Electronic Theses and Dissertations, 2004-2019

2018

Examining the Influence of Personal and Environmental Factors on Treatment Outcomes in Opioid Dependent Medication-Assisted Treatment Patients.

Vierne Placide
University of Central Florida

Showcase of Text, Archives, Research & Scholarship

EXAMINING THE INFLUENCE OF PERSONAL AND ENVIRONMENTAL FACTORS ON
TREATMENT OUTCOMES IN OPIOID DEPENDENT MEDICATION-ASSISTED
TREATMENT PATIENTS

by

VIERNE ERICA KATRINA PLACIDE
B.S. University of South Florida, 2005
M.P.H University of South Florida, 2007

A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
in the Department of Public Affairs
in the College of Health and Public Affairs
at the University of Central Florida
Orlando, Florida

Spring Term
2018

Major Professor: Lynn Unruh

ABSTRACT

Opioid abuse has become a global epidemic and is now a huge public health concern here in the US. Non-medicinal use of opioid prescription drugs is at the forefront of the epidemic and considered the "gateway" drug to other illicit opioid use. As opioid prescribing has increased over the last decade in the US, so has opioid-related deaths, surpassing car accidents and suicide as the leading cause of injury-related deaths. Medication assisted treatment (MAT) is fundamental in decreasing opioid abuse overdose and mortality. Therefore, the research study aims to determine if counseling adherence, opioid abstinence, and retention in MATs are influenced by personal characteristics, socio-economic factors, readiness to change, social support, and integrated care. Guided by social cognitive theory, transtheoretical model, and theory of reasoned action, the study will employ a retrospective cohort design utilizing opioid dependent patients from a MAT Program in West Florida. Analysis of three cox regression models indicated for personal factors: an increase in age was associated with patients being more likely to adhere to counseling (p=.001) and retention (p=.034), full-time employment (p=.043) was positively associated with opioid abstinence, whereas part-time employment (p=.037) was positively associated with retention, having insurance (public: p=.000) was positively associated with counseling adherence, opioid abstinence (public: p=.000, private: p=.035) and retention (public: p=.000, private: p=.000). With regards to environmental influences, social support was positively associated with opioid abstinence (p=.022) and integrated care was positively associated with opioid abstinence (p=.027) and retention (p=.000). Examining these factors are necessary to improve treatment adherence and expand MAT programs. Additionally, providing funding is crucial for practitioners to continually create educational intervention strategies to

engage patients in treatment, thereby reducing the opioid overdose epidemic. This study extends the literature contributing to understanding personal factors and environmental influences in MATs.

Key words: medication assisted treatment, opioid dependence, treatment outcomes, socio-economic factors, readiness to change, social support, integrated care, prescription drugs

I dedicate this research study to my parents, Delores and Vincent Placide. I will never be able to thank you enough for your countless sacrifices and support through the years. Thank you for your unconditional love and prayers and instilling in me at an early age the importance of faith and family.

ACKNOWLEDGMENTS

"Trust in the Lord with all your heart and lean not on your own understanding; in all your ways acknowledge Him, and He shall direct your paths." Proverbs 3:5-6 Thank you Lord for your wisdom, guidance and grace. For providing hope and peace in moments of despair, as well as patience to fulfill your purpose for my life.

I am especially grateful to my dissertation chair, Dr. Lynn Unruh, who has been an exceptional adviser throughout my studies. Thank you for your guidance, support, and expecting nothing but the best from your students. Thank you for challenging me. Although you were on sabbatical for a year, you still continuously dedicated your time and knowledge to see this dissertation to completion. To my dissertation committee members, Dr. Danielle Atkins, Dr. Latarsha Chisholm, and Dr. J. Blake Scott, thank you for your professional and personal guidance. I am thankful to my chair and each committee member for your willingness to serve on my committee and your thoroughness in creating a quality product.

I am appreciative for the financial support from The College of Graduate Studies, The Doctoral Program of Public Affairs, Health Management and Informatics Department, Student Government Association, and the Eagle Advancement Institute. Thank you for your commitment to graduate students' abilities to achieve academic excellence.

Thank you to the Doctoral Program of Public Affairs' faculty and staff for their continued support. Dr. Robyne Stevenson, thank you for stepping in as interim director during my cohort's initial year and for the first conference presentation opportunity as a doctoral student. To Dr. Stephen Holmes and Dr. Jacinta Gau, thank you for providing me with a solid foundation in Statistics. Denise and Jesica, thank you for always supporting the administrative needs of the

PAF students. I am also appreciative to my cohort, from the countless study sessions, to the encouraging words shared to motivate me in pushing forward. Amanda, Atalie, Carla, and Michelle, thank you for your support through this process. In addition, I would also like to thank the faculty and staff in the Health Management and Informatics Department. A special thank you to Dr. Kourtney Nieves for providing me with the opportunity to teach undergraduate courses, and being a wonderful supervisor, and Terry for your wit and listening ear. To Chantel, Ms. Sandi and the Office of Student Involvement staff and students, thank you for assisting me in balancing my academics with student involvement, and introducing me to the additional resources at UCF outside of academia.

I am extremely grateful to the Behavioral health agency who provided me with secondary data to complete this study. Thank you for being advocates for a population often stigmatized and providing patient-centered care for those in need of treatment.

And most importantly, to my family. I am truly blessed to have a family who has continuously prayed, encouraged and supported me. I would like to thank my parents for their unconditional love and sacrifices. To my sisters, Veda, Vickki, and Sheron, and their families, for your inspiration, motivation, and guidance. To my nephews, Makai, Tyler and Brandon, know that you will always have the love and support of family, and with faith anything is possible. To my extended family -especially my uncles, aunts and cousins- and friends, thank you for your prayers and for every phone call and text filled with encouraging words. To my dear friends Gabby, Natalie and Sabria, thank you for your laughter, patience, and encouragement. As I continue on this journey of life, I sincerely thank the collective efforts of everyone for their prayers, love, guidance, and support in attaining this educational achievement.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

ANOVA – Analysis of variance

ASAM – American Society of Addiction Medicine

CAST – Community Access to Specialized Treatment

CDC – Centers for Disease Control and Prevention

CFR – Code of Federal Regulations

DEA – Drug Enforcement Agency

DSM - Diagnostic and Statistical Manual of Mental Disorders

EHR – Electronic Health Record

GED – General Equivalency Diploma

HCV – Hepatitis C Virus

HHS – United States Department of Health and Human Services

HIPAA – Health Insurance Portability and Accountability Act

HIV – Human Immunodeficiency Virus

HR – Hazard Ratio

IRB – Institutional Review Board

MAT – Medication Assisted Treatment

NIDA – National Institute on Drug Abuse

PDMP – Prescription Drug Monitoring Program

PHI – Protected Health Information

SA – Survival Analysis

SAMHSA – Substance Abuse and Mental Health Services Administration

SCT – Social Cognitive Theory

SES – Socio-economic status

TTM – Transtheoretical Model

UDS – Urine drug screen

URICA – University of Rhode Island Change Assessment

VIF – Variance Inflation Factors

CHAPTER ONE: INTRODUCTION

Within the last decade, opioid abuse has become a major public health concern. The prescription drug abuse epidemic has caused a substantial burden on society, including disease transmissions as a result of injection drug use [Human Immunodeficiency Virus (HIV) and Hepatitis C (HCV)], work productivity loss, and crime (Franckowiak & Glick, 2015; Banta-Green, Maynard, Koepsell, Wells, & Donovan, 2009; Hubbard, Craddock & Anderson, 2003). The Centers for Disease Control and Prevention (CDC) has compared the current opioid epidemic in the US to the HIV epidemic of the late 1980s and early 1990s (CDC, 2016a; Park & Bloch, 2016, para 5; American Society of Addiction Medicine, n.d.). Overdose deaths as a result of opioid drugs have surpassed car accidents as the leading cause of injury-related deaths in the US (Hwang, Turner, Kruszewski, Kolodny & Alexander, 2016; CDC, 2011, Paulozzi, 2012).

Background

An estimated 2.2 million people in the US abuse opioids, of which 1.8 million are opioid dependent (Substance Abuse and Mental Health Services Administration [SAMHSA], 2015; Rusch, 2016). Non-medicinal opioid prescription drugs are considered a "gateway drug" and have been at the forefront of the opioid epidemic (National Institute on Drug Abuse [NIDA], 2014; Maxwell, 2015; Zullig, Divin, Weiler, Haddox & Pealer, 2015). The increase in opioid prescribing is associated with a surge in opioid diversion (medical prescriptions diverted to others for recreational, non-medicinal purposes), opioid abuse, and unintentional overdose deaths (Alford, 2016; Zosel, Bartelson, Bailey, Lowenstein, & Dart, 2013; Dowell, Haegerich, & Chou, 2016; Hwang et al., 2016; Turk, Dansie, Wilson, Moskovitz & Kim, 2014; Kresina & Lubran, 2011; Rusch, 2016).

The state of Florida in particular, was sluggish to enact opioid prescribing restriction

laws, which resulted in an upsurge in opioid prescribing. In 2010, 98 of the top 100 oxycodone-

prescribing physicians practiced in the state of Florida (Tozzie, 2014). Hence there was a

combined effort to decrease the crisis. Within the next two years this declined due to the

Prescription Drug Monitoring Program (PDMP) legislation signed in 2009 with mandatory

reporting requirements stating in 2011, The Drug Enforcement Agency Initiatives (Operation

Oxy Ally and Operation Pill Nation), and the Pill Mill Law, whose restrictions closed the illegal

practices of "pill mills" (Kennedy-Hendricks et al., 2016; Florida Senate, 2011). The rates have

therefore increased of those who sought another drug (heroin for instance) or effective treatment

through medication assisted treatment (MAT) programs to deal with withdrawals (Connery,

2015; Matson, Hobson, Abdel-Rasoul, & Bonny, 2014; Banta-Green et al., 2009; Timko,

Schultz, Cucciare, Vittorio & Garrison-Diehn, 2016).

SAMHSA (2015) notes the increase in the proportions of patients admitted nationally to

drug rehabilitation programs for opioid dependence -four percent for heroin and six percent for

non-medicinal prescription increase- due to the epidemic. The US Department of Health and

Human Services (HHS) has therefore made MAT a priority. In 2015, HHS discussed its

intentions to address treatment needs of those suffering with opioid dependence, and in 2016 the

US President's budget included funding specifically for the expansion of using medication-

assisted treatment to facilitate treatment for a large proportion of the population with opioid

dependence (Rusch, 2016).

MAT is a critical component to decreasing opioid abuse overdose and mortality (Dennis

et al., 2015; Rusch, 2016; Stotts, Dodrill, & Kosten, 2009; Jones, Campopiano, Baldwin, &

McCance-Katz, 2015; Kresina & Lubran, 2011). MAT is a chronic treatment approach for opioid

dependence similar to treatment of diseases such as diabetes and hypertension (HHS, 2011; Stotts et al., 2009). The monitored medication helps addicted individuals achieve a normal state of mind (reducing cravings and withdrawals) and allows individuals to be productive citizens (HHS, 2011, p. 5; Jones et al., 2015). MAT is a combination of medication and counseling tailored to each person's treatment needs, therefore maintenance and stabilization is individualized and differs for each patient (HHS, 2011; Stotts et al., 2009).

Purpose of the Study

With the increase in opioid dependent individuals fueled by the prescription drug abuse crisis, individuals successfully progressing through treatment are a vital component in reducing the epidemic. Therefore, the research study aims to determine if counseling adherence, opioid abstinence, and retention in MATs are influenced by:

1. Personal characteristics – gender, race, age, relationship status

2. Factors which contribute beyond personal characteristics, specifically socio-economic factors – education, employment, income, health insurance

3. Readiness to change

4. Having a support system – social support

5. Receiving integrated care

The study will integrate the social cognitive theory, transtheoretical model, and theory of reasoned action in order to assess these factors.

Significance of the Study

Drug-overdose deaths in the US have almost tripled within the last two decades, with opioid-related deaths accounting for 60.9% (Rudd, Seth, David & Scholl, 2016). Florida is one

of 19 states, which saw a statistically significant increase in drug overdose deaths between 2014 and 2015 (CDC, 2016b). Figures 1 – 4, illustrate the changes in drug-related deaths (if the drug was the cause of death and present in the body at time of death) involving several types of opioids, cocaine, and heroin in Florida, as indicated by the Medical Examiners Report (Florida Department of Law Enforcement [FDLE], 2016). Figure 1 shows there was an increase in deaths of three opioids until 2010, at which time deaths decreased and remained at a lower level for a few years, then increased within the last year. The decrease in deaths correspond with the combined legislative and law enforcement efforts -enactment of the Florida Pill Mill Law, DEA Initiatives (Operation Oxy Ally and Operation Pill Nation)-, and later implementation of the PDMP. Fentanyl (shown in figure 2) and heroin (shown in figure 4) have rapidly increased in the last two years while cocaine (figure 3) has fluctuated in prior years and is on the rise again.
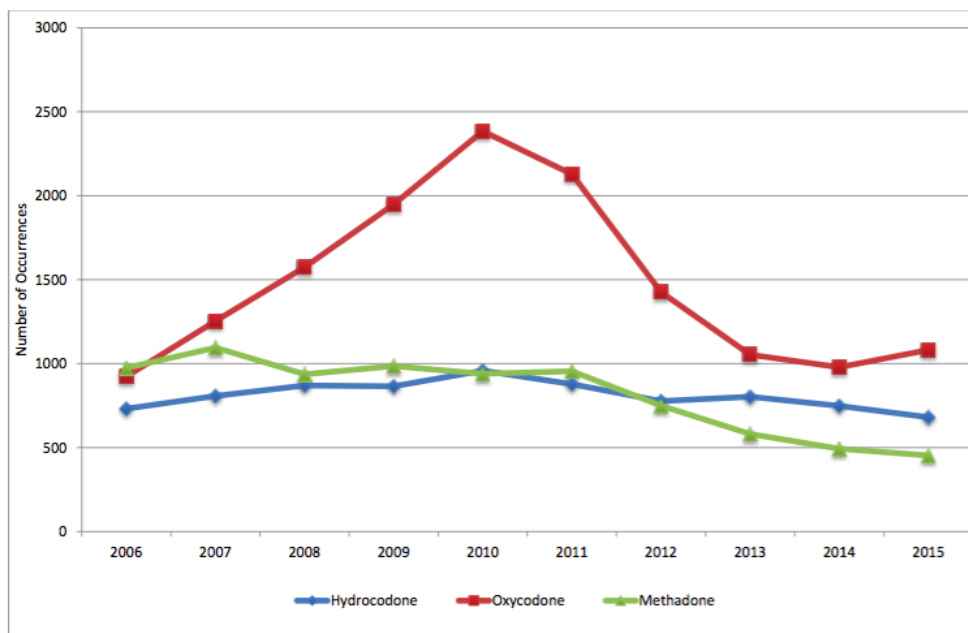
Figure 1. *Historical overview of hydrocodone, oxycodone, and methadone deaths. This figure illustrates the changes in Florida deaths inclusive of if the drug was the cause of death or present in the body at time of death (FDLE, 2016).*
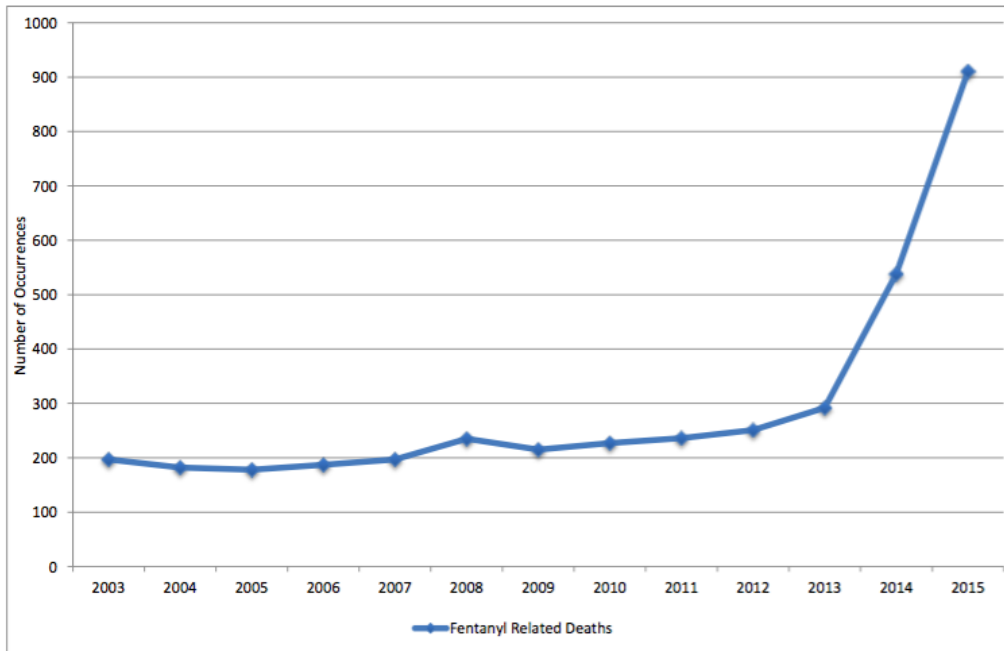
Figure 2. *Historical overview of fentanyl deaths. This figure illustrates the changes in Florida fentanyl deaths inclusive of if the drug was the cause of death or present in the body at time of death (FDLE, 2016).*
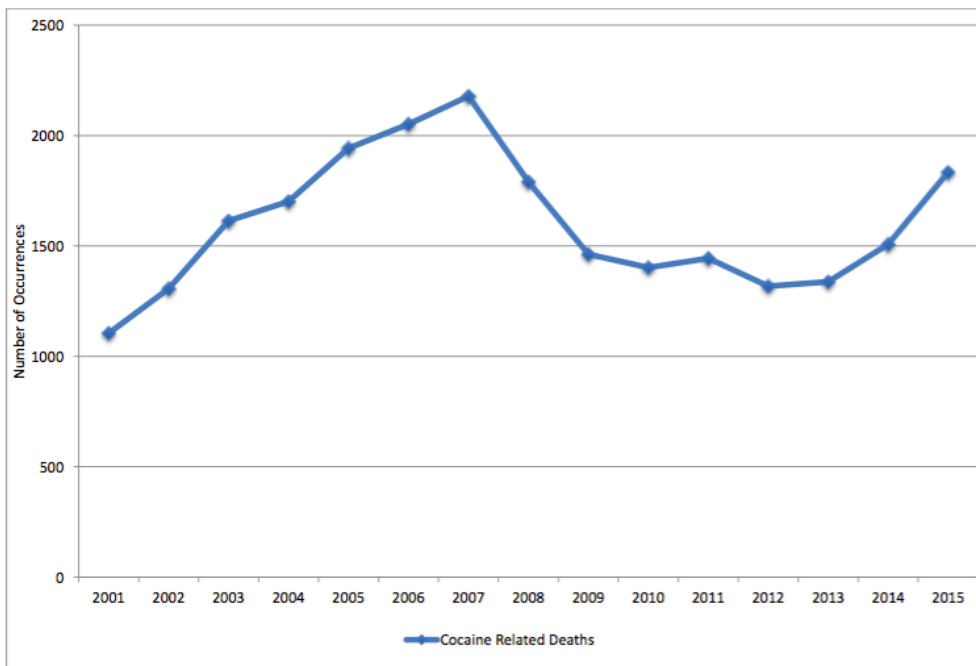
Figure 3. *Historical overview of cocaine deaths. This figure illustrates the changes in Florida cocaine deaths inclusive of if the drug was the cause of death or present in the body at time of death (FDLE, 2016).*
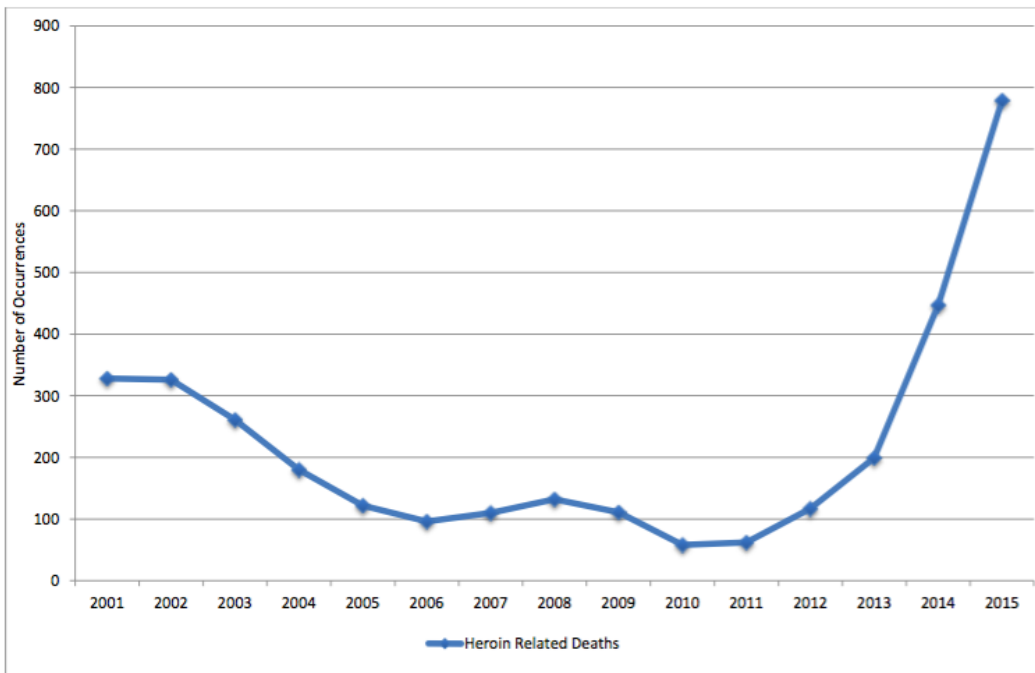
Figure 4. *Historical overview of heroin deaths. This figure illustrates the changes in Florida heroin deaths inclusive of if the drug was the cause of death or present in the body at time of death (FDLE, 2016).*

With the current opioid abuse climate, determining effective treatment modalities are essential. MAT is a prevention strategy to decrease opioid overdose deaths if patients are engaged in treatment. High relapse and lack of retention in treatment has plagued those with an opioid dependence. Considering the increase over the years in opioid prescription drug abuse, and the consequential effects created, it is important to understand the personal characteristics and socio-economic factors related to retention in treatment as well as the effects of readiness to change, support systems and integrated care on counseling adherence, abstaining from opioids, and retention in treatment. The study contributes to extending the literature on MAT and has implications to support educational, regulatory, clinical and multidisciplinary intervention strategies to combat the epidemic. The study provides a better understanding of factors that are associated with treatment outcomes.

Definition of Terms

Counseling adherence (CA): patients complying with the counseling sessions/visits agreed on in the initial treatment plan

Medication-assisted treatment (MAT): addiction treatment with medication and counseling for opioid dependent individuals.

Opioids: drugs that interact with opioid receptors on nerve cells in the brain and body (often prescribed to treat pain).

Opioid abstinence (OA): abstaining from all opioids during treatment with the exception of the medication – methadone, buprenorphine.

Opioid dependence: the effects of opioid misuse results in changes to the brain that causes addiction, and dependency on the drug.

Prescription drug abuse: the intentional use of psychoactive medications without a physician's prescription or in a way not advised by the prescribing doctor.

Retention (R): the length of time patients are engaged in medication treatment after admission

Socio-economic factors: social and economic measure of an individual's status in comparison to others based on education, employment, income and health insurance

Social support: being a part of a supportive social network i.e. friends, relatives

Stages of Change: assesses individuals' readiness to change towards a healthier behavior

CHAPTER TWO: LITERATURE REVIEW

The literature review section illustrates the magnitude of the research problem and provides a frame of reference on opioid dependence and medication-assisted treatment. Relevant literature on prescription opioid drug abuse, opioid dependence, MAT, indicators of successful treatment outcomes, and possible factors related to treatment outcomes - personal characteristics, socio-economic factors, readiness to change, social support and integrated care- are discussed. The chapter concludes with the theoretical approaches: social cognitive theory transtheoretical model, and theory of reasoned action, guiding the study.

