a) prescription opioids use disorder; (b) heroin use disorder; and (c) cocaine use disorder by young adults ages 18-34 in the United States and two under-studied independent variables: independent living arrangement and clients' principal source of referral using TEDS-A 2015 national data. Findings from these studies showed the trend in the prevalence of admissions to treatment for non-medical use of prescription opioids, heroin and cocaine/crack abuse among US adult population 18-34 by analyses of their living arrangements and the principal sources of treatment referral as recorded in 2015. Research that focuses on understanding the aspects of young adult non-medical prescription opioids users, heroin users, and cocaine/crack users' sources of referrals to treatment programs and the risk of relapse before the development of target intervention and policy will be beneficial. The examination of the aspects of neighborhood factors instead of individual living arrangement and the system of treatment facilities before the policy-making decision for intervention among young

drug use disorder will be vital. Utilization of secondary national data set for substance abuse that include fentanyl in other opiates and synthetics abuse may be useful in understanding the prescription opioids use disorder trend among young adults.

### **Implications**

Findings from these studies are beneficial for targeted interventions at young adults with drug use disorders that included prescription opioids use disorder, heroin use disorder, and cocaine/crack use disorder. Although several sources of treatment referrals to substance abuse treatment programs are effective in lowering the prevalence of admissions to treatment for drug use disorder, if young adults' users referred for treatment programs from these sources, then the implications are that some outreach or case finding should be targeted there. These findings emphasized a need for a target treatment and other interventions programs among young adults' users with associated higher risk treatment referral categories and exposed to neighborhoods factors and health-risk behaviors in reducing drug use disorders crisis in the United States. Prevention programs are falling for young adult drug users. We need prevention programs aimed at these people.

### **Conclusion**

The epidemics of prescription opioids use disorder, heroin use disorder, and cocaine/crack use disorder is a global public health epidemic that continues to affects many vulnerable young individuals in the United States. This present study analysis of 2015 TEDS-A national dataset through assessing the role of who referred US adult population ages 18-34 drug users to treatment facilities and the influence of their high-

risk homes adds to the knowledge in literature regarding the prevalence of admissions to treatments for prescription opioids use disorder, heroin use disorder and cocaine/crack use disorder among this target group. These studies findings highlight current program interventions are falling, the needs for effective target intervention and policy-making towards these higher-risk young adults particularly those referred by licensed drug abuse doctors, and self-referred in lowering the prevalence of abuse of prescription opioids, heroin, and cocaine/crack use disorder. While there are increasing efforts to reducing the public health crisis of non-medical use of prescription opioids and abuse of heroin and cocaine/crack among young individual through new intervention programs, a target intervention towards this young adult users is critical in lowering their risk of other chronic conditions and improve health outcomes in their respective living arrangements.

Appendix A: Doctoral Capstone Approval from Walden University IRB

IRB approval number is 07-25-18-0518047.

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