Opioid Prescription Drug Abuse

Substance use remains an urgent public health problem, due to its physical, mental, social and financial ramifications. Over $600 billion is lost annually in the US as a consequence of substance use due to health care, crime, and work loss productivity (National Drug Intelligence Center, 2010; NIDA, 2011; Franckowiak & Glick, 2015). In particular, opioid prescription drug abuse has become a significant public health concern over the last decade, because of its association with medical complications requiring emergency department visits, increased risks of overdose, and mortality (Nargiso, Ballard & Skeer, 2015; Compton & Volkow, 2006; NIDA, 2014; Drazdowski, 2016; Phillips, 2013). Opioid prescription use for the treatment of pain has increased over the last two decades primarily due to the aggressive marketing of pain management (Zee, 2009; Phillips, 2013). The CDC has noted that the steady increase in opioid prescribing shows a parallel increase in opioid addiction and overdose deaths (2016b).

Prescription drugs are comprised of the same drug categories as illicit drugs, therefore similar pharmacological factors associated with addiction and abuse also apply to prescription

drugs (Compton & Volkow, 2006). For instance, oxycodone, oxycontin, and hydrocodone are opioids, the same category as heroin; whereas amphetamines and methylphenidate are stimulants, like methamphetamine and cocaine (Compton & Volkow, 2006; Jones, Fullwood & Hawthorne, 2012).

The CDC (2016b) indicates that over the last 2 decades the increase in opioid prescriptions alone has resulted in an opioid overdose epidemic with approximately 115 deaths per day. Of the 20% of the US population 12 years and older abusing prescription medications, opioids, are one of the most misused (SAMHSA, 2013a; Fleary, Heffer & McKyer, 2011; Phillips, 2013). Nearly 2 million Americans aged 12 or older were either dependent on or abused prescription opioids in 2014 (CDC, 2016b). Many patients are prescribed doses that increase the probability of becoming addicted to opioids (Caccavale, 2016).

Opioid Dependence

Pharmacological dependence, impaired control, risky use and social impairment are the categories from which the DSM-V (Diagnostic and Statistical Manual of Mental Disorders) uses to define at least two of the eleven criteria for the presence of a substance use disorder (Rusch, 2016). Opioid dependence is defined as "a chronic brain-based disorder with a high potential for relapse" (Timko et al., 2016, p. 22). The complexity of opioid dependence has caused a significant strain on the health care system (increased health care utilization, increased blood borne viruses – HIV, HCV), criminal justice system, and family life to name a few (Stotts et al., 2009; Timko et al., 2016). Those exposed to opioids follow a general path. Whether drugs are obtained through diversion (for recreational use) or a prescription, tolerance evolves leading to misuse (Rusch, 2016). Swallowing non-medicinal prescription drugs advance to chewing, then

9

crushing, snorting and/or intravenous drug use, to release the drug more rapidly as the dependence develops (Rusch, 2016, p. 8; Kresina & Lubran, 2011). Vulnerability to opioid dependence is behaviorally complex, encompassing environmental, psychological, and biological influences (Kresina & Lubran, 2011, p. 4103).

Annual treatment admissions for patients addicted to opioids have almost doubled within the last decade in the US; with opioids only second to alcohol as the primary reason for admission to addiction treatment (Timko et al., 2016; SAMHSA, 2015; Banta-Green et al., 2009; Franckowiak, & Glick, 2015; Jones et al., 2015). In some states, admissions have increased 10-fold, which is parallel to the increase in prescription opioid abuse (Banta-Green et al., 2009). Opioid treatment (MAT) in communities are often limited, as abstinence is still seen as the preferred method in many sectors – public, justice and legal system, mental health following the Alcoholic Anonymous (AA) 12-step program, which is inadequate for opioid dependent individuals (Rusch, 2016). For the last few decades, treatment programs have shifted from abstinence to harm-reduction treatment supporting pharmacotherapy for opioid dependents (Smyth et al., 2005).

Medication Assisted Treatment (MAT)

MAT is "the use of pharmacotherapies in combination with counseling and behavior therapies to provide a comprehensive therapeutic approach to the treatment of opioid abuse and dependence" (Kresina, & Lubran, 2011, p. 4104). MAT previously referred to as methadone maintenance treatment was developed to reduce drug cravings and withdrawal symptoms (sweats, chills, joint pain, vomiting, and diarrhea) and ultimately prevent relapse for opioid dependent individuals (Rusch, 2016; Darker, Ho, Kelly, Whiston, & Barry, 2016; Jones et al.,

2015). Appendix A provides a table summary of prior MAT studies. MAT is recognized as an effective treatment choice for opioid dependence (Saxon, Hser, Woody, & Ling, 2013; Vogel, Dürsteler, Walter, Herdener, & Nordt, 2017; Wasserman, Stewart & Delucchi, 2001; Darker et al., 2016; Franckowiak & Glick, 2015; Jones et al., 2015). However, only an approximate eight percent of those suffering from opioid dependence receive MAT (Vogel et al., 2017). The World Health Organization (WHO) (2009) has advocated for long-term strategy care (open-ended treatment, a lifetime of treatment if necessary) of MAT for this population. The Food and Drug Administration (FDA) has approved three medications – methadone, buprenorphine, and naltrexone for the treatment of opioid dependence (Timko et al., 2016).

Methadone.

The effectiveness of methadone maintenance treatment has been well established for heroin addiction for decades (Cushman, Trussell, Gollance, Newman & Bihari, 1976; Dole & Nyswander, 1976; Dole & Joseph, 1978; Kresina & Lubran, 2011; Kreek, Borg & Ray, 2010; Banta-Green et al., 2009; Saxon et al., 2013; Jones et al., 2015). Due to the opioid epidemic fueled by prescription drugs, an increasing number of opioid dependents who used non-medicinal prescription drugs or poly users are seeking MAT. Due to cost, methadone is usually the most utilized medication. Methadone is a synthetic opioid shown to reduce morbidity and mortality in opioid dependents (research studies usually reference heroin-use addicts) (HHS, 2011; Timko et al., 2016; Darker et al., 2016). Methadone was previously dispensed in "methadone maintenance clinics," however many clinics now also dispense buprenorphine, and have recently started naltrexone. After ingesting orally, methadone absorbs rapidly with initial effects experienced within 30 minutes (Saxon et al., 2013; Darker et al., 2016). The complexity

of methadone metabolism is evident in the enzymes ability to exhibit individual variation based on environmental factors and genetics (Saxon et al., 2013, p. S70; Darker et al., 2016). The average dose rages from 80 – 100 mg, however some patients stabilize at a lower or higher dose (Saxon et al., 2013). Methadone is a full µ-opioid receptor agonist, while buprenorphine is only a partial agonist (Saxon et al., 2013; Timko et al., 2016, p. 23). Feeling normal, with cravings under control, minor or no side effects and no withdrawals, are indicators that individuals have reached their stabilization dose (HHS, 2011). Withdrawal symptoms include: nausea, vomiting, excessive sweating, diarrhea, anxiety and sleep issues (HHS, 2011). Side effects from methadone include: drowsiness, respiratory problems, and constipation (Darker et al., 2016). Methadone can be initiated at the start of recovery, unlike buprenorphine (once withdrawal has started), and naltrexone (7 – 10 days after withdrawal, to ensure no opioids in the patient's system) (HHS, 2011).

Buprenorphine.

The FDA approved Buprenorphine in 2002 for the treatment of opioid dependence. It is used both in opioid detoxification and maintenance treatment (Timko et al., 2016). Buprenorphine is usually referred to by its drug name of suboxone or subutex (generic drug). The route of administration is sublingual through tablet or film in three formulations (Timko et al., 2016; Saxon et al., 2013). Two of the sublingual formulations (tablet and film) are combined with naloxone to prevent medication misuse via injection (Saxon et al., 2013). Withdrawals and physical dependence is less severe with buprenorphine as a partial agonist versus methadone (full agonist) (Timko et al., 2016, p. 23). "It has a ceiling effect on µ-opioid receptor" which does not increase effects after ingesting a dose, decreasing the possibility of an overdose and

depression (Saxon et al., 2013, p. S70). One of the benefits of buprenorphine is the ability to receive a prescription outside of a maintenance treatment program (the sample for this study will only include patients in a maintenance treatment program). A disadvantage is the cost; therefore, it is less available to those without adequate resources (Timko et al., 2016).

Naltrexone.

Naltrexone is the only non-opioid treatment. It blocks all effects of opioids and does not produce euphoric effects (Timko et al., 2016; Kresina & Lubran, 2011; Pecoraro, Ma & Woody, 2012). Unlike methadone and buprenorphine which activates opioid receptors to negate cravings, naltrexone binds and blocks the receptors (SAMHSA, 2016, para. 2). It can be administered in an extended release form -via injection once per month, intramuscularly- or orally in tablet form (Timko et al., 2016). Starting treatment requires initial withdrawal from opioid substances for a minimum of seven to ten days of detoxification prior, otherwise extra strong withdrawal effects will be experienced (Kresina & Lubran, 2011; Stotts et al., 2009; SAMHSA, 2012). Naltrexone does not require a taper or cause withdrawal symptoms if someone is stable in recovery and wants to stop the medication (which should include physician consultation) (SAMHSA, 2012).

Indicators of Successful Medication Assisted Treatment Outcomes

MAT has showed improved ability for opioid dependents to function as respectable citizens. Similar to diabetic or hypertension patients receiving medications for their illnesses, this form of treatment for opioid addicts works. Counseling adherence, opioid abstinence and retention in treatment are behaviors that have indicated decreases in drug use and mortality, while improving the quality of life (Timko et al., 2016; Kelly, O'Grady, Mitchell, Brown & Schwartz, 2011; Saxon et al., 2013; Banta-Green et al., 2009).

Counseling Adherence.

Counseling is a benefit to MAT (as opposed to receiving a prescription outside of maintenance treatment –an option for buprenorphine treatment) that provides individuals the opportunity to understand the disease and delve into the causes and consequences of their addiction (HHS, 2011). Counseling provides optimism and encouragement to overcome the addiction (HHS, 2011). Receiving on-site counseling was positively correlated to treatment retention in a research study, which integrated buprenorphine maintenance therapy at a Federally Qualified Health Center (FQHC) (Haddad, Zelenev & Altice, 2013). The study also indicated opioid use decreased as retention increased (Haddad et al., 2013). Since counseling is a benefit to MAT, adherence to counseling should be an indicator of successful treatment outcomes of MAT.

Opioid Abstinence.

Opioid abstinence is an indicator of successful MAT because continued opioid use in conjunction with MAT can create devastating effects for individuals, increasing the possibility of cardiovascular dysfunction, overdose, and mortality (Kelly et al., 2011). A comparison of heroin and prescription drug use dependents in a primary care office-based setting, concluded prescription opioid dependent patients were more likely to have negative urine screens (56.3% vs. 39.8%) (Moore et al., 2007). Opioid abstinence, reflective of a decrease in drug use is usually an indicator of longer engagement in treatment (Kelly et al., 2011; Franckowiak & Glick, 2015).

Retention.

Treating opioid dependence is similar to that of other chronic illnesses, yet it is often regarded as a semi-acute disorder (Vogel et al., 2017). Long-term care strategy principles, which are accepted for chronic illnesses -such as diabetes, and obesity- are still not widely accepted or

practiced for opioid use treatment (Vogel et al., 2017; McLellan, Lewis, O'Brien, & Kleber, 2000). Engaging in treatment for an adequate time is crucial for treatment to be effective (NIDA, 2011; Franckowiak & Glick, 2015). Studies have indicated patients in treatment for over a year are more likely to be productive citizens, and reduce high-risk behaviors (SAMHSA, 2013b; Kelly et al., 2011; Hubbard et al., 2003; Zhang, Friedmann, & Gerstein, 2003).

Banta-Green et al. (2009) note although methadone maintenance treatment for heroin addicts have been assessed, there are limited studies on retention in treatment for prescription drug use. A comparison of retention of opioid (heroin and prescription drugs) dependents in Washington's maintenance treatment programs, found no statistically significant difference in treatment retention (Banta-Green et al., 2009).

Retention in MAT is an important outcome variable, as it correlates with long-term positive societal and treatment outcomes (Banta-Green, et al., 2009; Darker et al., 2016; Kelly et al., 2011). Retention in treatment decreases criminal involvement, increases education and social function, whereas treatment drop out may lead to relapse, and other high-risk behaviors (Darker et al., 2016; Compton & Volkow, 2006). Darker et al. (2016) notes that a higher rate in mortality occurs 30 days after drop-out, and a significant proportion of opioid dependents fail to stay in treatment.

Possible Factors Associated with Treatment Outcomes

Since MAT is a tool to prevent overdoses, abnormal cardiovascular function, and premature death, it is important to examine factors associated with successful treatment outcomes.

Personal Characteristics

The characteristics of opioid dependents have changed from addicts in the past (Banta-Green et al., 2009). In recent years, with the prescription drug misuse epidemic, the opioid dependence population has shifted to younger individuals, and there has been an increase in whites and females. Studies have asserted that personal characteristics are associated with treatment outcomes. However, there are disagreements in regard to gender, race, and relationship status in the literature, with age being the only exception in which there is agreement (Deck & Carlson, 2005; Joe, Simpson & Broom, 1998; Banta-Green et al., 2009; Darker et al., 2016; Kelly et al., 2011; Wasserman et al., 2001).

Some studies have indicated the female gender as a predictor of positive treatment outcomes. In a survival analysis on retention in methadone treatment being female was a predictor of staying in treatment at 90 days (Kelly et al., 2011). Gender was a significant predictor in a retention study of methadone maintenance programs in Western states, where males were less likely to stay in treatment (Deck & Carlson, 2005). Gender was also significantly associated with opioid use during treatment in one study, with males less likely to abstain from opioids (Wasserman et al., 2001). However, another study found that gender was not one of the predictive demographic factors of treatment outcomes (Darker et al., 2016)

Studies have found African Americans were less likely to stay in treatment in comparison to Whites and Latinos. African Americans were only half as likely to stay in treatment in the Washington sample from the two-Western state study (Deck & Carlson, 2005, p. 52). African Americans were 31% less likely to continue treatment in comparison to whites, with no significant differences between other races (Banta-Green et al., 2009, p. 778). Wasserman et al. (2001) also found African Americans significantly associated with being less likely to stay in

treatment, and to continue opioid abstinence. However, Kelly et al. (2011) found no statistical significance with race and treatment outcomes.

Research has indicated age is positively associated with retention in treatment (Deck & Carlson, 2005; Darker et. al, 2016; Joe et al., 1998; Banta-Green et al., 2009; Wasserman et al., 2001). Age was determined to be a significant predictor in a retention study of methadone maintenance programs in Western states (Deck & Carlson, 2005). In a binary logistic regression, age (being older) was significantly associated with retention (Darker et al., 2016). Banta-Green et al. (2009) noted 27% higher odds with every 10-year increase as a predictor for treatment retention.

Limited studies have measured the association of relationship status to treatment outcomes. Being single appeared to be associated with not having breaks in treatment in the chi square analysis for an Ireland study, however the logistic regression indicated the relationship was not significant (Darker et al., 2016). Relationship status significantly differed in an analysis of variance (ANOVA), which measured days of opioid abstinence, with widows having longer days of abstinence (Cavaiola, Fulmer & Stout, 2015).

Socio-economic Factors

Socio-economic status (SES) is a significant element in relation to disease and treatment (Galea & Vlahov, 2002). Socio-ecological studies have noted the association with SES and poorer health outcomes – mortality, various health risks in drug users (Galea & Vlahov, 2002): "The existence of a social gradient, in which rates of morbidity and mortality decrease directly and proportionately with each increase in level of income or education (Galea & Vlahov, 2002, p. S137). Similar to personal characteristics, SES factors in drug abuse has shifted, with the

prescription drug misuse epidemic increasingly affecting the middle class (Banta-Green et al., 2009; Moore et al., 2007).

Few studies have researched SES as predictors of MAT treatment outcomes. When researching demographic and clinical factors as predictors in a study conducted in Ireland, employment and higher education were not predictors associated with retention in treatment (Darker et al., 2016). Income at entry and during treatment was not associated with treatment outcomes (Rash, Andrade & Petry, 2013; Rash, Olmstead, & Petry, 2009). Payment for services (self-pay, private or public insurance) is an access factor in health care systems. Patients with stable Medicaid eligibility were more likely to continue treatment - two and a half (2.5) times more likely in Oregon, and two-thirds more likely in Washington State (Deck & Carlson, 2005). Banta-Green et al. (2009) analysis also showed patients with public assistance funding - Medicaid, TANF (Temporary Assistance for Needy Families)- were strongly associated with retention in treatment.

Readiness to Change.

Long-term behavioral changes require action and adjustments over time (Office of Behavioral and Social Sciences Research, n.d.). Motivation for treatment is an important aspect in treatment success (Harrell, Trenz, Scherer, Martins & Latimer, 2013). Opioid dependent individuals seeking treatment are at different stages in their ability to adopt a healthier behavior. Readiness to change is a construct within the transtheoretical model (TTM) (which will be discussed below) and includes 6 levels: pre-contemplation, contemplation, preparation, action, maintenance and termination (Prochaska & Velicer, 1997; Prochaska, Redding & Evers, 2002; Office of Behavioral and Social Sciences Research, n.d.). In researching predictors to retention

in treatment, at the 90-day interval a higher treatment readiness at admission was a predictor (Kelly et al., 2011). Harrell et al. (2013) in a latent class analysis noted patients in the "post-action" phase were significantly more likely to abstain from opioids, whereas the pre-contemplation class was significantly more likely to be positive for marijuana. Utilizing the URICA (the University of Rhode Island Change Assessment) to measure motivation in change, the assessment indicated individuals in the "committed action" stage were significantly associated with alcohol and cocaine abstinence (Pantalon, Nich, Frankforter & Caroll, 2002). Conversely, another study indicated no significance in readiness to change, but motivated patients had decreases in illicit drug use and crime (Nosyk et al., 2010).

Support Systems.

It is believed that social support plays an important role in health and recovery in general. Social support has shown to assist in the progression of treatment and abstinence from alcohol and drugs (Cavaiola et al., 2015; Franckowiak & Glick, 2015). However, disagreement exists in the literature in regard to social support improving treatment adherence and opioid abstinence. Cocaine abstinence was predicted when patients in opioid maintenance therapy had social support, but not opioid abstinence in a hierarchical logistic regression analysis (Wasserman et al., 2001; Cavaiola et al., 2015). In addition, neither drug showed effects for general support on abstinence (Wasserman et al., 2001). Cavaiola et al. (2015) whose sample was mainly heroin and poly users (54.7% and 39.8% respectively), hypothesis was supported indicating social support was a predictor of longer periods of abstinence and readiness to change. Unlike in the past, recent research has shown those suffering with a substance use disorder usually have contact with a family member (Cavaiola et al., 2015). Social support may play a significant role in

assisting opioid abusers achieve abstinence, depending on the type of support received (Wasserman et al., 2001).

Integrated Care.

Integrated care models are emerging due to the "clinical promise" of better health outcomes and the cost effectiveness they contribute to both the patient and provider (Farber et al., 2012; Kelly et al., 2011). Cooker et al. asserts integration is "a spectrum of organizational arrangements relating to the funding, administration, organization, service-delivery and clinical scenarios designed to create connectivity, alignment and collaboration" (as cited in Topp et al., 2013, p. 348). Substance use patients often lack the connectedness and treatment network to combat their illnesses; and often experience a high prevalence of additional medical disorders or shortages in basic care. Access to the availability of needed services has the potential to influence treatment outcomes.

If not addressed as part of medical treatment, complications can arise, and can lead to reduction in treatment compliance (Farber et al., 2012). Integration of treatment services therefore allows for a more holistic care to the patient, encouraging prevention and continuum of care, in addition to more flexibility for the provider (Stone & Katz, 1996; Kelly et al., 2011; Franckowiak & Glick, 2015). A study on the impact of MAT on co-occurring patients indicated patients in integrated cognitive behavioral therapy in comparison to standard care had lower odds of positive opioid urine drug screens (Saunders, McGovern, Lambert-Harris, Meier, McLeman & Xie, 2015). The Community Access to Specialized Treatment (CAST) Initiative noted patients receiving integrated care were more compliant to counseling adherence (Neufeld et al., 2010).

Summary of Possible Factors Associated with Treatment Outcomes.

Opioid dependence and treatment for the disease is complex. Few studies have examined the role of support systems and integrated care, in addition to personal characteristics and socio-economic status on treatment outcomes in MAT (Heiman & Artiga, 2015; Galea & Vlahov, 2002; Wasserman et al., 2001; Cavaiola et al. 2015). There are limited studies focusing on MAT outcomes, which primarily focus on non-medicinal prescription drug abuse opioid dependence (Timko et al., 2016). Additionally, prior studies included smaller sample sizes and variation in treatment outcomes. A need therefore exists to extend the literature on MAT programs for opioid dependence and fill a critical gap focusing on prescription drug abuse addicts. As the opioid epidemic has reached significant levels, in order to reduce mortality, it is important to understand factors that impact higher rates of retention and successful outcomes for a better quality of life.

Theoretical Framework

Social Cognitive Theory.

Initially developed in the 1960s as the social learning theory, social cognitive theory (SCT) was developed in 1986 (Bandura, 1986). Social context within environmental, personal, and behavioral interaction are key constructs of the social cognitive theory (Office of Behavioral and Social Sciences Research, n.d.; Sharma, 2005). The distinct way in which individuals acquire and retain behavior in addition to the emphasis on social and environmental influences and key characteristics (Office of Behavioral and Social Sciences Research, n.d.; Sharma, 2005). The triangular model of the theoretical framework demonstrates the continual interaction of the three factors: personal, environmental and behavioral (Office of Behavioral and Social Sciences Research, n.d.; Sharma, 2005).

The primary constructs of SCT include: knowledge, self-efficacy, outcome expectations, goals, perceived facilitators, and impediments. Two of the domains SCT emphasizes for substance use behavioral change include: outcome expectancies and self-efficacy. The belief of specific behaviors resulting in certain outcomes (Gullo, Matveeva, Feeney, Young, & Connor, 2017). Self-efficacy abstinence has received greater attention in relation to substance use treatment, in the ability to refuse or abstain from a substance. "Self-efficacy is a fundamental requirement for behavior change" (Sharma, 2005. p. 3). SCT recognizes exposures/beliefs play a pivotal role in consumption, dependence, and treatment (Gullo et al., 2017, p. 74). "Unless people believe that they can produce desired effects by their actions, they have little incentive to act or to persevere in the face of difficulties" (Bandura, 1999, p. 214).

Transtheoretical Model.

The transtheoretical model (TTM) emerged from theories in behavior change and psychotherapy (Prochaska et al., 2002). The core constructs of the model are stages of change, decisional balance, self-efficacy, and processes of change (Prochaska et al., 2002). This study incorporates the stages of change construct, which is commonly assessed in substance use treatment (Prochaska et al., 2002; Nosyk et al., 2010; Pantalon et al., 2002; Harrell et al., 2013). A temporal dimension is expressed in the stage construct, and change involves progress through the stages (Prochaska et al., 2002). Stages of change includes six stages: pre-contemplation, contemplation, preparation, action, maintenance, and termination.

In this model, individuals in the initial stage, pre-contemplation, have no intentions in taking action or making changes within the next six months in the near future (Prochaska et al., 2002). Contemplation stage includes those who intend to take action and make changes within

the next six months (Prochaska et al., 2002). Individuals in this stage are more aware of the advantages and disadvantages of their behaviors, and are often stuck in the difficult balance of the benefits and barriers (Prochaska et al., 2002, p. 100). Those in the preparation stage intend to take action within the next 30 days, usually have an action plan, and have made behavioral modifications (Prochaska et al., 2002). In the action stage, individuals have made observable behavior changes for less than six months, whereas individuals in the maintenance stage have made behavior changes for more than six months (Prochaska et al., 2002). In the final stage, patients have full self-efficacy and no matter their circumstance are confident in not returning to unhealthy habits (Prochaska et al., 2002).

Theory of Reasoned Action.

To improve the understanding within a broader context, the theory of reasoned action is integrated with social cognitive theory as the theoretical base of the study. The theory of reasoned action predicts and discerns motivational influences on a behavior (Fishbein & Ajzen, 1975; Madden, Ellen & Ajzen, 1992; Johnston, White & Norman, 2004). Created by Fishbein and Ajzen (1975), the theory was revised and extended as the theory of planned behavior to include perceived behavioral control. Behavioral intentions are a function of salient knowledge or beliefs about the probability that doing a particular behavior will lead to a distinct outcome (Fishbein & Ajzen, 1975; Madden et al., 1992; Millstein, 1996; McGinty & Anderson, 2008; Fleming et al., 2016; Johnston et al., 2004). Behavioral, and normative are the two initial constructs identified in the reasoned action approach (Fishbein & Ajzen, 1975; Madden et al., 1992; Millstein, 1996; Fleming et al., 2016; Roberto, Shafer & Marmo, 2014; Rich, Brandes, Mullan & Hagger, 2015; Johnston et al., 2004).

Behavioral beliefs are the intrinsic influence on an individual's attitude in performing the behavior, while the normative beliefs involve the subjective norms (Fishbein & Ajzen, 1975; Madden et al., 1992; Kleinman, Millery, Scimeca & Polissar, 2002). External elements affect intentions, but only to the extent of influencing either attitudes or subjective norms (Madden et al., 1992; Millstein, 1996). Therefore, the third belief, control was added. Control beliefs can guide or impede an individual from carrying out a behavior (Fishbein & Ajzen, 2010). Inclusive of environmental and personal factors, which facilitate positive outcomes in MAT; theory of reasoned action explains that an individual's actions (i.e. counseling adherence, opioid abstinence, and retention) are the result of attitudes/behavior (treatment readiness), subjective norms (social support) and intentions towards that behavior (Fleming et al., 2016).

Applications of the Theoretical Approach in Studies.

The literature on social cognitive theory, transtheoretical model and the theory of reasoned action focuses on personal factors, elements in the environment and motivational influences that can shape the responses of opioid addicts in MAT. The empirical studies discuss survival and adoptions to innovations and necessary changes in the environment, in addition to attitudes, subjective norms, motivations and control resulting in specific behavior. Each of the studies emphasize at least one of the three core elements in the environment, stages of change, or behavioral constructs, which influence the response. Appendix B provides a table summary of the theoretical approaches literature review summary. Limited studies have utilized each theory as a theoretical framework to guide associations in MAT for opioid dependence. However, social cognitive theory and transtheoretical model has been utilized in addiction treatment research for cannabis, alcohol, nicotine, cocaine; and theory of reasoned action in addition to addiction

treatment research studies, has also been used in chronic illness studies.

A socio-cognitive analysis of substance use hypothesized that self-efficacy (a domain of social cognitive theory) plays a key role in affecting every phase of treatment (initiation, recovery, relapse, long-term treatment) (Bandura, 1999). Having a greater belief in treatment success allows one to benefit more from treatment, and develop self-regulatory skills to succeed (Bandura, 1999). Environmental factors were noted as a motivator of relapse. Bandura (1999) therefore stressed the importance of a collective efficacy approach instead of an individualized approach in treating substance use.

SCT was utilized as the framework to assess treatment outcomes and self-efficacy in a substance use study on cannabis dependence (Gullo et al., 2017). Emotional relief refusal self-efficacy was a predictor of improved treatment outcomes; as abstinence increased with treatment sessions (1.20 times more likely) (Gullo et al., 2017). Self-efficacy is usually noted in relapse prevention approaches, influenced by social, personal and interpersonal key factors (Fiorentine & Hillhouse, 2011). Low controlled use of self-efficacy was a predictor of abstinence acceptance, which was associated with abstaining from drugs (Fiorentine & Hillhouse, 2011).

The self-efficacy to change has also been associated with readiness to change. Utilizing the transtheoretical model to guide the framework of readiness for counseling and motivation to change with prescription-drug dependent patients, significant associations were seen in those with a higher readiness to change (p= .001) (Schmidt, Bischof, Harting & Rumpf, 2009). Majority of the patients (56%) were in pre-contemplation stage, with the others either in contemplation or in preparation stages (Schmidt et al., 2009). Patients in each stage group did not differ in their readiness for counseling (Schmidt et al., 2009). Examining readiness to change guided by TTM asserts readiness to change is a predictor of retention in methadone maintenance

treatment, and opioid abstinence (Kelly et al., 2011; Harrell et al., 2013). Pantalon et al. (2002) also associated a higher motivation to change with drug use abstinence.

Prochaska and Velicer (1997) assert at-risk behaviors (opioid dependence) are usually in the initial three stages at the start of treatment. The majority is in pre-contemplation (40%) and contemplation stages (40%), followed by preparation (20%) (Prochaska & Velicer, 1997). Critical assumptions include, behavior change is a process, at-risk populations are not prepared for action, no one theory can account for the complex nature of behavior change, and chronic behavior patterns usually result from a combination of social, biological, and self-control (Prochaska & Velicer, 1997).

In researching predictors of long-term treatment for heroin and cocaine addicts entering detoxification Kleinman et al. (2002) asserts that the theory of reasoned action (in comparison to the other theoretical approaches constructs) was the most effective in predicting use of treatment programs. In the hierarchical multiple regression analysis, homelessness was the only significant predictor in the first stage, in addition to criminal justice involvement and fewer than 20 years using in the second stage (Kleinman et al., 2002). Behavioral beliefs and self-efficacy predicted treatment utilization on the third stage with the addition of four help-seeking variables (Kleinman et al., 2002).

Rich et al. (2015) meta-analysis studied the variance of intention and behavioral outcomes for chronic illnesses. Inclusion studies had to examine health behaviors and/or treatment as recommended by a health care provider and explicitly comprised at least one construct of the theory (Rich et al., 2015). In regard to the effects of the theory constructs on adherence behaviors, the correlations were significant ($p < .05$) and had medium to large effect sizes. Perceived behavioral control, attitudes and subjective norms were statistically significant

predictors of intention and treatment adherence behavior (Rich et al., 2015). The theory

explained 33% of variance in intention and 9% in adherence behavior (Rich et al., 2015).

Roberto et al. (2014) confirmed the theory of reasoned action as a conceptual model for

explaining attitudes and intentions and linkage of social norms in predicting substance-abuse

treatment providers encouraging patients to use MAT as part of their treatment plan. Significant

and substantial relationships were seen in each (behavior and intentions, attitudes and intentions,

and norms and intentions.

Conceptual Framework

Social cognitive theory, transtheoretical model and the theory of reasoned action together

provide a framework to understand the influence of factors on MAT outcomes. Figure 5

illustrates the integrated elements and behavioral constructs for the theoretical framework

conceptualized for the study.

The conceptual framework as illustrated in Figure 5 incorporates the triangular model of

SCT's interaction of three elements: personal factors, environmental influences, and behavior.

The framework integrates the transtheoretical model into personal factors and the theory of

reasoned action into the three elements. The study will focus on the personal factors and

behaviors (treatment outcomes) relationship, examining the interaction of personal influences

and actions; in addition to the association of environmental influences and behaviors, looking at

that interaction and how it affects individuals' behaviors.
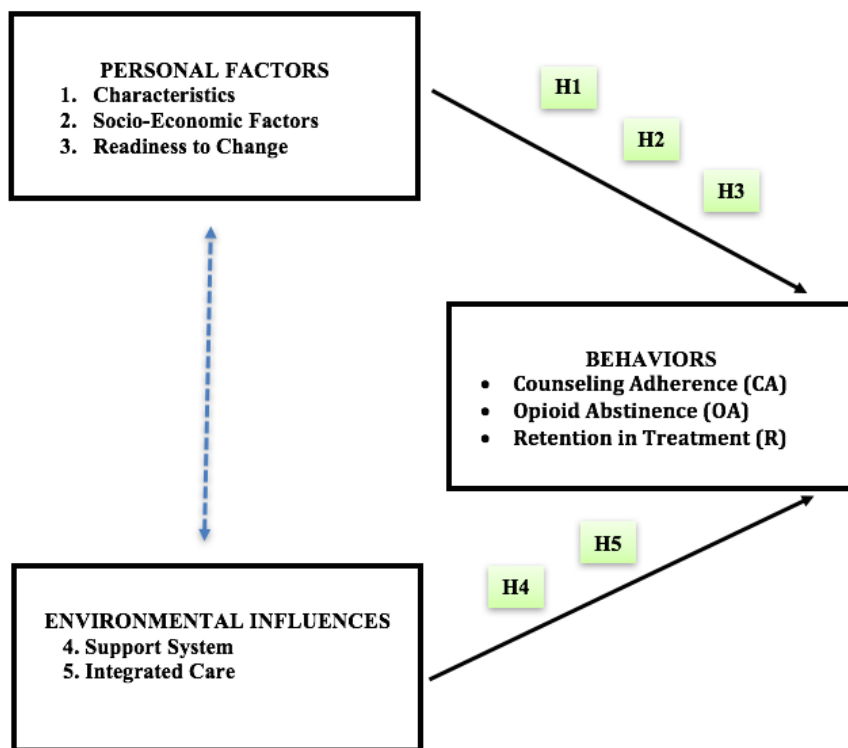
Figure 5. *Conceptual Framework. This figure depicts an interwoven theoretical framework from social cognitive theory, transtheoretical model, and theory of reasoned action.*

The personal factors element incorporates individual characteristics, and factors which contribute beyond personal characteristics in particular, socio-economic status. Although individual behaviors are often associated with a wide range of factors that influence engagement or barriers to healthy behaviors and treatment, research has shown the conditions in the environment also affects risks and quality of life outcomes (Office of Disease Prevention and Health Promotion, 2017; Heiman & Artiga, 2015). Heiman and Artiga (2015) estimate that 60% of premature death risk is associated with individual behavior (40%) and social and environmental factors (20%). Social cognitive theory takes into account personal factors and social influences on the environment (internal and external) in understanding individuals' behavior.

Readiness to change is the final variable in the personal factors element, taking from the stages of change construct in the transtheoretical model. This also incorporates the self-efficacy construct of SCT, in one's ability to succeed. It measures the stage of participants in their readiness to receive treatment, and incorporates the attitudes element from the theory of reasoned action.

The environmental influences encompass subjective norms (theory of reasoned action), and the physical environment. Subjective norms are the perceived social pressures to carry out a behavior (Azjen, 1991). Determining if having a support system or lack thereof during MAT may influence the treatment outcome. Access to the availability of needed services in the primary treatment location, is a physical environmental factor that also has the potential to influence behavior.

Behavior is an element in both the social cognitive theory and theory of reasoned action. The outcome expectancies domain is a function of influences, knowledge and beliefs. Gullo et al., 2017 note SCT recognizes influences and exposures are crucial elements in dependence and treatment. The behaviors measured for treatment outcomes as discussed prior include counseling adherence, opioid abstinence, and retention in treatment.

In summary, the conceptual framework indicates that personal factors (which incorporates personal characteristics, socio-economic factors, readiness to change) and environmental influences (subjective norms and physical environment) can impact behavior (treatment outcomes in MAT for opioid dependence). Utilizing the combined theoretical approach provides a framework for an examination of factors influencing MAT treatment outcomes.

CHAPTER THREE: METHODOLOGY

This section details the methodology used in the research study. The research questions and hypotheses are identified, the research design is explained, and a description of the population sample and variables are given. The ethical considerations of the study are also included. The chapter concludes with the data collection methods and analytical strategy used.

Research Questions & Hypotheses

The study aims to answer the following research questions derived from the literature and theoretical frameworks:

Research Question 1: Are personal characteristics associated with treatment outcomes in MAT?

    Hypothesis 1A: Gender – identification as male is negatively associated with treatment outcomes.

        H1A$_{CA}$: Male gender is negatively associated with treatment counseling adherence.

        H1A$_{OA}$: Male gender is negatively associated with abstinence from opioids.

        H1A$_{R}$: Male gender is negatively associated with retention in treatment

    Hypothesis 1B: Race - identification as African American is negatively associated with treatment outcomes.

        H1B$_{CA}$: Identification as African American is negatively associated with treatment counseling adherence.

        H1B$_{OA}$: Identification as African American is negatively associated with abstinence from opioids.

        H1B$_{R}$: Identification as African American is negatively associated with retention

in treatment.

Hypothesis 1C: Age is positively associated with treatment outcomes.

H1C$_{CA}$: Age is positively associated with treatment counseling adherence.

H1C$_{OA}$: Age is positively associated with abstinence from opioids.

H1C$_R$: Age is positively associated with retention in treatment.

Hypothesis 1D: Single relationship status is positively associated with treatment outcomes.

H1D$_{CA}$: Single - relationship status is positively associated with treatment counseling adherence.

H1D$_{OA}$: Single - relationship status is positively associated with abstinence from opioids.

H1D$_R$: Single - relationship status is positively associated with retention in treatment.

Research Question 2: Are personal factors beyond characteristics, specifically socio-economic factors, associated with treatment outcomes in MAT patients?

Hypothesis 2A: Higher education is positively associated with successful treatment outcomes in MAT patients.

H2A$_{CA}$: Higher education is positively associated with treatment counseling adherence.

H2A$_{OA}$: Higher education is positively associated with abstinence from opioids.

H2A$_R$: Higher education is positively associated with retention in treatment

Hypothesis 2B: Employment is positively associated with successful treatment outcomes in MAT patients.

H2B$_{CA}$: Employment is positively associated with treatment counseling adherence.

H2B$_{OA}$: Employment is positively associated with abstinence from opioids.

H2B$_R$: Employment is positively associated with retention in treatment.

Hypothesis 2C: Having a higher income is positively associated with successful treatment outcomes in MAT patients.

H2C$_{CA}$: Higher income is positively associated with treatment counseling adherence.

H2C$_{OA}$: Higher income is positively associated with abstinence from opioids.

H2C$_R$: Higher income is positively associated with retention in treatment

Hypothesis 2D: Having health insurance is positively associated with successful treatment outcomes in MAT patients.

H2D$_{CA}$: Having health insurance is positively associated with treatment counseling adherence.

H2D$_{OA}$: Having health insurance is positively associated with abstinence from opioids.

H2D$_{R1}$: Having health insurance is positively associated with retention in treatment.

H2D$_{R2}$: Having public insurance (Medicaid) is positively associated with retention in treatment.

Research Question 3: Is readiness to change associated with treatment outcomes in MAT patients?

Hypothesis 3A: Readiness to change is positively associated with treatment outcomes in

MAT patients.

H3A_{CA}: Readiness to change is positively associated with treatment counseling adherence.

H3A_{OA}: Readiness to change is positively associated with abstinence from opioids.

H3A_R: Readiness to change is positively associated with retention in treatment.

Research Question 4: Is having a support system associated with treatment outcomes in MAT patients?

Hypothesis 4A: Having social support during treatment is positively associated with treatment outcomes in MAT patients**.**

H4A_{CA}: Having social support is positively associated with treatment counseling adherence.

H4A_{OA}: Having social support is positively associated with abstinence from opioids.

H4A_R: Having social support is positively associated with retention in treatment.

Research Question 5: Is integrated care associated with treatment outcomes in MAT patients?

Hypothesis 5A: Patients receiving integrated care are associated with positive treatment outcomes in MAT.

H5A_{CA}: Receiving integrated care is positively associated with treatment counseling adherence.

H5A_{OA}: Receiving integrated care is positively associated with opioid abstinence.

H5A_R: Receiving integrated care is positively associated with retention in treatment.

Research Design

A retrospective cohort research design was utilized in this study to examine the associations of personal factors (personal characteristics, socio-economic factors, and readiness to change) and environmental influences (support systems and integrated care) on treatment outcomes in MAT. Cohort studies examine specific sub-populations (opioid dependent individuals in MAT) over time (Babbie, 2014). Retrospective cohort studies are observational research designs, which examine prior data and investigate associations (risk or protective factors) to an outcome (Sedgwick, 2014). An advantage of this design is the assessment of the temporal sequence of factors and outcomes (Sedgwick, 2014). A limitation of this design is the observational nature of the study does not indicate causal pathways (Jeffers et al., 2015; Sedgwick, 2014). Observational or correlational research attempts to examine a relationship between two or more variables using statistical data but cannot assign causation (Babbie, 2014).

Population & Sample

The population was adults who sought treatment at an accredited not-for profit MAT program in West Florida. The not-for-profit behavioral health agency provides comprehensive community-based medical, substance use, mental health and HIV services reaching over 25,000 individuals annually through prevention and treatment -detoxification, residential, intensive outpatient, outpatient, and medication-assisted treatment. The MAT program has doubled in admissions due to the prescription drug epidemic. Purposive sampling was utilized, specifically targeting individuals admitted to the MAT program during July 1, 2014 – June 30, 2016. Inclusion criteria includes a single episode of care for patients admitted during the study period. The final treatment episode was used for patients who re-entered treatment. With implementation

of the electronic health record (EHR), secondary data were retrieved from various sources within the EHR, as identified in the last column of Table 1, for patients enrolled in treatment during the study period.

Setting.

The MAT program provides services for adults (18 and older) seeking treatment for opioid dependence. Patients are self-referred, court-ordered, or referred from medical providers including pain management clinics, hospitals, and behavioral health programs. The program provides methadone, buprenorphine, or vivitrol medication treatment to control cravings and prevent withdrawals, while managing other medical conditions (onsite mental health, HIV and primary care services are available). Patients on vivitrol were not included in the study, as those patients' records were not retrievable through the EHR. Patients also receive individualized counseling in addition to their medications.

The program adheres to federal and state requirements for opioid treatment programs and is supervised by a licensed physician. A patient can only be admitted to treatment after a physician has determined the patient is physiologically addicted to opioid drugs for over a year (exceptions include penal, pregnant, and individuals with prior maintenance or detoxification treatment) (Florida Administrative Code, 2006). At the initial visit, patients complete a substance use and mental health assessment, which confirms an opioid dependence diagnosis using DSM-V. Additionally, the ASAM (American Society of Addiction Medicine) placement criteria guides admission to the program. Patients may not be appropriate for outpatient treatment and referred to residential, intensive outpatient, or detoxification. The current study focuses on patients in outpatient treatment.

Strict protocols exist for starting patients on a low dosage, which the medical staff then monitors, and adjusts if necessary to stabilize the patient. A urine drug screen (UDS) is collected at the initial visit and randomly throughout treatment, which patients are required to adhere to by calling the urine drug screen line daily. Patients agree during the initial treatment plan to meet with an assigned counselor to discuss treatment goals and prevent relapse.

Ethics.

Prior to the start of the study, an approval was received from the University of Central Florida's Institutional Review Board (IRB) to conduct human research. A HIPAA (Health Insurance Portability and Accountability Act) Waiver of Authorization required by 45 CFR (Code of Federal Regulations) 164.508 for the use or disclosure of protected health information (PHI) was also received, since PHI was required to match the UDS labs in a separate system, and patients' consent was not received. The initial IRB approval (SBE-17-13277) was received on July 5, 2017, and the modification approval inclusive of the HIPAA Waiver of Authorization (HRP-441) was received on July 27, 2017.

Risks to subjects were minimized by securing and protecting identifiable information. Data were recoded for analysis and secured (password-protected) on the Agency's server with only the researcher having access. All identifiable information was deleted once the recode was completed within the three-month time period specified in the IRB protocol. Data will only be reported in aggregate form, and the study's data set will be deleted after the required retention period of 5 years. Additionally, a business associate agreement was signed with the Agency, in accordance with federal regulations governing the Confidentiality of Substance Use Disorder Patient Records, 42 CFR Part 2; 45 CFR Parts 142, 160, 162, and 164, and HIPAA.

Study Variables/ Measures

Variables of interest were determined from previously working in the behavioral health field, and other analyses in the literature. Table 1 defines the operationalization of each variable in more detail. Independent variables are: personal characteristics (patient's gender, race, age relationship status), socio-economic factors (education, employment status, income, and health insurance), readiness to change, support system (social support), and integrated care. Controls include: type of primary opioid dependence, criminal history, whether patients were court-ordered, and the medication prescribed. The outcome variables of interest include: counseling adherence, opioid abstinence, and retention in treatment.

Dependent Variables.

Counseling Adherence: captures whether the patient adheres to the counseling sessions/visits agreed on in the treatment plan. Counseling adherence is a continuous variable measured in weeks for the survival analysis based on the last counseling session date from the date of admission.

Opioid Abstinence: assessed by urine drug screen (UDS) results. A negative result will indicate a negative screen from opioid substances with the exception of methadone or buprenorphine. Opioid Abstinence is a continuous variable measured in days for the survival analysis based on negative urine drug screens. If screens were positive at admission, patients were given a window period depending on the substance used. For instance amphetamines can still be detected in UDS up to 48 hours after use, whereas diazepam can be detected up to 30 days after (Moeller, Lee & Kissack, 2008).

Retention: measured by the length of time patients are engaged in medication treatment

after admission. For those with multiple treatment episodes, the final treatment episode was used. Retention is a continuous variable measured in days for the survival analysis based on medication dosing.

Independent Variables.

Personal Characteristics. There were four variables within this category: gender, race, age, and relationship status, reported by the patient at admission.

Gender: was measured by the category the patient identifies as: 1= male, 2= female. Male gender was the reference variable for the gender category (females compared against).

Race: was measured by the category the patient identifies as: 1= White, 2= Black or African American (AA), 3= Other at admission. White was the reference variable.

Age: A continuous variable of the patient's age, based on date of birth at time of admission.

Relationship status: was measured as reported by the patient at admission in the following categories: 1= single, 2= married, 3= other. Other is inclusive of patients who were divorced, separated, or widowed. Being single was the reference variable for the relationship status category.

Socio-economic Factors. There were four variables within this category: education, employment, income and health insurance

Education: was coded by the highest education level completed at admission. Categories include 1= less than high school diploma, 2= high school diploma/GED (General Equivalency Diploma), 3= vocational training, 4= some college, 5= college degree inclusive of

any college degree attained. The lowest level attained, less than a diploma (elementary, middle or high school), was the reference variable.

Employment: was coded by patient's employment status at admission. 1= unemployed, 2= not in the workforce, 3= part-time, 4= full-time. Not in the workforce category was comprised of students, home-makers, those retired, disabled, on a leave of absence, or not authorized to work. Unemployment was the reference variable.

Income: A continuous variable of the patient's income at admission.

*Health insurance: was b*ased on patient's payment method for services rendered whether they had insurance or assistance. Patients were coded as 1= none, 2= public, 3= private. Public included Veterans and Medicaid patients, as well as those receiving assistance from federal and state funds or grants. Self-pay patients, those with no insurance was the reference category.

Readiness to Change. This was assessed using the URICA (University Rhode Island Change Assessment Scale) by the intake counselor. The scoring of the URICA and categories was inclusive of four phases. 1= pre-contemplation, 2= contemplation, 3= action, and 4= maintenance. Pre-contemplation was the reference variable.

Social Support. This was measured by patient's report on having a support system during their initial assessment. The two categories were 1= no, 2= yes. Having no support was the reference variable.

Integrated Care. Patients who received additional services (i.e. mental health, HIV) integrated in to MAT during care was measured by 1= no, 2= yes. Having no integrated care was the reference variable

Controls.

There were four variables within this category: opioid dependence, criminal history, court ordered, and medication.

Primary Drug Dependence. At admission, patients reported their primary drug of choice. Categories included 1= prescription medications, 2= heroin, 3= cocaine/crack, 4= methamphetamine, 5= other. Prescription medications are narcotics, tranquilizers, and amphetamines. The reference variable was prescription drugs.

Criminal History. Criminal history is self-reported at admission, based on the patients' recollection of prior criminal record. The two categories were 1= no criminal history, 2= yes for patients with a history. No criminal history was used as the reference variable.

Court Ordered. The intake counselor verified the referral source and indicated if the patient was court-ordered to treatment. Patients were coded as 1= no (not court ordered) versus 2= yes (court-ordered to treatment). Not court-ordered was the reference category.

Medication. Categorized by the prescribed medication the patient received on initial admission to the clinic. The medication prescribed was coded as 1= Methadone, 2= Buprenorphine. Methadone served as the reference category.

Table 1

Operational Definitions of the Study Variables

Variables	Type	Definition	Measure	Data Source
Counseling adherence	Dependent	Length of time patient adhered to counseling sessions agreed upon in the initial treatment plan	Continuous SA: weeks	Treatment – Weekly Note
Opioid Abstinence	Dependent	Length of time patient abstained from opioids since in treatment	Continuous SA: days	Drug Screen
Retention	Dependent	Length of time patient is receiving medication	Continuous SA: days	Admission & Discharge
Personal Characteristics: Gender	Independent	Gender the patient identifies as at admission	Categorical (2): 1= male*, 2= female	Admission
Personal Characteristics: Race	Independent	Race the patient identifies as at admission	Categorical (3): 1= White*, 2= Black/AA, 3= Other	Admission
Personal Characteristics: Age	Independent	Age of the patient at admission	Continuous	Admission
Personal Characteristics: Relationship Status	Independent	Relationship status as reported by the patient at admission	Categorical (3): 1=single*, 2= married, 3= other	Admission
Socio-economic factor: Education	Independent	Highest education level completed by the patient at admission	Categorical (5): 1= < high school diploma*, 2= high school diploma/ GED, 3= vocational, 4= some college, 5= college degree	Admission
Socio-economic factor: Employment	Independent	Patient's employment status at admission	Categorical (4): 1= unemployed*, 2= not in the workforce, 3= part-time, 4= full-time	Admission
Socio-economic factor: Income	Independent	Patient's income at admission	Continuous	Admission

Variables	Type	Definition	Measure	Data Source
Socio-economic factor: Health Insurance	Independent	Patients form of payment for services	Categorical (3): 1= None*, 2= Public, 3= Private	Insurance/ Payment
Readiness to Change	Independent	Patient's stage of change assessed at admission	Categorical (4): 1= pre-contemplation*, 2= contemplation, 3= action, 4= maintenance	Admission,
Social Support	Independent	Patient's report of support systems during initial assessment	Categorical (2): 1= no*, 2=yes	Admission, PSA
Integrated Care	Independent	Patients who received additional services integrated into MAT treatment – HIV, MH, Medical	Categorical (2): 1= no*, 2=yes	Treatment Plan
Primary Drug Dependence	Control	Drug dependence at time of admission	Categorical (5): 1= prescription medication*, 2= heroin, 3= crack/ cocaine, 4= methamphetamine, 5= other	Admission
Criminal History	Control	Criminal history reported at time of admission	Categorical (2): 1= no*, 2=yes	Admission
Court Ordered	Control	Patient court-ordered to treatment	Categorical (2): 1= no*, 2=yes	Admission
Medication	Control	Medication prescribed after admission into the program	Categorical (2): 1= methadone*, 2= buprenorphine	Medical Order

* Reference variable

Data Collection

Permission to gain access to secondary data from the MAT Programs in West Florida was

granted in December 2016 by the Chief Executive Officer pending IRB approval. The Chief

Executive Officer provided a letter of support to conduct the study (see Appendix C), and

requested that a confidentiality clause is included to protect substance use patients in adherence

with *HIPAA* and *42 CFR Part 2 the Confidentiality of Alcohol and Drug Abuse Patient Records* when completing the IRB protocol. With the merging of data sets for the urine drug screens, in addition to cleaning and verifying any data needed, it was important to ensure the confidentiality of patients' health information. After IRB approval was received, data were obtained from three systems that comprise the electronic health record (EHR) on September 6, 2017. Comprehensive questions in the admission, psychosocial assessment, treatment planning and discharge were used for the study variables.

Data Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) Program. Data were first cleaned and coded to detect and remove errors for ensuring appropriate statistical analysis. The initial data set included 5979 cases. However, the majority were duplicates which had to be removed. Since the data were received in September, the data set also included admissions beyond the study period which also had to be removed. Additionally, only the last treatment of care was used for patients with multiple admissions. Univariate descriptive statistics (measures of central tendency, dispersion and distribution) and identification of missing data were then analyzed. In terms of missing values, SPSS uses pairwise exclusion which excludes cases when data are missing for the particular analysis.

Bivariate statistical tests -correlations and ANOVA- examined the relationships between the dependent (counseling adherence, opioid abstinence, and retention) and independent variables. The covariates were analyzed for multicollinearity to ensure predictor variables do not impact the models. Multicollinearity is not a concern when the independent variables are not highly correlated ($r = .8$ or above) or when the variance inflation factor (VIF) is under 4.0 or

tolerances are above 40. Since the variables being measured were time-dependent, the Kaplan Meier Method was conducted to demonstrate the bivariate relationships, and cox regression models for the multivariate analysis.

Survival Analysis.

Survival analysis studies illustrate the time it takes for an event of interest to occur (Kleinbaum, & Klein, 2005; Fox & Weisberg, 2011; Despa, n.d.; Parmar & Machin, 1995; Allison, 2014). In addition to the time variable, survival analysis also includes censoring. A paramount feature which accounts for observations when the survival time is incomplete (Allison, 2014; Despa, n.d.) Right censored depicts patients who do not experience the event during the study (Allison, 2014; Kleinbaum & Klein, 2005; Despa, n.d.). This also accounts for missing data. Random and non-informative censoring is required to avoid bias in a survival analysis (Kleinbaum & Klein, 2005).

Utilizing the wrong model and violating assumptions can lead to false inferences about the regression (Allison, 1999). Since survival times are usually positive, using linear regression would not be the optimum choice (Allison, 2014; Despa, n.d.). Regression techniques such as ordinary least squares (OLS) cannot adequately handle censored observations, which survival analysis incorporates in estimating important model parameters (Allison, 2014; Kleinbaum & Klein, 2005; Despa, n.d., p. 1).

Kaplan Meier Method.

The Kaplan Meier Method estimates and illustrates survival probabilities as a function of time (Despa, n.d., p. 2; Kleinbaum & Klein, 2005). It provides descriptive and bivariate statistics of the variables.

Cox (Proportional Hazards) Regression.

The cox regression model is the most widely used model providing information on the hazard function to predictors (Kleinbaum & Klein, 2005; Fox & Weisberg, 2011). The model examines the relationship between survival (dependent variables – counseling adherence, opioid abstinence, and retention in treatment up to 365 days/ 52 weeks) and predictors.

Survival function is denoted as the probability a patient "survives" longer than a specified time, $S(t) = P\ (T > t)$ (Kleinbaum & Klein, 2005). While the hazard function provides the "instantaneous potential per unit time for the event to occur; given that the individual has survived up to time "t" and is considered the conditional failure rate (Kleinbaum & Klein, 2005, p. 10). One function can be derived knowing the other, although on opposing ends (Kleinbaum & Klein, 2005). The hazard function centers on failing, whereas surviving is the focus of the survivor function.

$$h(t) = \lim_{\Delta t \to 0} \frac{P(t \le T < t + \Delta t \mid T \ge t)}{\Delta t}$$

Where:

T= survival time (dependent variables)

t= specified value of t (52 weeks – counseling adherence, 365 days – opioid abstinence and retention)

The cox proportional-hazard equation:

$$h_i(t) = ho(t) \exp(\beta_1 X_{i1} + \beta_2 X_{i2} + \ ... \ + \beta_k\ X_{ik})$$

Where:

$h_i\ (t)$ = hazard rate at time t

$h_0\ (t)$ = baseline hazard

β_{1-15} = regression coefficients

X = predictor variables

X_1 = Personal Characteristics – gender

X_2 = Personal Characteristics – race

X_3 = Personal Characteristics – age

X_4 = Personal Characteristics – relationship status

X_5 = Socio-economic Factors – education

X_6 = Socio-economic Factors – employment

X_7 = Socio-economic Factors – income

X_8 = Socio-economic Factors – health insurance

X_9 = Readiness to Change

X_{10} = Social Support

X_{11} = Integrated Care

X_{12} = Opioid Dependence

X_{13} = Criminal History

X_{14} = Court Ordered

X_{15} = Medication

Power Analysis.

A priori power analysis determines if the expected sample is large enough to support this analysis achieving desired effect size. Determination of minimum sample size is needed to make generalizations to the population. Power is the odds of observing an effect when it occurs (Farrokhyar, Reddy, Poolman & Bhandari, 2013). A priori power equation includes sample size

(number of units in the study), effect size (salience of treatment relative to noise), number of predictors, and alpha level (odds that observed results are due to chance). Power = f(sample size, effect size, number of predictors, alpha). With an anticipated effect size of 0.15, power level of .8, 41 predictors and a probability level of .05, the priori power analysis indicated a minimum sample size of 216 is required to reach statistically significant results.

CHAPTER FOUR: RESULTS

The results section provides a detailed description of the analyses completed. The chapter begins with a depiction of the study sample, then continues with the bivariate and survival analyses conducted. The chapter concludes with an interpretation of the hypotheses testing.

Descriptive Analysis

The sample consisted of 1151 adults receiving MAT during the study period from July 1, 2014 to June 30, 2016. As shown in Table 2, the sample was predominantly female (61.4%), White (86.6%) and single (68.2%). The mean age at time of admission was 34.72 years (standard deviation = 9.926) ranging from 18 to 76 years. Almost 30% of the participants' highest level of education was less than a high school diploma or GED, 39.9% received a high school diploma or GED, 3.4% completed vocational training, 17.2% completed some college courses, and 9.8% had a college degree. The majority of participants were unemployed (56.9%), therefore the mean income at time of admission was $825.29 (standard deviation = 5131.61). The majority of the sample had some form of insurance or coverage -public 55% and private 9.4%- while 35.6% of patients had no insurance and were considered self-pay. For the final variable under personal factors, readiness to change, 29.5% of patients were in the initial phase of pre-contemplation at intake, 34.8% in contemplation, 24.2% in action, and 11.5% were in the maintenance stage. In terms of variables under environmental factors, the majority of patients 87.1% had some form of social support, and 37.8% had received integrated care.

The study included four control variables: primary drug dependence, criminal history, being court-ordered to treatment, and medication prescribed. The majority of patients had a primary drug addiction to non-medicinal prescription drugs (68.1%) or heroin (27.7%), had no

criminal history (81.5%), were not court ordered to treatment (93.4%) and were prescribed

methadone (93%).

In addition to the mean and standard deviation, the median is also reported due to the

normal curve being skewed for the three dependent variables which were time-dependent.

Counseling adherence measured in weeks had a median of 38.43 weeks, and mean of 32.80

(standard deviation = 20.104). Opioid abstinence measured in days had a 77.21 median and mean

of 139.47 (standard deviation = 131.230). Retention was also measured in days had a 182.50

median, and mean of 202.91 (standard deviation = 136.520). Detailed characteristics of the

sample is illustrated in Table 2.

Table 2.

Sample Characteristics

N= 1151	N	%	Median	Mean	(SD)
Gender					
Male	444	38.6			
Female	707	61.4			
Race					
White	986	86.6			
Black/AA	51	4.5			
Other	102	9.0			
Age			33.00	34.72	9.926
Relationship Status					
Single	773	68.2			
Married	166	14.7			
Other	194	17.1			
Education					
< high school	245	29.7			
High school	329	39.9			
Vocational	28	3.4			
Some college	142	17.2			
College Degree	81	9.8			
Employment					
Unemployed	472	56.9			
Not-in workforce	189	22.8			
Part-time	45	5.4			
Full-time	124	14.9			

N= 1151	N	%	Median	Mean	(SD)
Income			0.00	825.29	5131.613
Insurance					
None	410	35.6			
Public	633	55.0			
Private	108	9.4			
Readiness to Change					
Pre-contemplation	305	29.5			
Contemplation	360	34.8			
Action	250	24.2			
Maintenance	119	11.5			
Support System					
No	148	12.9			
Yes	1003	87.1			
Integrated Care					
No	716	62.2			
Yes	435	37.8			
Drug Dependence					
Prescriptions	616	68.1			
Heroin	251	27.7			
Crack/Cocaine	10	1.1			
Methamphetamine	6	0.7			
Other	22	2.4			
Criminal History					
No	710	81.5			
Yes	161	18.5			
Court. Ordered					
No	845	93.4			
Yes	60	6.6			
Medication Prescribed					
Methadone	1071	93.0			
Buprenorphine	80	7.0			
Counseling Adherence					
(weeks)			38.43	32.80	20.104
Opioid Abstinence					
(days)			77.21	139.47	131.230
Retention					
(days)			182.50	202.91	136.520

Bivariate Analysis

Comparisons between continuous variables were analyzed using the Pearson correlation coefficient (r). For categorical variables, the means of the dependent variables were compared between groups, using the Fischer's test (F). For statistical significant differences between groups of three or more, the post-hoc comparisons using the Tukey HSD test was analyzed.

Correlation.

As depicted in Tables 3, 4 and 5, there were no significant correlations between the continuous independent variables (age and income) with the dependent variables.

Table 3

Correlations between counseling adherence and continuous independent variables

Variable	N	R	P-value
Age	623	.058	.145
Income	445	-.012	.802

Table 4

Correlations between opioid abstinence and continuous independent variables

Variable	N	R	P-value
Age	1118	.027	.370
Income	778	.064	.076

Table 5

Correlations between retention and continuous independent variables

Variable	N	R	P-value
Age	1066	.038	.214
Income	742	-.048	.193

ANOVA.

Counseling Adherence: Table 6 shows the results of ANOVAs conducted to explore the impact of independent categorical variables on counseling adherence in mean weeks. There were no statistically significant differences between the means of any of the personal characteristic variables –gender, race, relationship status.

All of the socio-economic factors, with the exception of insurance, had no statistical significance as well. There was a statistically significant difference in counseling adherence time for the three insurance groups: $F(2, 623) = 14.380$, $p = .000$. Post hoc comparisons using the Tukey HSD test indicated that the mean score for no insurance ($M = 26.44$, $SD = 19.927$) was significantly different from public insurance ($M = 35.72$, $SD = 19.567$) but did not differ significantly from private insurance ($M = 27.29$, $SD = 19.938$).

For the final personal factor, readiness to change was not statistically significant.

In regard to environmental influences, having a support system was not statistically significant. There was a statistical significant difference in those who had integrated care and those who did not: $F(1, 623) = 6.256$, $p = .013$.

Table 6

ANOVA of Counseling Adherence and the categorical independent variables

Variable	N	Mean (weeks)	SD	F	p-value
Gender				.926	.336
Male	226	31.77	19.945		
Female	397	33.38	20.196		
Race				.478	.620
White	539	32.57	20.274		
Black/AA	32	36.14	18.199		
Other	48	32.56	19.341		
Relationship Status				.755	.470
Single	403	33.67	20.005		
Married	97	32.30	20.103		
Other	112	31.15	20.422		
Education				.614	.653
< high school	132	34.49	19.865		
High school	196	33.97	19.797		
Vocational	18	33.93	21.261		
Some college	78	30.68	19.904		
College Degree	49	35.48	19.282		
Employment				1.314	.269
Unemployed	263	32.29	20.102		
Not-in workforce	116	34.91	20.075		
Part-time	28	32.97	20.575		
Full-time	69	37.19	17.645		
Insurance				14.380	.000*
None	141	26.44	19.927		
Public	421	35.72	19.567		
Private	61	27.29	19.938		
Readiness to Change				.891	.445
Pre-contemplation	169	32.70	20.637		
Contemplation	201	34.48	19.971		
Action	141	31.51	19.731		
Maintenance	67	35.36	19.454		
Support System				.231	.631
No	540	32.64	20.134		
Yes	83	33.78	20.004		
Integrated Care				6.256	.013*
No	339	30.96	20.603		
Yes	284	34.99	19.300		

Variable	N	Mean (weeks)	SD	F	p-value
Drug Dependence				.673	.611
Prescriptions	352	34.30	19.918		
Heroin	143	31.98	19.673		
Crack/Cocaine	8	38.16	20.578		
Methamphetamine	4	42.72	10.727		
Other	8	31.93	21.796		
Criminal History				.328	.567
No	429	33.96	19.725		
Yes	69	32.49	20.214		
Court. Ordered				.061	.804
No	487	33.80	19.880		
Yes	28	32.84	19.053		
Medications				1.191	.276
Methadone	595	32.99	20.293		
Buprenorphine	28	28.74	15.297		

* Statistical significance, $p \leq .05$

Opioid Abstinence: Table 7 details the results of ANOVAs conducted to explore the impact of independent categorical variables on opioid abstinence in mean days. There was no statistical significance between the means of any of the personal characteristic variables –gender, race, relationship status with opioid abstinence.

There was also no statistical significance for education. There was a statistical significant difference in opioid abstinence days for the four employment groups: $F(3, 820)= 3.2200$, $p=.022$. Post hoc comparisons using the Tukey HSD test indicated there was only one significant difference between the four employment categories, unemployed patients (M = 135.39, SD = 128.336) and patients who worked full-time (M = 176.52, SD = 146.166).

Having some form of insurance had statistical significance with opioid abstinence: $F(2, 1118)= 18.3700$, $p=.000$. Post hoc comparisons using the Tukey HSD test indicated that the mean score for no insurance (M = 109.32, SD = 114.748) was significantly different from public

insurance (M = 151.32, SD = 135.362) and private insurance (M = 180.53, SD = 141.820).

However, there was no statistical significant difference in public and private insurance.

Readiness to change had no statistical significance with opioid abstinence.

For environmental influences, there was a statistically significant difference between those who had social support: $F(1, 1118)= 17.968$, p=.000, and those who did not. In addition, patients who received integrated care and those who did not had a statistical difference in opioid abstinence days: $F(1, 1118)= 11.763$, p=.001.

Control variables indicated two significant differences between means in opioid abstinence days. There was a statistical significant difference in primary drug dependence for the five groups: $F(4, 895)= 4.883$, p=.001. Post hoc comparisons using the Tukey HSD test indicated only two groups differed significantly from each other, prescription drugs (M = 148.41, SD = 133.448) and heroin (M = 117.10, SD = 122.836). Prescribed medications also indicated a statistical significance between means for methadone and buprenorphine medications: $F(1, 1118)= 43.986$, p=.000.

Table 7

ANOVA Analysis of Opioid Abstinence and categorical independent variables

Variable	N	Mean (days)	SD	F	p-value
Gender				.001	.970
Male	419	139.28	134.524		
Female	699	139.58	129.312		
Race				.629	.533
White	957	140.39	130.637		
Black/AA	50	149.74	143.644		
Other	100	126.96	132.193		
Relationship Status				.096	.909
Single	749	137.39	130.184		
Married	164	139.17	134.662		
Other	190	141.95	128.210		

Variable	N	Mean (days)	SD	F	p-value
Education				2.035	.088
< high school	244	133.86	127.761		
High school	324	153.73	138.794		
Vocational	28	167.14	126.169		
Some college	140	121.77	122.621		
College Degree	79	151.11	135.301		
Employment				3.220	.022*
Unemployed	468	135.39	128.336		
Not-in workforce	185	140.58	134.829		
Part-time	45	134.09	119.571		
Full-time	122	176.52	146.166		
Insurance				18.370	.000*
None	387	109.32	114.748		
Public	628	151.32	135.362		
Private	103	180.53	141.820		
Readiness to Change				1.136	.333
Pre-contemplation	298	143.27	134.073		
Contemplation	354	137.98	130.258		
Action	250	125.31	122.686		
Maintenance	119	146.95	135.601		
Support System				17.968	.000*
No	972	133.07	128.574		
Yes	146	182.08	140.922		
Integrated Care				11.763	.001*
No	690	128.92	129.896		
Yes	428	156.48	131.734		
Drug Dependence				4.883	.001*
Prescriptions	610	148.41	133.448		
Heroin	248	117.10	122.836		
Crack/Cocaine	10	175.83	155.566		
Methamphetamine	6	258.68	144.471		
Other	21	196.09	121.824		
Criminal History				1.079	.299
No	707	145.17	134.137		
Yes	155	133.00	122.371		
Court. Ordered				1.280	.258
No	837	140.59	118.614		
Yes	58	160.83	131.778		
Medications				43.986	.000*
Methadone	1067	133.89	128.935		
Buprenorphine	51	256.30	125.320		

* Statistical significance, p ≤ .05

Retention: Table 8 shows the results of ANOVAs conducted to explore the impact of independent categorical variables on retention. There was no statistical significance between the means of any of the personal characteristic variables -gender, race, relationship status- and socio-economic variables -education, and employment- and retention, with the exception of insurance. Insurance had a statistically significant difference in means for the three groups –none, public, private: $F(2, 1066)= 53.629$, $p=.000$. Post hoc comparisons using the Tukey HSD test indicated that the mean score for no insurance ($M = 146.71$, $SD = 123.167$) was significantly different from public insurance ($M = 233.15$, $SD = 133.145$) and private insurance ($M = 234.09$, $SD = 138.778$). However, there was no statistically significant difference in public and private insurance.

Readiness to change had no statistical significance with retention.

There was a statistically significant difference in those who had a support system $F(1, 1066)= 9.561$, $p=.002$, and those who did not. In addition, patients who received integrated care and those who did not had a statistical difference between means in opioid abstinence days $(1, 1118)= 71.975$, $p=.000$.

Control variables indicated two significant differences between means in retention days. There was a statistically significant difference in patients who had a criminal history and those who did not: $F(1, 822)= 4.703$, $p=.030$. Prescribed medications also indicated a statistical significance between means for methadone and buprenorphine: $F(1, 1066)= 19.078$, $p=.000$.

Table 8

ANOVA Analysis of Retention in treatment and categorical independent variables

Variable	N	Mean (days)	SD	F	p-value
Gender				.095	.758
Male	387	201.20	133.874		
Female	679	203.88	138.094		
Race				2.781	.062
White	923	204.81	137.144		
Black/AA	45	225.51	127.292		
Other	87	173.17	130.894		
Relationship Status				.286	.751
Single	720	200.78	136.946		
Married	155	209.14	136.607		
Other	179	198.86	133.223		
Education				1.464	.211
< high school	234	200.15	133.099		
High school	306	218.41	135.657		
Vocational	26	206.69	130.950		
Some college	135	191.84	128.442		
College Degree	74	225.53	141.998		
Employment				1.337	.261
Unemployed	453	200.79	133.952		
Not-in workforce	175	217.51	136.563		
Part-time	43	231.02	131.646		
Full-time	109	217.70	132.260		
Insurance					
None	374	146.71	123.167	53.629	.000*
Public	600	233.15	133.145		
Private	92	234.09	138.778		
Readiness to Change				.837	.474
Pre-contemplation	286	201.60	137.417		
Contemplation	335	200.25	135.946		
Action	241	200.77	133.300		
Maintenance	117	221.98	136.599		
Support System				9.561	.002*
No	924	197.83	137.648		
Yes	142	235.91	124.419		
Integrated Care				71.975	.000*
No	660	175.97	138.729		
Yes	406	246.70	120.786		

Variable	N	Mean (days)	SD	F	p-value
Drug Dependence				1.236	.294
Prescriptions	587	208.37	137.150		
Heroin	232	200.08	127.613		
Crack/Cocaine	10	242.70	145.924		
Methamphetamine	5	316.00	109.567		
Other	20	223.35	133.992		
Criminal History				4.703	.030*
No	668	212.29	133.766		
Yes	154	186.27	136.041		
Court. Ordered				1.716	.191
No	796	205.87	135.435		
Yes	58	229.84	121.496		
Medications				19.078	.000*
Methadone	1031	199.57	136.067		
Buprenorphine	35	301.20	112.458		

* Statistical significance, p ≤ .05

Survival Analysis

Kaplan Meier Method.

The Kaplan-Meier survival curves of the treatment outcomes are illustrated only for

selected factors with significant associations and the detailed results are included in Table 9. For

each covariate the table includes the percentage for each category that met the survival goal (52

weeks or 365 days), the median survival time, chi-square, and significance. The Log rank

(Mantel-cox) was used for the chi-square, since it focuses on events that occur later on within the

timeframe (Kleinbaum & Klein, 2005). Since none of the curves were normal for the dependent

variables, the median (versus the mean) was used for the estimated survival time rounded to the

nearest whole number (Barker, 2009).

Table 9

Kaplan Meier table of covariates and treatment outcomes.

	Counseling Adherence	Opioid Abstinence	Retention
Gender			
Male	38.9%, est. 34 weeks	17.9%, est. 66 days	29.7%, est. 180 days
Female	46.1%, est. 42 weeks	16.7%, est. 79 days	33.07%, est. 183 days
	x^2 (1, N=623)= 2.230, p=.135	x^2 (1, N=1118)= .037, p=.848	x^2 (1, N=1066)= .473, p=.492
Race			
White	43.4%, est. 38 weeks	16.8%, est. 79 days	32.5%, est. 184 days
Black/AA	50.0%, est. 43 weeks	22.0 %, est.62 days	33.3%, est. 209 days
Other	37.5%, est. 36 weeks	19.0%, est. 50 days	24.1%, est. 132 days
	x^2 (2, N= 619)= 1.055, p=.590	x^2 (2, N= 1107) = .583, p= .747	x^2 (2, N=1055)= 4.608, p= .100
Relationship Status			
Single	45.7%, est. 42 weeks	16.6%, est. 75 days	31.3%, est. 176 days
Married	42.3%, est. 33 weeks	20.1%, est. 78 days	34.8%, est. 194 days
Other	40.2%, est. 34 weeks	14.2%, est. 85 days	27.9%, est. 175 days
	x^2 (2, N= 612)= 1.464, p= .481	x^2 (2, N= 1103)= .157, p= .924	x^2 (2, N= 1054)= 1.131, p=.568
Education			
< high school	50.0%, est. 47 weeks	15.2%, est. 73 days	29.1%, est. 175 days
High school	46.4, est. 43 weeks	22.5%, est. 90 days	37.6%, est. 222 days
Vocational	50.0, est. 44 weeks	17.9%, est. 165 days	26.9%, est. 196 days
Some college	37.2, est. 26 weeks	12.9%, est. 62 days	24.4%, est. 176 days
College Degree	42.9, est. 47 weeks	16.5%, est. 109 days	37.8%, est. 260 days
	x^2 (4, N=473)= 3.190, p= .527	x^2 (4, N= 815)= 8.174, p= .085	x^2 (4, N= 775)= 8.514, p= .074
Employment			
Unemployed	43.7%, est. 36 weeks	16.7%, est. 73 days	30.2%, est. 178 days
Not-in workforce	47.4%, est. 48 weeks	17.8%, est. 74 days	36.0%, est. 229 days
Part-time	50.0%, est. 35 weeks	11.1%, est. 118 days	41.9%, est. 212 days
Full-time	47.8%, est. 48 weeks	26.2%, est. 119 days	32.1%, est. 234 days
	x^2 (3, N= 476)= 1.673, p= .643	x^2 (3, N= 820)= 7.271, p= .064	x^2 (3, N= 780)= 3.982, p= .263
Insurance			
None	28.4%, est. 24 weeks	9.6%, est. 52 days	14.2%, est. 93 days
Public	50.8%, est. 33 weeks	20.2%, est. 91days	41.3%, est. 261 days
Private	27.9%, est. 27 weeks	27.2%, est. 164 days	41.3%, est. 307 days
	x^2 (2, N= 623)= 33.641, p= .000*	x^2 (2, N= 1118)= 37.823, p= .000*	x^2 (2, N= 1066)= 120.975, p= .000*

	Counseling Adherence	Opioid Abstinence	Retention
Readiness to Change			
Pre-contemplation	45.0%, est. 43 weeks	18.8%, est. 77 days	32.5%, est. 178 days
Contemplation	48.3%, est. 49 weeks	17.5%, est. 73 days	32.5%, est. 172 days
Action	37.6%, est. 33 weeks	12.4%, est. 73 days	28.6%, est. 183 days
Maintenance	50.7%, est. 35 weeks	19.3%, est. 82 days	35.9%, est. 245 days
	x^2 (3, N= 578)= 4.189, p= .242	x^2 (3, N= 1021)= 4.509, p= .211	x^2 (3, N= 979)= 1.986, p= .575
Support System			
No	43.3%, est. 38 weeks	15.7%, est. 70 days	31.2%, est. 170 days
Yes	44.6%, est. 43 weeks	26.7%, est. 170 days	35.9%, est. 242 days
	x^2 (1, N= 623)=.116, p= .733	x^2 (1, N= 1118)= 13.297, p= .000*	x^2 (1, N= 1066)= 4.859, p= .028*
Integrated Care			
No	39.8%, est. 32 weeks	15.9%, est. 64 days	26.5%, est. 122 days
Yes	47.9%, est. 44 weeks	19.2%, est. 108 days	40.4%, est. 275 days
	x^2 (1, N= 623)= 5.548, p= .019*	x^2 (1, N= 1118)= 9.370, p= .002*	x^2 (1, N= 1066)= 48.188, p= .000*
Drug Dependence			
Prescriptions	47.7%, est. 48 weeks	19.3%, est. 85 days	34.2%, est. 194 days
Heroin	38.5%, est. 33 weeks	12.1%, est. 51 days	25.0%, est. 183 days
Crack/Cocaine	62.5%, est. weeks	30.0%, est. 79 days	50.0%, est. 281 days
Methamphetamine	50.0%, est. 34 weeks	50.0%, est. 300 days	80.0%, est. days
Other	50.0%, est. 16 weeks	23.8%, est. 202 days	40.0%, est. 201 days
	x^2 (4, N= 515)= 3.793, p= .435	x^2 (4, N= 895)= 19.255, p= .001*	x^2 (4, N= 854)= 7.758, p= .101
Criminal History			
No	45.7%, est. 43 weeks	18.8%, est. 81 days	33.4%, est. 208 days
Yes	42.0%, est. 35 weeks	14.2%, est. 83 days	26.6%, est. 160 days
	x^2 (1, N= 498)= .355, p= .551	x^2 (1, N= 862)= .993, p= .319	x^2 (1, N= 822)= 4.598, p= .032*
Court. Ordered			
No	45.6%, est. 43 weeks	17.9%, est. 78 days	32.3%, est. 194 days
Yes	42.9%, est. 34 weeks	15.5%, est. 134 days	32.8%, est. 183 days
	x^2 (1, N= 515)= .046, p= .830	x^2 (1, N= 895)= .720, p= .396	x^2 (1, N= 854)= .589, p= .443
Medication			
Methadone	45.0%, est. 41 weeks	16.1%, est.72 days	30.9%, est.176 days
Buprenorphine	10.7%, est. 28 weeks	39.2%, est. 322 days	57.1%, est. days
	x^2 (1, N= 623)= 7.374, p= .007*	x^2 (1, N= 1118)= 22.430, p= .000*	x^2 (1, N= 1066)= 10.921, p= .001*

* Statistical significance, p ≤ .05

There were no statistically significant associations with personal characteristics and treatment outcomes. Health insurance was the only socio-economic factor which showed an association with all three dependent variables. Figures 6, 7 and 8 show the curve of counseling adherence, opioid abstinence and retention respectively by health insurance. Relative to counseling adherence, patients with public coverage have a higher survival probability than those with private or no insurance (Log-rank statistic = 33.641, p = .000). Opioid abstinence on the other hand, initially showed a similar probability among all three categories in the first 50 days. However, as time progressed, those with private coverage had a higher probability than those with public assistance, followed by those with no insurance with the lowest survival probability to abstain from opioids (Log-rank statistic = 37.823, p = .000). Patients' retention in treatment was higher if they had either public or private insurance than if they had none. (Log-rank statistic = 120.975, p = .000). Median survival time was over 240 days for patients with either type of insurance (public= 261 days, private= 307 days) versus 93 days for patients without insurance.

Figure 6. *Insurance and Counseling Adherence. This figure illustrates the Kaplan Meier survival curve on the association of insurance and counseling adherence.*

Figure 7. *Insurance and Opioid Abstinence. This figure illustrates the Kaplan Meier survival curve on the association of insurance and opioid abstinence.*

Figure 8. *Insurance and Retention. This figure illustrates the Kaplan Meier survival curve on the association of insurance and retention.*

For environmental influences, there were associations for both covariates. There was a statistically significant association with social support and two of the dependent variables-opioid abstinence and retention. Figure 9 illustrates patients with social support having a higher survival probability than those without, in abstaining from opioids (Log-rank statistic = 13.297, p = .002). The median survival time was 170 days for those with social support versus those without social support at 70 days. Similarly, a higher probability in survival time was seen in relation to retention and having social support. Figure 10 shows the survival probability for patients with social support having a higher survival probability than those without in relation to retention (Log-rank statistic = 4.859, p = .028). The median survival time was 242 days for those with social support versus those without social support at 170 days.
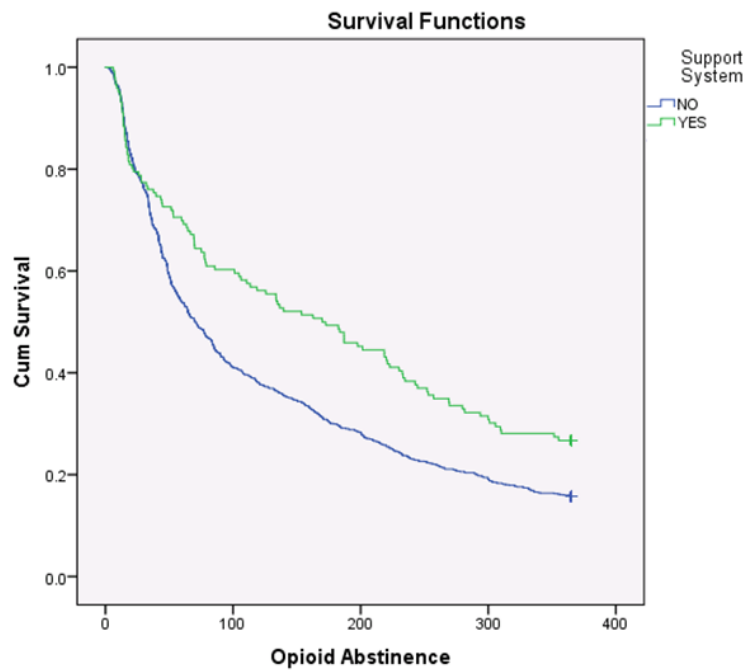
Figure 9. *Social Support and Opioid Abstinence. This figure illustrates the Kaplan Meier survival curve on the association of support systems and opioid abstinence.*

Figure 10. *Social Support and Retention. This figure illustrates the Kaplan Meier survival curve on the association of support systems and retention.*

65

Integrated care showed statistically significant associations with all dependent variables.

Figures 11, 12, and 13 depicts the association of integrated care on counseling adherence, opioid

abstinence and retention respectively in Kaplan Meier curves. In regard to counseling adherence,

patients with integrated care have a higher survival probability than those without (Log-rank

statistic = 5.548, p = .019). Opioid abstinence on the other hand, initially showed a similar

probability among both categories in the initial month as seen in Figure 12. However, as time

progressed those with integrated care had a higher probability than those without (Log-rank

statistic = 9.370, p = .002). Patients' retention in treatment had a much higher survival

probability if they were in integrated care than not (Log-rank statistic = 48.188, p = .000).

Median survival time of those with integrated care was 275 days versus 122 days for those
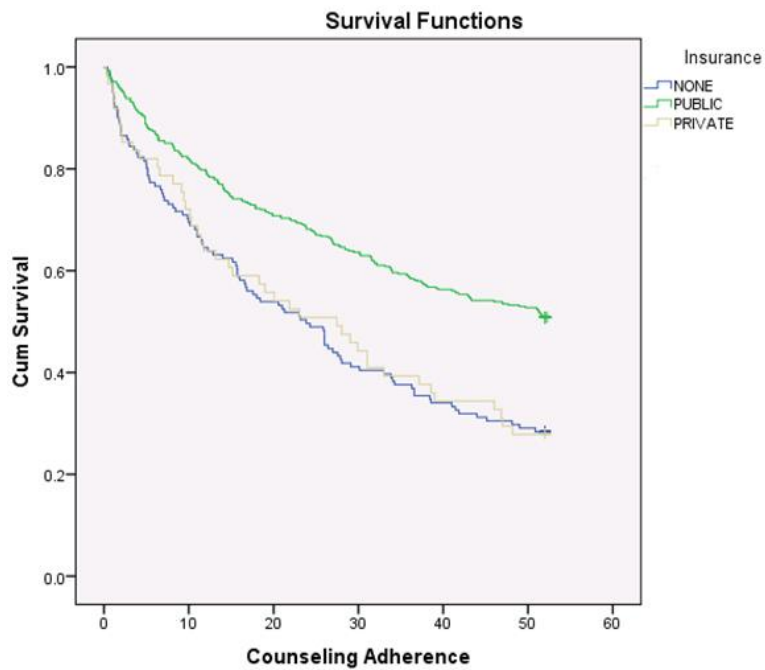
without integrated care.

Figure 11. *Integrated Care and Counseling Adherence. This figure illustrates the Kaplan Meier survival curve on the association of integrated care and counseling adherence.*
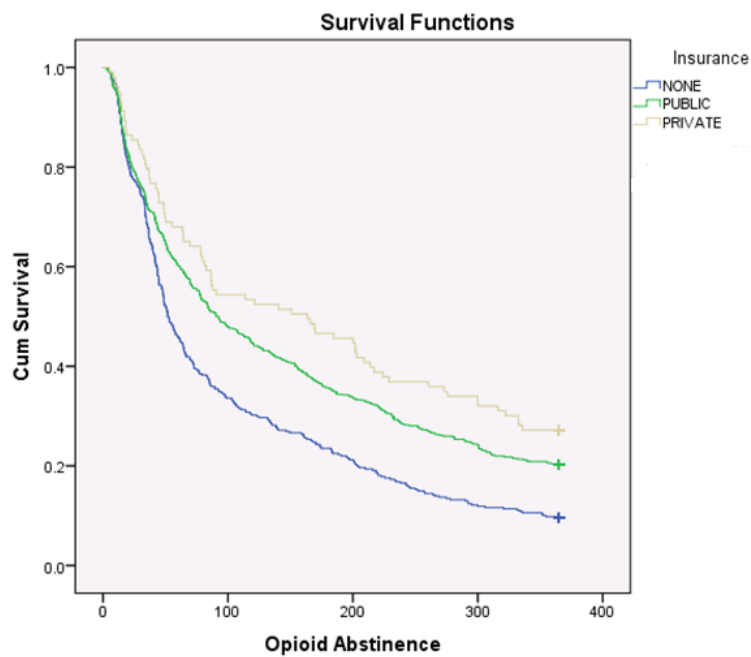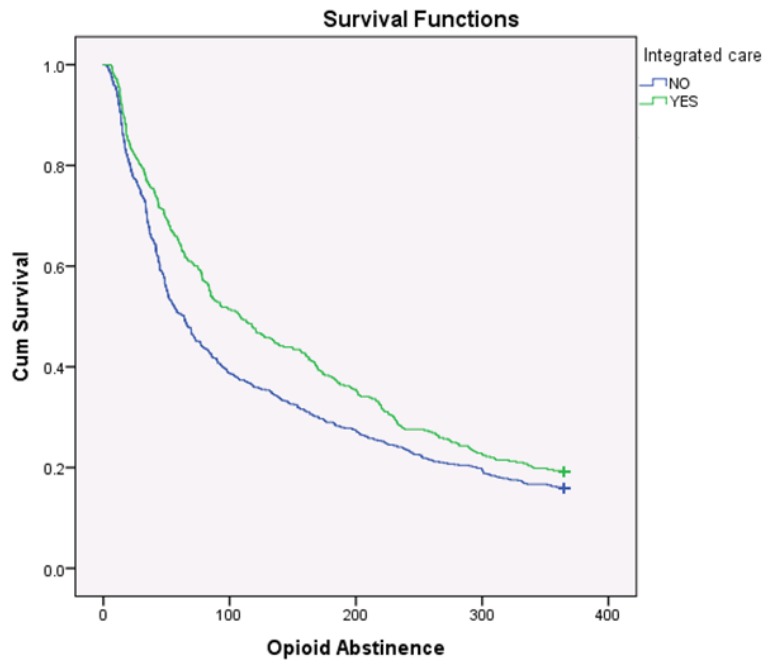
Figure 12. *Integrated Care and Opioid Abstinence. This figure illustrates the Kaplan Meier survival curve on the association of integrated care and opioid abstinence.*
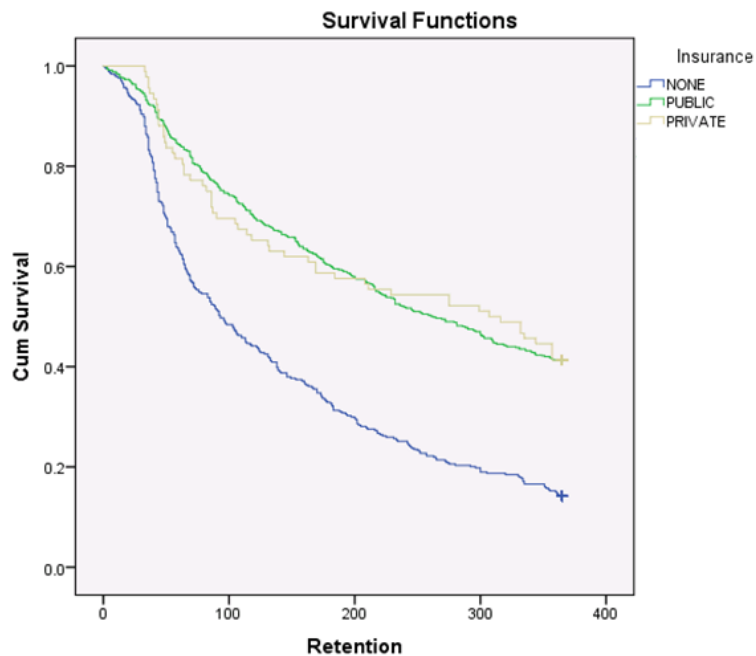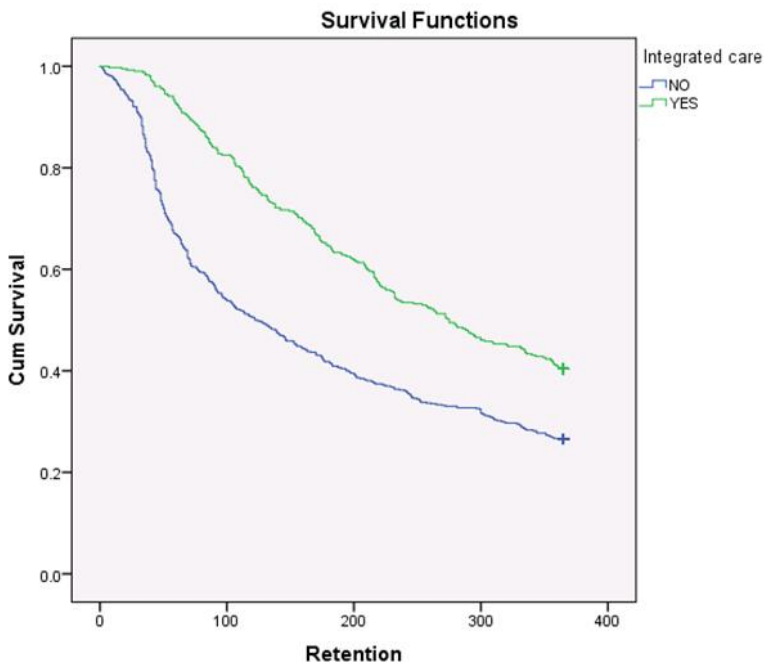

Figure 13. *Integrated Care and Retention. This figure illustrates the Kaplan Meier survival curve on the association of integrated care and retention.*

Finally, the control variables had three significant associations. The association of opioid abstinence and primary drug dependence showed a statistically significant association, as depicted in Figure 14. Those whose primary dependence was methamphetamine or other drugs have a higher survival probability in comparison to non-medicinal prescription drugs (median survival: 85 days) or heroin (median survival: 51 days) (Log-rank statistic = 19.255, p = .001).
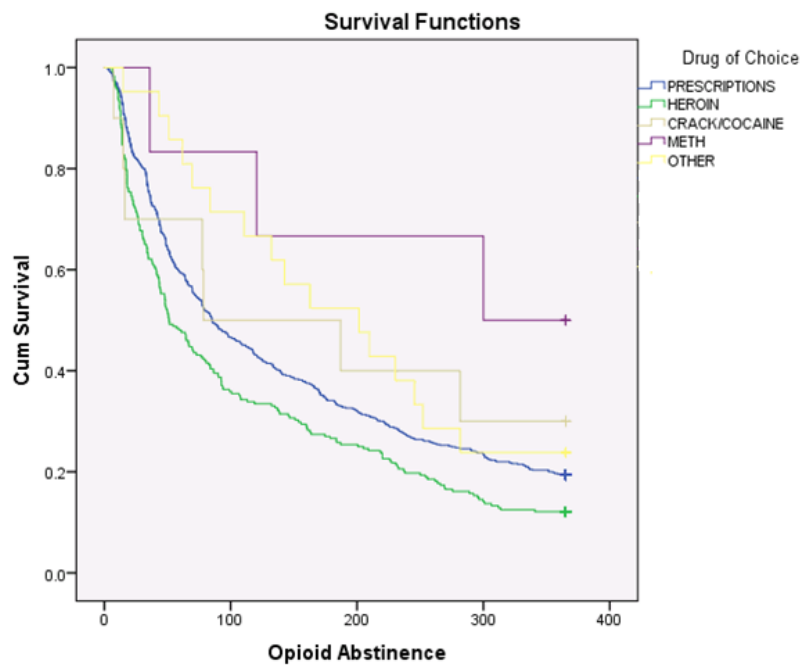
Figure 14. *Primary Drug Dependence and Opioid Abstinence. This figure illustrates the Kaplan Meier survival curve on drug dependence and opioid abstinence.*

Those with no criminal history had a median survival of 208 days retained in MAT in comparison with 160 days for those with a criminal (Log-rank statistic = 4.598, p = .032). Figure 15 shows the association of patient's criminal history and retention.
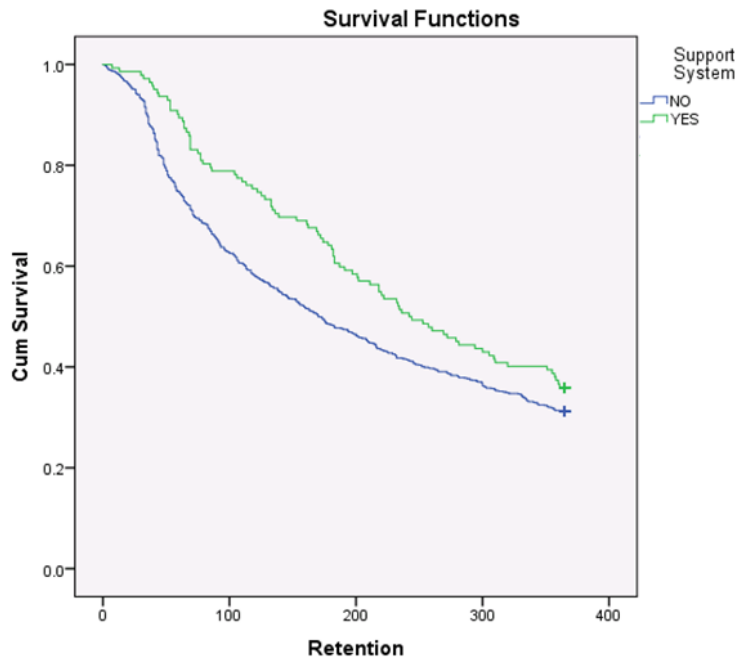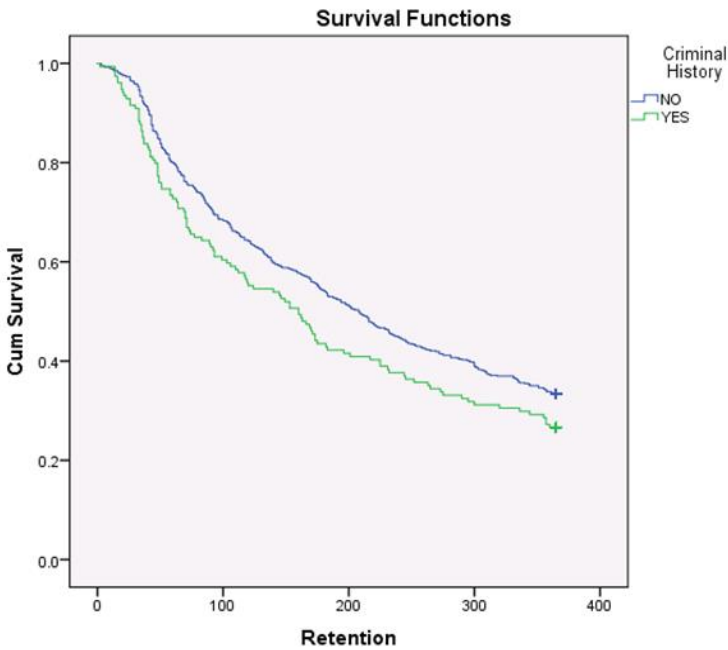
Figure 15. *Criminal History and Retention. This figure illustrates the Kaplan Meier survival curve on the association of criminal history and retention.*

All dependent variables had an association of significance with the medication prescribed. Figure 16 shows patients on methadone having a higher survival probability than those on buprenorphine for counseling adherence (Log-rank statistic = 7.374, p = .007). The median survival time was 41 weeks for methadone in comparison to 28 weeks for buprenorphine. Alternatively, buprenorphine had a higher survival probability than methadone in relation to opioid abstinence as seen in Figure 17 (Log-rank statistic = 22.430, p = .000), and also in relation to retention in treatment (Log-rank statistic = 10.921, p = .001 which is illustrated in Figure 18.
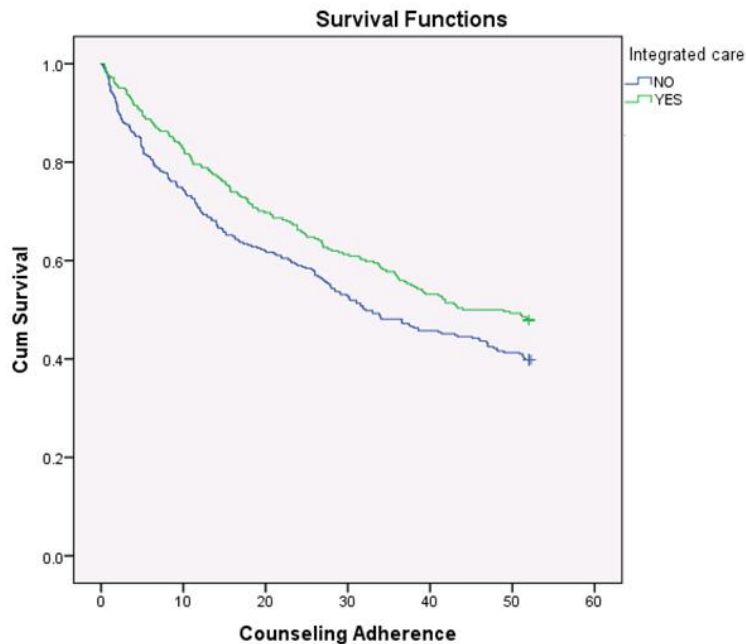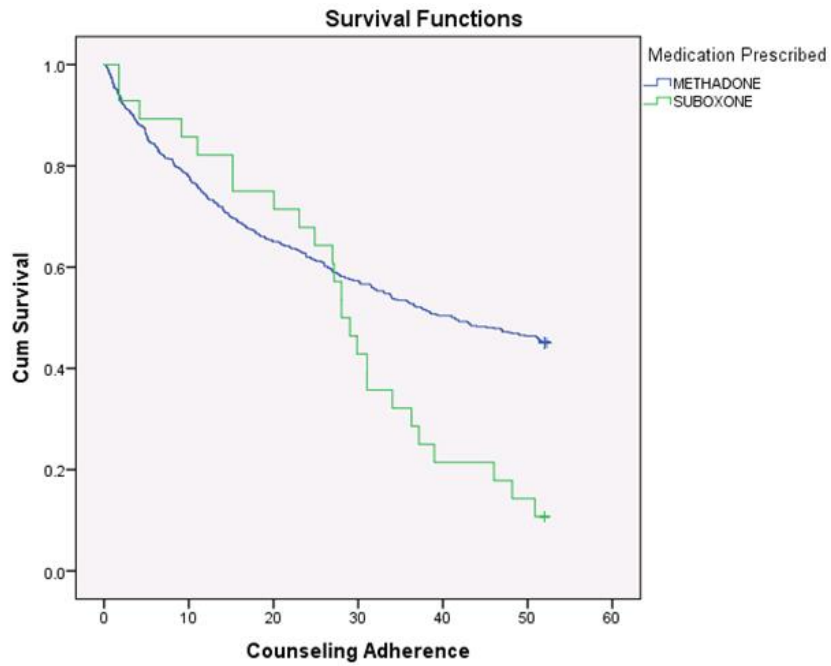
Figure 16. *Medication Prescribed and Counseling Adherence. This figure illustrates the Kaplan Meier survival curve on the association of medication prescribed and counseling adherence.*
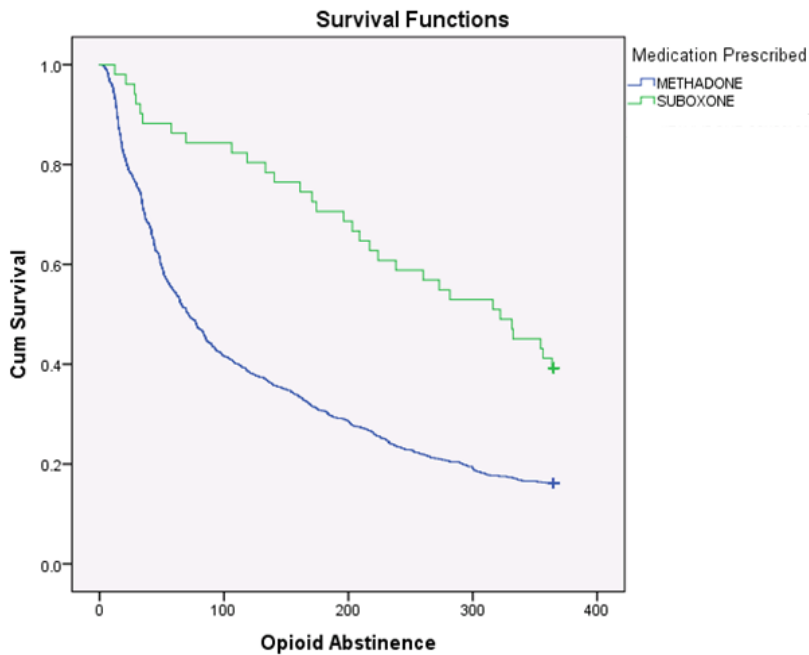

Figure 17. *Medication Prescribed and Opioid Abstinence. This figure illustrates the Kaplan Meier survival curve on medication prescribed and opioid abstinence.*

70
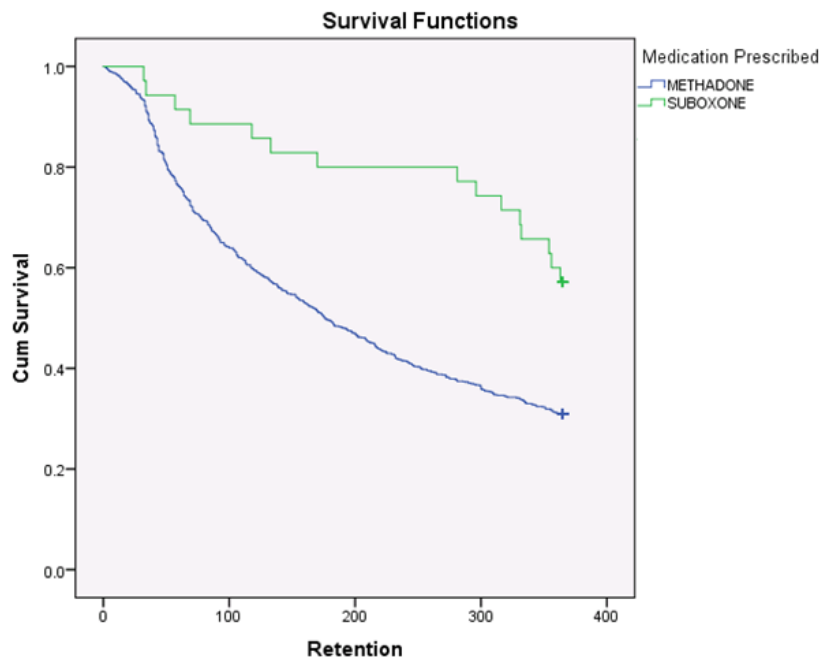
Figure 18. *Medication Prescribed and Retention. This figure illustrates the Kaplan Meier survival curve on the association of medication prescribed and retention.*

Multicollinearity Assumption.

All independent variables were analyzed for multicollinearity to ensure predictor variables did not impact the conclusions derived from the Cox regression model. Variance Inflation Factors (VIFs) reveal how many times a coefficient's standard error is increased due to collinearity (O'brien, 2007). VIFs higher than four means collinearity does exist. Collinearity diagnostics were analyzed for the independent variables, all of which were below two. Additionally, the standard errors in the cox regression models (reported next) for all variables were small (Chan, 2004). Multicollinearity did not exist between the independent variables included in the models.

Cox Regression Analysis.

To assess the relationship of personal factors and environmental influences on the dependent variables (counseling adherence, opioid abstinence, and retention) while controlling for factors such as primary drug dependence, criminal history, court-ordered treatment and medication prescribed, three cox regression models (one for each of the dependent variables) were observed. All three models were statistically significant. In the cox regression analyses tables (10, 11 and 12), the exponentiated coefficients (Exp B) are the hazard ratios. The hazard ratio describes the relationship between the covariates and survival time. It is the measure of effect inferred in a survival analysis (Kleinbaum & Klein, 2005). If the hazard ratio numerical value is less than one, with the confidence interval less than one, it means the covariate decreases failure (increases the likelihood of survival time). A hazard ratio of one means there is no relationship between the covariates and dependent variables. A hazard ratio greater than one, with the confidence interval above one, means the covariate has a higher risk of failure (decreasing the survival time).

Counseling Adherence: In the first model, the analysis is detailed in Table 10 and the survival curve depicting the number of weeks patients in treatment adhered to counseling over a 12-month period is shown in Figure 19. The model's summary statistics indicate the model was strong explaining factors influencing counseling adherence as the model was statistically significant (x^2= 48.527, p≤ .05).

The results indicate that age was the only significant (p≤.05) personal characteristic factor when controlling for other variables. An increase in age is associated with being more likely to adhere to counseling (HR=.968, 95% CI= .950-.986, p= .001).

For socio-economic factors, statistically significant associations were observed in relation to the employment and insurance variables. Patients not-in-the-workforce (i.e. student, home-maker, disabled) (HR= 1.508, 95% CI= 1.026 - 2.218, p= .037) were more likely than those unemployed to not continue adhering to counseling sessions. Those without insurance (HR= 1.000, p= .000) and public coverage (HR= .489, CI= .342 - .698, p= .000) were predictors of adhering to counseling. Education did not have a significant association in determining counseling adherence while controlling for other factors.

The final personal factor, readiness to change, was not statistically significant. However, although not significant the model indicated those in action stage have a higher risk of shorter counseling adherence (HR= 1.476, CI= .987- 2.208, p= .058) than those in pre-contemplation.

Neither of the environmental factors showed statistical significance while controlling for other factors.

The controlling variables -criminal history, court-ordered, medication prescribed- did not have statistical significance with the exception of primary drug dependence. Having a primary drug dependence of heroin showed a higher risk of shorter counseling adherence (HR= 1.514, CI= 1.097 - 2.090, p= .012) than patients whose primary dependence is non-medicinal prescription drugs.

Table 10

Cox regression predicting number of weeks adhering to counseling in treatment

	Exp (B)	95.0% CI Lower	Upper	Sig.
Gender				
Male (ref)	1.000			
Female	.920	.648	1.307	.643
Race				
White (ref)	1.000			.641
Black/AA	1.299	.630	2.680	.479
Other	1.203	.708	2.044	.494
Age	.968	.950	.986	.001*
Relationship Status				
Single (ref)	1.000			.273
Married	.939	.609	1.449	.777
Other	1.346	.902	2.009	.145
Education				
Less than high school diploma(ref)	1.000			.439
High school diploma/GED	1.227	.847	1.778	.279
Vocational	1.403	.625	3.154	.412
Some college	1.463	.921	2.322	.107
College degree	.962	.572	1.615	.882
Employment				
Unemployed (ref)	1.000			.023*
Not-in workforce	1.508	1.026	2.218	.037*
Part-time	.666	.357	1.243	.202
Full-time	.710	.441	1.143	.158
Income	1.000	1.000	1.000	.145
Insurance				
None (ref)	1.000			.000*
Public	.489	.342	.698	.000*
Private	.682	.392	1.188	.177
Readiness to Change				
Pre-contemplation (ref)	1.000			.154
Contemplation	.998	.682	1.461	.993
Action	1.476	.987	2.208	.058
Maintenance	1.229	.732	2.064	.435
Support System				
No (ref)	1.000			
Yes	1.129	.727	1.753	.588
Integrated Care				
No (ref)	1.000			
Yes	.806	.591	1.100	.174

	Exp (B)	95.0% CI Lower	Upper	Sig.
Drug Dependence				
Prescription drugs (ref)	1.000			.056
Heroin	1.514	1.097	2.090	.012*
Crack/Cocaine	.508	.119	2.162	.359
Methamphetamine	.326	.042	2.519	.282
Other	.696	.201	2.403	.566
Criminal History				
No (ref)	1.000			
Yes	.754	.440	1.292	.304
Court Ordered				
No (ref)	1.000			
Yes	1.295	.656	2.558	.456
Medication				
Methadone (ref)	1.000			
Buprenorphine	1.033	.390	2.739	.948
Summary Statistics				
-2 Log Likelihood				2143.365
Model (x^2)				48.527
Degrees of freedom				28
P-value				.009

* Statistical significance, p ≤ .05
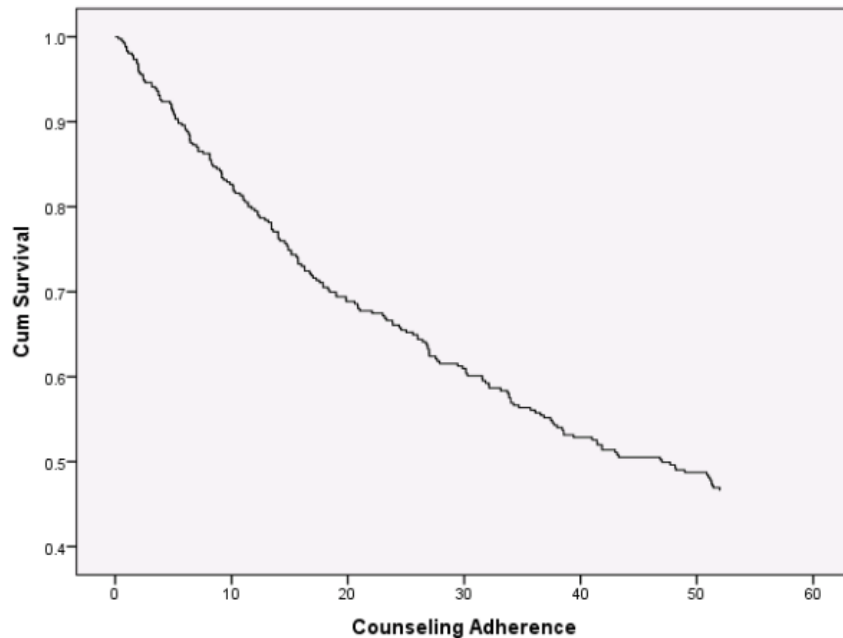
Figure 19. *Counseling Adherence survival curve. This figure illustrated the survival curve of number of weeks adhering to counseling over 12 months.*

Opioid Abstinence: The results for the second cox regression model analysis is described in Table 11, and the survival curve depicting the number of days patients abstained from opioids is illustrated in Figure 20. The model's summary statistics indicate the model was strong explaining factors influencing opioid abstinence as the model was statistically significant ($x^2=$ 78.961, p≤ .05).

No statistically significant associations were seen between personal characteristics in relation to opioid abstinence, while controlling for other factors; the p-values were insignificant.

Opioid abstinence at 365 days was predicted by two socio-economic factors, employment and insurance. Patients with full-time employment (HR= .734, 95% CI=.544 - .991, p=.043) were more likely to abstain from opioids at 365 days than those unemployed. Patients receiving public coverage (HR= .652, 95% CI= .529 - .804, p= .000) and those with private insurance

(HR= .685, 95% CI= .483 - .973, p= .035) were more likely to abstain from opioids than those without insurance (HR= 1.000, p= .000).

Readiness to change had surprising results when controlling for other factors. Patients in action phase (HR= 1.316, 95% CI= 1.028 - 1.686, p= .029), the only statistically significant category, were less likely to abstain from opioids at 365 days than those in pre-contemplation.

The two environmental factors, having a support system and receiving integrated care were both statistically significant. Patients who reported having a support system (HR= .716, 95% CI= .537 - .954, p= .022) at intake were more likely to abstain from opioids. Similarly, patients receiving integrated care (HR= .802, 95% CI= .660 - .975, p= .027) were also more likely to abstain from opioids at 365 days.

The controlling variables did not have statistical significance with the exception of primary drug dependence. Patients with a primary drug dependence of heroin were less likely to abstain from opioids (HR= 1.480, 95% CI= 1.209 - 1.811, p= .000) than patients whose primary dependence is non-medicinal prescription drugs (HR= 1.000, p= .002).

Table 11

Cox regression, predicting number of days abstaining from opioids

	Exp (B)	95.0% CI Lower	Upper	Sig.
Gender				
Male (ref)	1.000			
Female	.936	.757	1.159	.546
Race				
White (ref)	1.000			.906
Black/AA	.892	.538	1.478	.657
Other	.992	.709	1.388	.963
Age	.998	.987	1.009	.735
Relationship Status				
Single (ref)	1.000			.810
Married	.914	.687	1.216	.538
Other	.953	.736	1.234	.715
Education				
Less than high school diploma(ref)	1.000			.351
High school diploma/GED	.819	.659	1.018	.072
Vocational	.908	.561	1.469	.693
Some college	1.031	.784	1.357	.827
College degree	.920	.671	1.261	.605
Employment				
Unemployed (ref)	1.000			.128
Not-in workforce	1.095	.855	1.403	.471
Part-time	1.023	.710	1.474	.904
Full-time	.734	.544	.991	.043*
Income	1.000	1.000	1.000	.497
Insurance				
None (ref)	1.000			.000*
Public	.652	.529	.804	.000*
Private	.685	.483	.973	.035*
Readiness to Change				
Pre-contemplation (ref)	1.000			.140
Contemplation	1.071	.849	1.351	.562
Action	1.316	1.028	1.686	.029*
Maintenance	1.210	.886	1.651	.230
Support System				
No (ref)	1.000			
Yes	.716	.537	.954	.022*
Integrated Care				
No (ref)	1.000			
Yes	.802	.660	.975	.027*

|	Exp (B)	95.0% CI		Sig.
		Lower	Upper	
Drug Dependence				
Prescription drugs (ref)	1.000			.002*
Heroin	1.480	1.209	1.811	.000*
Crack/Cocaine	.834	.335	2.074	.696
Methamphetamine	.471	.114	1.941	.297
Other	.752	.387	1.463	.401
Criminal History				
No (ref)	1.000			
Yes	1.192	.904	1.570	.214
Court Ordered				
No (ref)	1.000			
Yes	.905	.606	1.351	.625
Medication				
Methadone (ref)	1.000			
Buprenorphine	.581	.298	1.133	.111
Summary Statistics				
-2 Log Likelihood				5755.786
Model (x^2)				78.961
Degrees of freedom				28
P-value				.000

* Statistical significance, p ≤ .05
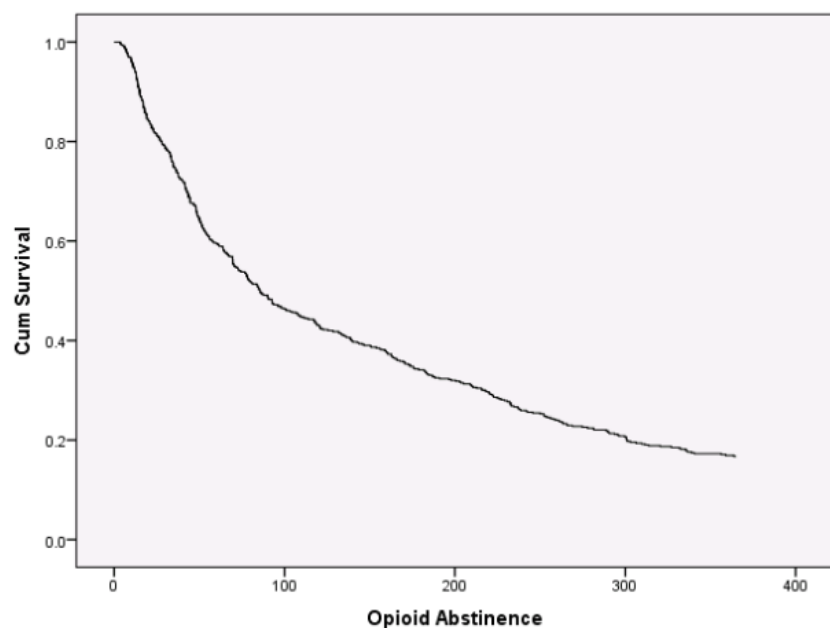
Figure 20. *Opioid Abstinence Survival Curve. This figure illustrated the survival curve of number of days abstaining from opioids over 12 months.*

Retention: the final cox regression analysis results are indicated in Table 12, and the survival curve depicting the number of days patients retained in treatment is illustrated in Figure 21. The model's summary statistics indicate the model was strong explaining factors influencing opioid abstinence as the model was statistically significant (x^2= 144.174, p≤ .05).

Retention at 365 days was predicted by a number of factors, while controlling for patients' primary drug dependence, criminal history, being court-ordered to treatment, and medication prescribed. For personal characteristics, an increase in age was associated with patients being more likely to still be in treatment at one year (HR= .985, 95% CI= .972 - .999, p= .034). Race was the other statistically significant personal characteristic. Patients under other (not White or African American/Black) were less likely than Whites to still be in treatment at 365 days (HR= 1.455, 95% CI= 1.000 – 2.118, p= .050).

For socio-economic factors, statistically significant associations were seen in all factors with the exception of income. Patients who had a high school diploma/GED (HR= .760, 95% CI= .593 - .976, p= .031) were more likely to still be in treatment at one year than those whose highest education level attainment was less than a diploma. Patients working part-time (HR= .615, 95% CI= .390 - .972, p= .037) were more likely to still be in treatment at one year than those unemployed (p= .028). Although not significant, the model indicated patients having full-time employment (HR.723, p= .061) were also more likely to still be in treatment at one year than those unemployed. Those with insurance -public coverage (HR= .399, 95% CI= .315 - .505, p= .000) and private insurance (HR= .496, 95% CI= .337 - .731, p= .000)- were more likely than those without health insurance to still be in treatment at one year (HR= 1.000, p= .000).

Again, readiness to change had unexpected results when controlling for other factors. Patients in action phase (HR= 1.454, 95% CI= 1.093 - 1.934, p= .010), the only statistically

significant category, were less likely to be in treatment after one year than those in pre-contemplation.

Having a support system did not have a significant role in determining retention. On the other hand, receiving integrated care (HR= .564, 95% CI= .450 - .709, p= .000) was a predictor of retaining in treatment.

The controlling variables did not have statistical significance with the exception of primary drug dependence. Patients with a primary drug dependence of heroin were less likely to still be in treatment at 365 days (HR= 1.370, 95% CI= 1.086 - 1.727, p= .008) than those whose primary dependence was prescription drugs (HR= 1.000, p= .016).

Table 12.

Cox regression, predicting number of days retained in treatment.

	Exp (B)	95.0% CI Lower	Upper	Sig.
Gender				
Male (ref)	1.000			
Female	1.126	.882	1.437	.341
Race				
White (ref)	1.000			.146
Black/AA	.997	.555	1.791	.991
Other	1.455	1.000	2.118	.050*
Age	.985	.972	.999	.034*
Relationship Status				
Single (ref)	1.000			.357
Married	.804	.577	1.122	.199
Other	1.049	.778	1.415	.753
Education				
Less than high school diploma(ref)	1.000			.172
High school Diploma/GED	.760	.593	.976	.031*
Vocational	.981	.570	1.689	.946
Some college	.992	.729	1.350	.958
College Degree	.780	.539	1.127	.186

	Exp (B)	95.0% CI		Sig.
		Lower	Upper	
Employment				
Unemployed (ref)	1.000			.028*
Not-in workforce	1.166	.879	1.545	.286
Part-time	.615	.390	.972	.037*
Full-time	.723	.515	1.015	.061
Income	1.000	1.000	1.000	.107
Insurance				
None (ref)	1.000			.000*
Public	.399	.315	.505	.000*
Private	.496	.337	.731	.000*
Readiness to Change				
Pre-contemplation (ref)	1.000			.079
Contemplation	1.268	.964	1.669	.089
Action	1.454	1.093	1.934	.010*
Maintenance	1.201	.848	1.700	.303
Support System				
No (ref)	1.000			
Yes	.832	.605	1.144	.564
Integrated Care				
No (ref)	1.000			
Yes	.564	.450	.709	.000*
Drug Dependence				
Prescription Drugs (ref)	1.000			.016*
Heroin	1.370	1.086	1.727	.008*
Crack/Cocaine	.675	.211	2.167	.509
Methamphetamine	.348	.048	2.534	.297
Other	.539	.244	1.190	.126
Criminal History				
No (ref)	1.000			
Yes	1.243	.922	1.674	.153
Court Ordered				
No (ref)				
Yes	.836	.532	1.312	.436
Medication				
Methadone (ref)	1.000			
Buprenorphine	.709	.330	1.520	.376
Summary Statistics				
-2 Log Likelihood				4457.881
Model (x^2)				144.174
Degrees of freedom				28
P-value				.000

* Statistical significance, p ≤ .05
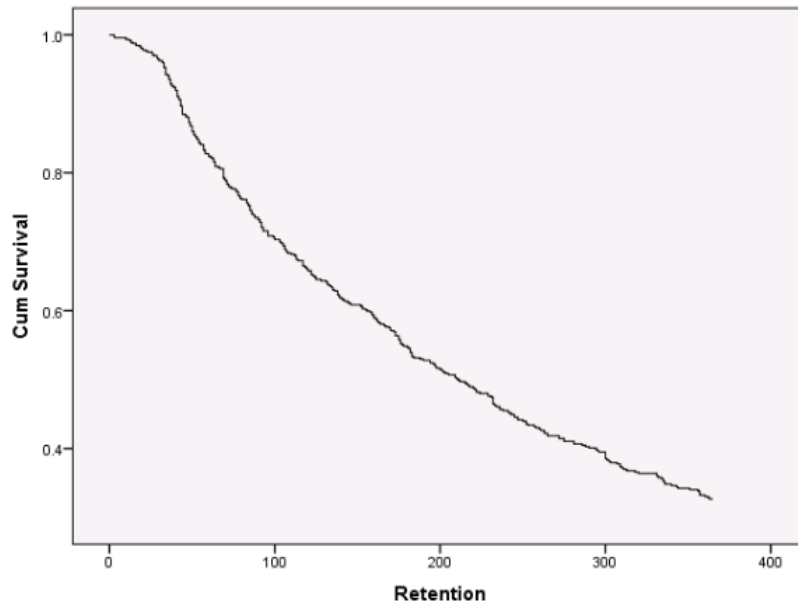
Figure 21. *Retention Survival Curve. This figure illustrated the survival curve of number of days retained in treatment over 12 months.*

Conclusions of Hypothesis Testing

Each hypothesis included sub-hypotheses as it related to each of the dependent variables - counseling adherence, opioid abstinence, and retention in MAT.

Personal Factors.

Personal characteristics. Variables in this category included: gender, race, age and relationship status.

Hypothesis 1A: Gender – identification as male is negatively associated with treatment outcomes.

H1A$_{CA}$: Male gender is negatively associated with treatment counseling adherence.

H1A$_{OA}$: Male gender is negatively associated with abstinence from opioids.

H1A$_{R}$: Male gender is negatively associated with retention in treatment.

This study divided patients into male and female categories, with males being the reference variable. The sample was predominantly female, with only 38.6% of male patients. The ANOVA revealed the means between males and females were not significantly different from one another as did the Kaplan Meier Method (included the mean and median, since none of the curves were normally distributed) for all three dependent variables. Furthermore, all three cox regression models were not statistically significant for gender, $H1A_{CA}$, $H1A_{OA}$, and $H1A_R$ were not supported.

Hypothesis 1B: Race - identification as African American is negatively associated with treatment outcomes.

$H1B_{CA}$: Identification as African American is negatively associated with treatment counseling adherence.

$H1B_{OA}$: Identification as African American is negatively associated with abstinence from opioids.

$H1B_R$: Identification as African American is negatively associated with retention in treatment.

The sample characteristics showed that only a small percentage (4.5%) of patients were African American/Black. The bivariate associations between race and counseling adherence, opioid abstinence, and retention were all statistically insignificant. The cox regression analyses were also statistically insignificant with the exception of patients in the other category being less likely to still be in treatment at 365 days. Therefore $H1B_{CA}$, $H1B_{OA}$, and $H1B_R$ were not supported.

Hypothesis 1C: Age is positively associated with treatment outcomes.

$H1C_{CA}$: Age is positively associated with treatment counseling adherence.

$H1C_{OA}$: Age is positively associated with abstinence from opioids.

$H1C_R$: Age is positively associated with retention in treatment.

      Bivariate associations between age and each treatment outcome were all statistically non-significant. However, when controlling for additional factors, an increase in age is associated with being more likely to adhere to counseling at one year. This variable was a statistically significant predictor. Age was not significant in the opioid abstinence model. For the retention model, the association was statistically significant, showing an increase in age was associated with being more likely to retain in treatment at one year. Therefore, $H1C_{CA}$ and $H1C_R$ were supported, and $H1C_{OA}$ was not supported.

Hypothesis 1D: Single relationship status is positively associated with treatment outcomes.

$H1D_{CA}$: Single - relationship status is positively associated with treatment counseling adherence.

$H1D_{OA}$: Single - relationship status is positively associated with abstinence from opioids.

$H1D_R$: Single - relationship status is positively associated with retention in treatment.

      Bivariate analyses did not indicate any statistically significant associations with relationship status. The cox regression analyses were also all not statistically significant. $H1D_{CA}$, $H1D_{OA}$, and $H1D_R$ were not supported.

Hypothesis 2A: Higher education is positively associated with successful treatment outcomes in MAT patients.

H2A$_{CA}$: Higher education is positively associated with treatment counseling adherence.

H2A$_{OA}$: Higher education is positively associated with abstinence from opioids.

H2A$_R$: Higher education is positively associated with retention in treatment.

The ANOVA analyses did not demonstrate any statistically significant difference in means between the education groups in each of the time dependent variables, as well as the chi-square analyses in the Kaplan Meier model. The likelihood of still being retained in treatment differed across education levels, and most of the cox regression analyses also showed no statistically significant association between education and the dependent variables. The retention analysis however, did have a significant relationship between patients with a high school diploma/GED being more likely to be retained in treatment at one year. However, no significance was indicated with an increase in education, therefore H2A$_{CA}$, H2A$_{OA}$, and H2A$_R$ were all not supported.

Hypothesis 2B: Employment is positively associated with successful treatment outcomes in MAT patients.

H2B$_{CA}$: Employment is positively associated with treatment counseling adherence.

H2B$_{OA}$: Employment is positively associated with abstinence from opioids.

H2B$_R$: Employment is positively associated with retention in treatment.

Two ANOVA analyses did not demonstrate any statistically significant difference in means between the employment groups for the counseling adherence and retention dependent variables. There was a statistically significant difference between the unemployment and full-

time employment means in the opioid abstinence ANOVA. Additionally, the cox regression analysis also had a statistically significant association of patients with full-time employment being more likely to abstain from opioids at 365 days than those unemployed. In the counseling adherence cox regression analysis unemployed and not-in-the-work force had significant associations, with those not-in-the-workforce less likely than those unemployed to be in counseling at one year. The retention cox regression showed patients who worked part-time were more likely to still be in treatment at one year than those unemployed. $H2B_{CA}$ is therefore not supported, whereas $H2B_{OA}$ is supported for full-time employment, and $H2B_R$ is supported for part-time employment.

Hypothesis 2C: Having a higher income is positively associated with successful treatment outcomes in MAT patients.

$H2C_{CA}$: Higher income is positively associated with treatment counseling adherence.

$H2C_{OA}$: Higher income is positively associated with abstinence from opioids.

$H2C_R$: Higher income is positively associated with retention in treatment.

Correlations revealed no significant associations between income and any of the dependent variables. The three cox regression analyses also revealed no significant associations with income, $H2C_{CA}$, $H2C_{OA}$, and $H2C_R$ were not supported.

Hypothesis 2D: Having health insurance is positively associated with successful treatment outcomes in MAT patients.

$H2D_{CA}$: Having health insurance is positively associated with treatment counseling adherence.

$H2D_{OA}$: Having health insurance is positively associated with abstinence from opioids.

H2D$_{R1}$: Having health insurance is positively associated with retention in treatment.

H2D$_{R2}$: Having public insurance (Medicaid) is positively associated with retention in treatment.

Bivariate analyses -both ANOVA and Kaplan Meier survival curves- illustrated statistically significant associations between insurance and treatment outcomes. When controlling for additional variables in the cox regression analyses the associations were also statistically significant. Only public insurance (not private) did show a statistical significance with counseling adherence; patients being more likely to still be in counseling at one year than those without insurance. Both insurance groups did indicate being more likely to abstain from opioids and retained in treatment at one year. All four hypotheses were supported H2D$_{CA}$, H2D$_{OA}$, and H2D$_R$, and H2D$_{R2}$. H2D$_{CA}$ was supported only for public insurance.

Hypothesis 3A: Readiness to change is positively associated with treatment outcomes in MAT patients.

H3A$_{CA}$: Readiness to change is positively associated with treatment counseling adherence.

H3A$_{OA}$: Readiness to change is positively associated with abstinence from opioids.

H3A$_R$: Readiness to change is positively associated with retention in treatment.

None of the bivariate analyses had statistically significant associations between the readiness to change categories and dependent variables. The cox regression opioid abstinence and retention models did show significance for the action category, but in the opposite direction. Patients in the action phase were less likely to abstain from opioids and still be in treatment at one year. None of the other categories showed significant results, H3A$_{CA}$, H3A$_{OA}$, and H3A$_R$ were not supported.

Environmental Influences.

Hypothesis 4A: Having social support during treatment is positively associated with treatment outcomes in MAT patients.

$H4A_{CA}$: Having social support is positively associated with treatment counseling adherence.

$H4A_{OA}$: Having social support is positively associated with abstinence from opioids.

$H4A_R$: Having social support is positively associated with retention in treatment.

All counseling adherence analyses -ANOVA, Kaplan Meier, and Cox regression- were all not statistically significant. Conversely, all opioid abstinence models were statistically significant indicating patients reporting social support at intake were more likely to abstain from opioids at one year. Retention models were statistically significant with bivariate relationships, but insignificant when controlling for other factors in the cox model. $H4A_{CA}$ and $H4A_R$ were not supported, whereas $H4A_{OA}$ was supported.

Hypothesis 5A**:** Patients receiving integrated care are associated with positive treatment outcomes in MAT.

$H5A_{CA}$: Receiving integrated care is positively associated with treatment counseling adherence.

$H5A_{OA}$: Receiving integrated care is positively associated with opioid abstinence.

$H5A_R$: Receiving integrated care is positively associated with retention in treatment.

All bivariate analyses were statistically significant. However, when controlling for other factors, there was no statistically significant association with counseling adherence. In regard to the other two dependent variables, patients receiving integrated care were more likely to abstain from opioids and retain in treatment at one year. Therefore, $H5A_{OA}$ and $H5A_R$ were supported, and $H5A_{CA}$ was not supported.

Table 13 provides a Hypothesis Testing Summary of the above section, which

demonstrates whether a hypothesis was supported or not, indicated by an "X" as a result of the

cox regression analyses.

Table 13

Hypothesis Testing Summary

Hypothesis	Supported	Not Supported
H1A$_{CA}$: Male gender is negatively associated with treatment counseling adherence.		X
H1A$_{OA}$: Male gender is negatively associated with abstinence from opioids.		X
H1A$_R$: Male gender is negatively associated with retention in treatment		X
H1B$_{CA}$: Identification as African American is negatively associated with treatment counseling adherence.		X
H1B$_{OA}$: Identification as African American is negatively associated with abstinence from opioids.		X
H1B$_R$: Identification as African American is negatively associated with retention in treatment.		X
H1C$_{CA}$: Age is positively associated with treatment counseling adherence.	X	
H1C$_{OA}$: Age is positively associated with abstinence from opioids.		X
H1C$_R$: Age is positively associated with retention in treatment.	X	
H1D$_{CA}$: Single - relationship status is positively associated with treatment counseling adherence.		X
H1D$_{OA}$: Single - relationship status is positively associated with abstinence from opioids.		X
H1D$_R$: Single - relationship status is positively associated with retention in treatment.		X
H2A$_{CA}$: Higher education is positively associated with treatment counseling adherence.		X
H2A$_{OA}$: Higher education is positively associated with abstinence from opioids.		X
H2A$_R$: Higher education is positively associated with retention in treatment.		X
H2B$_{CA}$: Employment is positively associated with treatment counseling adherence.		X
H2B$_{OA}$: Employment is positively associated with abstinence from opioids.	X (ft)	X (pt)

Hypothesis	Supported	Not Supported
H2B$_R$: Employment is positively associated with retention in treatment.	X (pt)	X (ft)
H2C$_{CA}$: Higher income is positively associated with treatment counseling adherence.		X
H2C$_{OA}$: Higher income is positively associated with abstinence from opioids.		X
H2C$_R$: Higher income is positively associated with retention in treatment.		X
H2D$_{CA}$: Having health insurance is positively associated with treatment counseling adherence.	X (public)	
H2D$_{OA}$: Having health insurance is positively associated with abstinence from opioids.	X	
H2D$_{R1}$: Having health insurance is positively associated with retention in treatment.	X	
H2D$_{R2}$: Having public insurance is positively associated with retention in treatment.	X	
H3A$_{CA}$: Readiness to change is positively associated with treatment counseling adherence.		X
H3A$_{OA}$: Readiness to change is positively associated with abstinence from opioids.		X
H3A$_R$: Readiness to change is positively associated with retention in treatment.		X
H4A$_{CA}$: Having social support is positively associated with treatment counseling adherence.		X
H4A$_{OA}$: Having social support is positively associated with abstinence from opioids.	X	
H4A$_R$: Having social support is positively associated with retention in treatment.		X
H5A$_{CA}$: Receiving integrated care is positively associated with treatment counseling adherence.		X
H5A$_{OA}$: Receiving integrated care is positively associated with opioid abstinence.	X	
H5A$_R$: Receiving integrated care is positively associated with retention in treatment.	X	

CHAPTER FIVE: DISCUSSION

Discussion of Findings

The aim of the study was to examine characteristics and factors associated with counseling adherence, opioid abstinence, and retention in patients receiving MAT for up to one year. The study focused on these three key areas because successful patient engagement in treatment decreases drug use, and most importantly, mortality.

Personal Factors.

Personal Characteristics: The results of this study indicated that for personal characteristics, gender, race and relationship status was not a significant factor associated with counseling adherence, opioid abstinence or retention. These findings were supported in the literature (Darker et al., 2016; Deck & Carlson, 2005; Banta-Green et al., 2009; Wasserman et al., 2011). Age was the only personal characteristic which played a statistically significant role when controlling for other factors in counseling adherence and retention in treatment. This was consistent with research studies indicating an increase in age as a predictor of retention (Deck & Carlson, 2005; Banta-Green et al., 2009; Wasserman et al., 2011; Darker et al., 2016; Joe et al., 1998; Proctor et al, 2015). This is an important factor for clinicians to be mindful of. Especially with the opioid epidemic shift to a younger population, treatment agencies may benefit from utilizing evidence-based practices for adolescents and young adults to better engage and retain the younger population in treatment.

Socio-economic Factors: Prior literature has shown a direct correlation between social determinants of health, inclusive of socio-economic factors and health outcomes. Limited studies however, have researched the influence of socio-economic factors influence on MAT outcomes

(Darker et al., 2016; Rash, Andrade & Petry, 2013; Rash, Olmstead & Petry, 2009). This study found there was no association with higher levels of education and counseling adherence, and opioid abstinence. However, having lower education (patients with a high school diploma or GED) was associated with retention. This is consistent with a study that found higher education was not associated with retention in treatment (Darker et al., 2016). In terms of employment, patients working part-time were more likely to be retained in treatment at one year. Those working full-time were more likely to abstain from opioids. This is not surprising since many jobs have Drug and Alcohol Policies which employees are required to adhere to as part of their employment (Hartwell, Steele, French, & Rodman, 1996). O'Connell, Enev, Martin and Inciardi (2007) also assert having employment instills a renewed sense of self- identity and benefits of not using substances (p. 1093). A limitation of the study, which is discussed further below, is this information was collected at intake. This also correlates with the income variable which had all non-significant associations.

Health insurance had the most impactful association with the variables studied. In the initial model, only public insurance (Medicaid, federal and state funding coverage) showed statistical significance for adhering to counseling at one year. The associations were statistically significant and had the lowest hazard ratios for the opioid abstinence and retention models. Findings agree with Deck and Carlson (2005) and Banta-Green et al. (2009) who reported that patients with public assistance funding were more likely to stay in treatment. This is a significant factor as the epidemic has now received national attention. In the US President's 2017 Public Health Emergency declaration of the national crisis, allocating additional funding to treatment was not included. Action for telemedicine, improving hiring process for addiction specialist, dislocated worker grants and shift in HIV resources for those also affected by substance use were

93

the focal areas of the declaration (The White House, United States Government, 2017). Although this was an important step in the right direction, more is needed than just acknowledging the epidemic, which has been an issue for quite some time. Funding to increase access to and engagement in treatment was considerably missing from the declaration. Florida's governor and political leaders however, announced support for legislation towards public assistance funding for the opioid crisis (Wilson, 2017). This is expected to pass during this year's Florida legislative session.

Readiness to change: This was not an influential factor in any treatment outcome, which did not support the literature. A few studies indicated that treatment motivation was an important factor in treatment success, with motivated patients more likely to abstain from opioids and stay in treatment (Harrell et al., 2013; Kelly et al., 2011; Pantalon et al., 2002). Surprisingly, the action phase (HR= 1.316) was statistically significant in the reverse direction, implying patients were less likely to abstain from opioids at 365 days than those in the pre-contemplation phase. This variable was assessed by the admissions counselor at intake; it would be interesting to see if patients are in different phases during their treatment plan updates and if this had any effect on the survival times.

Environmental Influences.

In examining the environmental factors both revealed significant associations.

*Social Support***:** When controlling for other variables in the cox regression, only the opioid abstinence models were significant, suggesting those with a support system were more likely to abstain from opioids. This was consistent with two studies (Cavaiola et al. 2015; Franckowiak & Glick, 2015) but was inconsistent with the Wasserman et al. (2001) article.

These results suggest that addiction counselors can help patients abstain from opioids by encouraging them to add positive support during treatment through group sessions or 12-step programs.

   Integrated care: All bivariate associations indicated positive associations with treatment outcomes. In the cox regression, patients receiving integrated care were more likely to abstain from opioids and retain in treatment (counseling adherence was not significant). As indicated in the literature, integrated care improves patient-centered care and cost-effectiveness (Kelly et al., 2011; Farber et al., 2012; HHS 2016). The Surgeon General's 2016 report indicated both the substance use and general health care workforces are undertrained to meet this need. "Health care now requires a new, larger, more diverse workforce with the skills to prevent, identify, and treat substance use disorders, providing "personalized care" through integrated care delivery" (HHS, 2016, p.6-2). Additionally, health care and treatment agencies will need funding to not only provide integrated treatment teams, but integrated services to meet patients' needs.

   Controls.

   An analysis of the control variables revealed patients whose primary drug dependence was heroin, were less likely to adhere to counseling, abstain from opioids, and retain in treatment at one year than patients with a primary dependence of prescription drugs. The association to opioid abstinence was consistent with the findings of Moore et al. (2007) but conflicted with Banta-Green et al. (2009) in regard to retention. This population may require additional attention. Counseling staff and treatment teams should utilize evidence-based curriculum, and work on developing initiatives to further engage this population. Bivariate analysis revealed significant associations with the medications used. Those on methadone were more likely to adhere to

95

counseling sessions, whereas patients taking buprenorphine were more likely to abstain from opioids and still be in treatment at one year. This may also directly correlate to available funding (buprenorphine is costlier) and health coverage.

The study's results were slightly different from the conceptual model in some respects. With the guidance of the conceptual model, personal factors such as age, and insurance, in addition to the environmental factors of social support and integrated care, were predictors to counseling adherence, opioid abstinence, and retention in MAT. Though the concepts in the models were interwoven, some personal factors -demographics, socio-economic and readiness to change- showed no statistical significance to the treatment outcomes. The findings from the self-efficacy and readiness to change constructs were inconsistent with the literature. Nevertheless, the conceptual model did appear to address the dynamic relation between personal factors or environmental influences and behavior in certain instances. The outcome expectancies domain from the social cognitive theory, in addition to the behavioral and normative constructs from the theory of reasoned action.

Limitations

Several study limitations should be noted. The original use of the data were not for research purposes. Therefore, variables such as support systems did not have additional information to further identify the type of support, for example, whether it was a spouse, relative, or friend. Additionally, the severity of patient's addiction was not controlled for.

Though usage of data from clinical records has strengths, it also has limitations. Missing data are a major limitation of using existing clinical records (Jacobsen, 2017). The assumption cannot be made that the health record includes a full picture of each patient's characteristics and

treatment episode (Jacobsen, 2017, p. 164). Whether the missing data were patients lost to follow-up, patients transferring, or staff's inability to completely enter information into the clinical record; statistical methods were employed to control for this. Survival analysis not only focuses on the time variable, it censors data, whether missing, lost to follow-up, death or patients not accounted for during the treatment timeframe.

Also, the measures may not have been completely reliable or valid. Many of the independent variables were collected upon admission and could have changed over the year in which the study measured the survival of the patient. Future studies should include a feasible follow-up period to evaluate any changes in patient's status, for instance the education level, income, support systems, since stabilizing in treatment. Additionally, the initial intake assessment relies on self-report for some questions. Patients' recall of factors such as criminal history, education level, income, and support system may be biased.

Finally, in observational studies, unlike experimental studies, findings may suggest, but do not determine, a causal pathway. Variables that affected the findings that are not included in the analysis may have biased the results (omitted variable bias) (Carlson & Morrison, 2009).

Strengths & Generalizability

The generalizability of the research study should be carefully considered as the data were from a single city in Florida. The most recent demographics for Florida from SAMSHA's Treatment Episode Data Sets (TEDS) for opioid dependent admissions is 2013. Florida is one of over 20 states which more recent information is not available. Although comparable for age and race, gender shows almost the reverse of the percentages usually encountered, with the majority of opioid dependents being male in the TEDS data. However, in general this statistic is shifting nationally (Banta-Green et al., 2009). Additionally, the patients in the sample received treatment

97

at a not-for-profit MAT facility, and as the sample characteristics illustrated, included mostly low-income persons, of which a good portion received public assistance. Therefore, these findings may not be generalizable to the entire population.

Despite the limitations listed above, retrospective cohort designs using clinical records also have strengths. Neither the patient nor services provided by the treatment agency was influenced by being included in the study. Furthermore, use of data from clinical records eliminates the need for additional required resources, essentially time and money, in the collection of primary data (Song, & Chung, 2010). Clinical records from a large behavioral agency provided the advantage of a large sample size and detailed data that would not have otherwise been feasible.

The study extends the literature, as few studies have examined retention with a large sample size in MATs using cox regression analysis (Hser et al., 2013). This study goes beyond prior research in also studying counseling adherence and opioid abstinence as outcome variables, instead of solely focusing on retention. Since methadone was the only accepted treatment for opioid abstinence for a long time, few studies have also included buprenorphine patients. Additionally, the sample included a large percentage of those whose primary drug dependence was non-medicinal prescription drugs.

Lastly, the study addresses a very timely issue, as the opioid epidemic was responsible for more than 42,000 deaths in the US in 2016 (CDC, 2017). Understanding factors influencing treatment outcomes assists the substance use disorder workforce when assessing and engaging patients in treatment. Equally important, it provides policy and lawmakers with data showing the need for funding and initiatives targeting community providers to collaborate in integrated care services.

Implications

Given the current opioid epidemic in the United States, particularly in the state of Florida where the study sample is from, this study has significant implications for policies, such as legislative initiatives, and programs, such as effective treatment modalities and MAT expansions. The following sections discuss some of these policy and programmatic implications.

Policy Implications.

In 2016, Florida had over 5,725 opioid-related deaths (a 35% increase from the prior year), yet the state does not have an office tracking the epidemic (Duran, 2018). Governor Scott in 2009 eliminated The Office of Drug Control (Duran, 2018). Such an agency needs to be at the forefront of the epidemic, to utilize collaborative teams to assess, treat, and prevent the crisis. Studies such as this would provide viable information to a centralized office working on the epidemic in the State.

The 2018 Florida Legislative session introduced House Bill 1025 to reinstate the Office of Drug Control. The bill lists a number of responsibilities of the agency inclusive of monitoring state policies and data (including overdoses) related to substance use, developing a strategic plan to reduce substance use within the State, working with the behavioral health managing entities throughout the state for resources and advocacy, conducting media campaigns on the negative effects of substance use and making policy recommendations (Florida House of Representatives, 2018). However, the bill was indefinitely postponed and withdrawn from consideration. Having a central agency to establish an assessment of the State's needs and create a comprehensive plan to overcome the epidemic should be reconsidered for the next session. An additional recommendation in the policy would be to assess the opioid addiction treatment workforce in the

State and the collaborative efforts of treatments agencies providing integrated care. The study

highlighted patients receiving integrated care were more likely to abstain from opioids and retain

in treatment. The US Surgeon General in the *Facing Addiction in America Report* highlighted

the importance of integrated care systems in healthcare (HHS, 2016). Furthermore, calling to

attention the need to workforce needs – "Well-supported evidence shows that the current

substance use disorder workforce does not have the capacity to meet the existing need for

integrated health care, and the current general health care workforce is undertrained to deal with

substance use related problems" (HHS, 2016, p. 6-2).

      The availability of funding/coverage to pay for treatment services was a key factor for

patients' survival time in MAT. The study indicated in each of the cox regression models that the

availability of health insurance coverage to pay for treatment was significant. Self-pay patients

without private insurance or public funding were less likely adhere to counseling, abstain from

opioids and retain in treatment. This is of importance, as the US President in October 2017

declared a Nationwide "Public Health Emergency" to address the opioid epidemic but fell short

of requesting funds for treatment. Florida's Governor recently announced proposing $50 million

($27 million from federal funds) in the budget towards combating the opioid epidemic, which

will be important during this legislative session (Office of Governor Rick Scott, 2017). Adequate

funding is necessary for successful treatment outcomes. State legislators initially planned to

request an additional $25 million for treatment, however the recent events in Florida, became

more of a priority for resources towards gun control (Mower, 2018). Florida's recent budget

proposal (HB 5001: General Appropriations Act) includes $704 million to community substance

and mental health services ($19 million decrease from the prior year) (Florida Senate, 2018). The

appropriations act often includes non-reoccurring funds, with the exception of a few member

projects, special projects or populations, for instance women special funding (pregnant, post-partum and their affected families), family intensive treatment, funding for specific treatment agencies and Sheriff Office's (Florida Department of Children and Families, 2018). With the current opioid epidemic in the state, and the study illustrating the funding need for a higher probability a recommendation of reoccurring funds specifically for Medication Assisted treatment programs would be ideal.

House Bill 1025 also includes a request for a Medicaid waiver. Florida is one of nineteen states, which did not expand Medicaid under the *Affordable Care Act* (ACA), which leaves just under half a million people in the coverage gap (Norris, 2017). The Agency for Health Care Administration can request federal approval for treatment (inclusive of MAT) to support services that Medicaid does not cover without the waiver to improve access and quality of services thereby assisting to restore the care continuum (Florida House of Representatives, 2018, p. 4)

In terms of federal policy, repealing the Affordable Care Legislation will have detrimental effects to this population (Bailey, 2017; Zezima & Ingraham, 2017). The study illustrated the importance of public funding, of which a larger majority of the patients was on Medicaid. It is estimated that under an ACA repeal, over 2.8 million people with a substance use disorder (220,000 with an opioid disorder) could lose health care coverage (Bailey, 2017, para. 3). Throughout the nation, and in the State of Florida, the need remains high for opioid addiction treatment. A reduction in coverage will create an adverse effect in combating the epidemic.

Program Implications.

Age was the only personal factor statistically significant when controlling for other factors in counseling adherence, and treatment retention. Proctor et al. (2015) asserts younger

patients' maturity levels and understanding of negative consequences of substance use may cause less success in treatment outcomes. Efforts to increase engagement of younger adults in treatment adherence, by utilizing evidence-based models focused on young adults or adolescents, to retain them in treatment is warranted. Focusing on early intervention treatment techniques - integrating motivational enhancement, and therapeutic groups based on age- could also be beneficial for the younger patients (Proctor et al., 2015).

Treatment providers should also highly encourage family/support groups or require 12-Step Programs (Methadone Anonymous) to increase social support. The study indicated those with a support system were more likely to abstain from opioids. Cavaiola et al. (2015) findings indicated patients were appreciative of a number of different factors from the support systems. Therapeutic support groups could be beneficial in helping the family/support system understand how to express belief/confidence in their recovery, being honest, refraining from being critical and expressing concern (Cavaiola et al., 2015, p. 190).

Providing patient-centered care, inclusive of integrated care services, is also a collaborative effort that requires resources for training, services, and staff. Also, from a clinical standpoint, resources should also be allocated to the treatment of heroin (not just opioids in general). Patients with a heroin primary drug dependence were less likely to adhere to counseling, abstain from opioids, and retain in treatment than those with a primary drug dependence of prescription drugs.

From the context of health and public affairs, it is essential that policymakers, health care professionals and researchers work collectively to ensure that public funding is allocated to MAT programs, to ensure continuation in treatment. Efforts to increase funding for opioid abuse treatment and additional research for evidence-based interventions for heroin and non-medicinal

prescription drug interventions are needed. Also utilizing an interdisciplinary approach to support integrative care services being provided throughout MATs. The overall benefits of treatment and factors that increase survival for more than a year will enable citizens to be positive and productive.

Future Research

While this was an important study on the association of personal and environmental factors and treatment outcomes, additional research is needed to address the current opioid climate. First, unfortunately patients on vivitrol did not have their clinical information in the EHR and could therefore not be included in the study. Having a study inclusive of patients on vivitrol is important, as there is not much literature on this medication in regard to survival analysis in MAT. Comparative effectiveness studies need to be conducted to see if there are differences between patients on this medication in comparison to others. Unlike with methadone and buprenorphine, patients are required to have that initial detoxification period prior (seven to ten days minimum) and can take the medication via injection or orally once per month (instead of daily).

As this study suggests, personal factors do not play a large role in treatment outcomes whereas the treatment environment and social support do; it is also important to study the context of the treatment environment and patients' social context. For example, quantitative studies should be conducted that: examine close relationships that may increase the risk of opioid use; define the settings in which social relationships occur; and explore the social and cultural norms in relation to opioid abuse and treatment. Qualitative studies could explore the contextual and environmental issues in detail. Such qualitative and quantitative studies could address the

personal factors and environmental influences linkage that was not studied in the triangular conceptual model utilized in this study (see Figure 8).

Additionally, subsequent research should assess the needs of substance use agencies to provide integrated care. This is imperative to improve care coordination, and financial costs to both the patients and providers, and an area, which the US Surgeon General said both the health and substance use workforce are lacking the capacity to meet the needs of an integrative care system (HHS, 2016; Stone & Katz, 1996). In addition, research is needed to examine the knowledge and beliefs of patient-centered integrated care with the addiction and health workforces to be able to develop necessary trainings to engage more patients in integrated care.

Finally, it will be intriguing to understand how the cost of medications and treatment coverage compare across private insurance providers. Whether insurance companies limit the length of time patients are able to receive services, or medications received -methadone, buprenorphine, or vivitrol. Furthermore, with the increase in primary-care providers treating this population, it will also be beneficial to examine treatment outcomes in the primary care outpatient office setting in comparison to MATs.

Conclusion

The objective of this study was to determine if treatment outcomes, measured by counseling adherence, opioid abstinence, and retention, were influenced by personal characteristics, socio-economic factors, readiness to change, social support and integrated care. Guided by a conceptual framework inclusive of social cognitive theory, transtheoretical model, and theory of reasoned action; a retrospective cohort design was conducted. Bivariate analyses and three cox regression models revealed factors associated with positive treatment outcomes.

This dissertation expands the literature and contributes to the knowledge of characteristics and factors associated with MAT outcomes. MAT is a pivotal step in preventing relapse and reducing opioid mortality. The study provides crucial information on the need for funding to support patients' continual efforts to engage in treatment. As the opioid epidemic has become a national public health concern, having treatment interventions inclusive of support systems and integrated care in addition to the availability of funding for treatment is of uttermost importance to achieve care continuum.

APPENDIX A: PRIOR MEDICATION ASSISTED TREATMENT STUDIES

Table 14. Prior Medication Assisted Treatment Studies

Author & Pub. Year	Title	Type of Study	Focus	Critical Findings
Banta-Green et al., 2009	Retention in methadone maintenance drug treatment for prescription-type opioid primary users compared to heroin users	Design: Retrospective cohort study Analysis: Logistic Regression Sample: heroin and prescription drug users receiving MMT in WA. (n = 2308	Assess retention in treatment for opioid dependent prescription drug users in comparison to heroin users	Not adjusting for other factors, odds of retention for PDU was 1.33 (95% CI, 1.03, 1.71). Odds of retention for PDU in comparison to heroin users: 1.25 (95% CI, 0.93, 1.67). No statistical difference in treatment type when adjusting for tx agencies, public assistance type, services – medical, psychiatric, legal, familial, and demographics
Saxon et al., 2013	Medication-assisted treatment for opioid addiction: Methadone and buprenorphine	Design: Randomized Control Trial Sample: Opioid dependents (n = 1269)	Summarizes clinical use and pharmacology of Methadone and Buprenorphine treatment for opioid use disorder	Better tx retention for methadone. Decrease illicit opioid use early in tx with buprenorphine. Risk behavior (injection drug use) decline14.4 to 2.4% for buprenorphine and 14.1 to 4.8% for methadone (p < .001).

Author & Pub. Year	Title	Type of Study	Focus	Critical Findings
Kresina & Lubran, 2011	Improving Public Health Through Access to and Utilization of Medication Assisted Treatment	Theoretical	Providing integrated care and improving care coordination for access to and utilization of Medication Assisted Treatment	Integrated Models of MAT Coordination Care Models for MAT
Darker at al., 2016	Demographic and clinical factors predicting retention in methadone maintenance: results from an Irish cohort	Design: Cross sectional Analysis: Binary Logistic regression Sample: patients receiving MMT in Ireland (n= 189)	To explore the demographic and clinical factors predicting retention in Methadone Maintenance Treatment.	Characteristics of patients who had fewer breaks in tx: single, older, living in their own home, medication – higher methadone dose or taking antipsychotic meds Factors enabling regular attendance at MMT: Sobriety (37.5 %), to avoid withdrawals (16.1 %), methadone dependence (13.9 %) and additional services (10.2 %,).

Author & Pub. Year	Title	Type of Study	Focus	Critical Findings
Moore et al., 2007	Primary Care Office-based Buprenorphine Treatment: Comparison of Heroin and Prescription Opioid Dependent Patients	Design: Randomized clinical trial

Analysis: Multinomial Logistic Regression

Sample: adults receiving primary care buprenorphine tx (n=200) | To compare characteristics and tx outcomes of heroin and prescription use opioid dependents. | Prescription opioid dependents are associated with improved treatment outcomes over heroin dependents. POD characteristics: younger, less opioid use, more likely to be white, with higher earning incomes POD vs heroin patients: completing treatment: 59% vs. 30%. Length of stay: 21.0 vs. 14.2 weeks Rate of negative US 56.3% vs. 39.8%, all p values < .05. |
| Timko et al., 2016 | Retention in medication-assisted treatment for opiate dependence: A systematic review. | Design: Randomized control trials

Analysis: Systematic Review

Sample: 55 articles between 2010 - 2014 | Reviewing literature on retention in medication assisted treatment. | Retention rates varied from 3 months to over a year. Retention rates were highest in buprenorphine/naloxone. 1 study measured retention in treatment over a year. Studies with larger samples and longer-term follow-ups are needed. |

Author & Pub. Year	Title	Type of Study	Focus	Critical Findings
Franckowiak & Glick, 2015	The effect of self-efficacy on treatment	Design: Experimental – Pre-Post Test Analysis: t-test and correlation Sample: Convenience sample, 50 opioid dependent MAT patients	Measuring the association between self-efficacy and tx outcomes for opioid dependent MAT patients	Average increase in general GSE scores: 5.1 points, when comparing pre and post-test at a 95% CI. Total scores increased an average of 10.1 points. P< .01 There was no correlation between negative drug screens and self – efficacy. There was no correlation with number of counseling sessions and self –efficacy.
Zhang et al., 2003	Does retention matter? Treatment duration and improvement in drug use	Design: Longitudinal cohort Analysis: Linear regression Sample: 62 drug treatment units, 4005 patients	To examine a relationship (minimum threshold, continuous or non-linear) between treatment duration and drug use improvement	Positive linear relationship with duration in treatment, and drug use improvement for MMT Retention in outpatient (non-MMT and long-term residential was less predictive)
Author & Pub. Year	Title	Type of Study	Focus	Critical Findings

| Hubbard et al., 2003 | Overview of 5-year follow-up outcomes in the drug abuse treatment outcome studies (DATOS) | Design: Longitudinal

Analysis: paired t-test, logistic regression

Sample: 1,393 patients from 96 treatment programs | To describe and examine the association between treatment duration and modalities – outpatient methadone, outpatient, short term inpatient, and long term residential | Duration of 6 months or greater in treatment was associated with decreased criminal activity and full-time employment increase |
| Kelly et al., 2011 | Predictors of methadone treatment retention from a multi-site study: A survival analysis | Design: Longitudinal

Analysis: Cox proportional hazards regression

Sample: Convenience sample, 361 MMT patients | Examining predictors of three domains – personal, program and community factors – for opioid dependent MMY patients. | 3-month retention predictors: being female, higher treatment readiness at admission (p = .005); but lower desire for help, (p = .010).

1-year retention: higher medical and lower legal composite scores; in addition to higher treatment satisfaction at 3-months |

APPENDIX B: THEORETICAL APPROACHES LITERATURE REVIEW SUMMARY

Table 15. Theoretical Approaches Literature Review Summary

Author & Pub. Year	Title	Theory	Type of Study/ Unit of Analysis	Focus	Critical Findings
Gullo et al., 2017	Social cognitive predictors of treatment outcome in cannabis dependence	Social Cognitive	Cross-Sectional UOA: substance use – cannabis patients	Treatment outcomes in cannabis dependence, testing expectancies and refusal self-efficacy as predictors	Abstinence increased with tx sessions (1.20x more likely). Negative expectancies increased the odds of abstinence, as was emotional relief refusal. Emotional relief refusal self-efficacy predictor of improved treatment outcomes; and was also a mediator of positive expectancy outcomes
Bandura, 1999	A socio-cognitive analysis of substance abuse: an agentic perspective	Social Cognitive	Theoretical	Analysis of SU	Self-efficacy beliefs create desired changes Guides: Assessment of self-efficacy Enabling community (for negative drug use) Social vs individual models
Fiorentine & Hillhouse, 2001	When low self-efficacy is efficacious: toward an addicted-self model of cessation of alcohol- and drug dependent behavior	Social Cognitive	Prospective cohort	Examine the relationship between self-efficacy and behaviors – alcohol cessation and drug-dependent	Predictors: low controlled use of self-efficacy was a predictor of abstinence acceptance. Increasing levels of abstinence acceptance was associated with drug abstinence. An increase in abstinence acceptance was associated with a decreased controlled self-efficacy.

Author & Pub. Year	Title	Theory	Type of Study/ Unit of Analysis	Focus	Critical Findings
Dijkstra et al., 2006	Is social cognitive theory becoming a transtheoretical model?	Social Cognitive			At the 2-month follow-up, the matched interventions were significantly more effective in stimulating forward stage transition
Sharma, 2005	Enhancing the effectiveness of alcohol and drug education programs through social cognitive theory	Social Cognitive	Theoretical	Application of theory to Alcohol and Drug Education Programs	Various substance abuse studies presented on the theory 1983 – 2004. Highlights Bandura's 3-level implementation model.
Schmidt et al., 2009	Motivation to change and readiness for counseling in prescription-drug-dependent patients in a general hospital setting	Transtheoretical	Design: Cross-sectional Analysis: U test and chi-square Sample: 45 prescription drug dependents (952 hospital patients)	To investigate the motivation to change and willingness to accept consultations in prescription drug dependent patients	Majority of the population was in pre-contemplation stage, followed by contemplation stage. Self-efficacy to change was associated with readiness to change. Receiving counseling was also rated positive
Harrell et al., 2013	A latent class approach to treatment readiness corresponds to a transtheoretical ("stages of change") model	Transtheoretical	Design: Cross-sectional, Interview Analysis: latent class Sample: 539 cocaine and opioid users	Analyze readiness for treatment	Pre-contemplative phase significantly more likely to test for marijuana, whereas the action phase was significantly less likely to test positive for opioids.

Author & Pub. Year	Title	Theory	Type of Study/ Unit of Analysis	Focus	Critical Findings
Pantalon et al., 2002	The URICA as a measure of motivation to change among treatment-seeking individuals with concurrent alcohol and cocaine problems.	Transtheoretical	Design: Cross-sectional Analysis: confirmatory factor analysis Sample: 106 in a pharmacotherapy randomized control trial	Evaluating the URICA as a motivation to change assessment	Committed action: significantly higher percentage of abstinent days in comparison to lower phases (85.6% vs 72.7%, p < .01)
Prochaska & Velicer, 1997	The transtheoretical model of health behavior	Transtheoretical	Theoretical	Providing an understanding of the constructs and stages of change	Identifying the core constructs: stages of change, processes of change, decisional balance, self-efficacy, temptation Assumptions: complexities of behavioral change require more than a single theory, behavior change is a process, planned intervention is required for behaviors change in the population, at-risk populations are usually not prepared for action, specific interventions/process need to occur at identified stages for progress to occur, and chronic behavior patterns are usually a result of biological, social and self-control

Author & Pub. Year	Title	Theory	Type of Study/ Unit of Analysis	Focus	Critical Findings
Roberto et al., 2014	Predicting substance-abuse treatment providers' communication with clients about medication assisted treatment: A test of the theories of reasoned action and planned behavior	Theory of Reasoned Action Theory of Planned Behavior	Retrospective cohort	Examine if TRA & TPNB can predict tx providers encouraging patients to use MAT	Confirms TRA application as a conceptual model for explaining attitudes and intentions (counselor's) and linkage of social norms. SEM showed significant relation b/w intentions & behavior, attitudes & intentions, and norms and intentions.
Kleinman et al., 2002)	Predicting long-term treatment utilization among addicts entering detoxification: the contribution of help-seeking models	Combination of theories including: Theory of Reasoned Action Theory of Planned Behavior	Cross-sectional UOA: opioid dependents	Examining socio-demographics as predictors of long-term treatment	TRA/TPB was the most effective in predicting use of treatment programs. Hierarchical MR: Being homeless was the only socio-demographic variable found to significantly predict tx at the 1st stage. On the 2nd stage: being on parole and using drugs regularly for fewer than 20 years were also predictors with homelessness. Treatment utilization is predicted by behavioral beliefs favoring treatment and self-efficacy at the third stage.

Author & Pub. Year	Title	Theory	Type of Study/ Unit of Analysis	Focus	Critical Findings
Madden, Ellen & Ajzen, 1992	A comparison of the Theory of Planned Behavior and the Theory of Reasoned Action	Theory of Reasoned Action Theory of Planned Behavior	Quasi-experimental Pretest UOA: undergraduate business students	Comparison of both theories by measuring attitudes toward performing behaviors identified by the subjects	Inclusion of behavioral control is an indicator of practice and intention. Effects of perceived behavior control are most telling when the behavior presents a problem with control.
Rich et al., 2015	Theory of planned behavior and adherence in chronic illness: a meta-analysis	Theory of Reasoned Action Theory of Planned Behavior	Meta-analysis	Theory as a predictor of treatment adherence	Explained 33% of variance in intention and 9% in adherence behavior. Results support theory predictions, though effect sizes were small.
Johnston, White & Norman, 2004	An examination of the Individual-Difference Approach to the Role of Norms in the Theory of Reasoned Action	Theory of Reasoned Action	longitudinal	Examining individual-difference approach in subjective norms weak predictor of behavioral intentions in undergraduate students	Both individuals and behaviors are associated with normative and attitudinal control. Combined for 85% health intention variance. Closer examination of social influences to address the weak association between subjective norm and intention.

Author & Pub. Year	Title	Theory	Type of Study/ Unit of Analysis	Focus	Critical Findings
Millstein, 1996	Utility of the theories of reasoned action and planned behavior for predicting physician behavior: A prospective analysis	Theory of Reasoned Action	Cross-sectional Survey UOA: physicians	Predicting physicians' delivery of preventive services for educating adolescent patients about the transmission of HIV and other sexually transmitted diseases.	Studies in the past have found attitudes to have the stronger association (not social norms) on behavioral intentions. Behavioral intentions were strongly associated with attitudes and social norms (strongest influence) towards the behavior – prescribing antibiotics. Perceived behavioral control had direct effects on behavior and interacting with social norms and behavioral intentions.

APPENDIX C: LETTER OF SUPPORT

March 22, 2017

To Whom It May Concern:

███████████████████████ is pleased to provide a letter of support to Vierne Placide at the University of Central Florida under the supervision of Lynn Unruh, PhD for the proposed research study, *The Influence of personal characteristics, socio-economic factors, readiness to change, support systems and integrated care on treatment outcomes in opioid dependent Medication Assisted Treatment patients.*

As the opioid epidemic here in Florida, and the US has increased over the last decade, it is important to examine personal factors and environmental influences associated with successful treatment outcomes in medication assisted treatment patients. Examining these factors are necessary to improve treatment adherence, increase funding, and expand initiatives for this population. Thereby creating educational, and intervention strategies for practitioners, to reduce the opioid overdose epidemic.

Our organization supports your efforts in researching addiction medicine and integrated care in opioid dependent patients.

Sincerely,

Chief Executive Officer

APPENDIX D: INSTITUITONAL REVIEW BOARD APPROVAL

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Vierne Erica Placide, MPH**

Date: **July 05, 2017**

Dear Researcher:

On 07/05/2017 the IRB approved the following human participant research until 07/04/2018 inclusive:

Type of Review:	UCF Initial Review Submission Form, Expedited Review
Project Title:	The influence of personal characteristics, socio-economic factors, readiness to change, support systems, and integrated care on opioid-dependent medication assisted treatment patients.
Investigator:	Vierne Erica Placide, MPH
IRB Number:	SBE-17-13227
Research ID:	N/A

The scientific merit of the research was considered during the IRB review. The Continuing Review Application must be submitted 30days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at https://iris.research.ucf.edu .

If continuing review approval is not granted before the expiration date of 07/04/2018,
approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

All data, including signed consent forms if applicable, must be retained and secured per protocol for a minimum of five years (six if HIPAA applies) past the completion of this research. Any links to the identification of participants should be maintained and secured per protocol. Additional requirements may be imposed by your funding agency, your department, or other entities. Access to data is limited to authorized individuals listed as key study personnel.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Renea Carver

Signature applied by Renea C Carver on 07/05/2017 04:02:27 PM EDT

IRB Coordinator

The purpose of this checklist is to provide support for the Reviewer designated to conduct Privacy Board Reviews using the expedited procedure to document a waiver or alteration of HIPAA authorization. This checklist is to be used. This checklist needs to be completed, signed, dated, and retained.

IRB Number:	SBE-17-13227
Protocol Name:	The influence of personal characteristics, socio-economic factors, readiness to change, support systems, and integrated care on opioid-dependent medication assisted treatment patients.
Investigator:	Vierne Erica Placide

1   DOCUMENTATION OF WAIVER APPROVAL (Check if "**Yes**". All must be checked)

☒	The description of the PHI for which use or access is included in the protocol summary and is necessary for the research. **Date of Admission, Date of Discharge (if applicable, Counseling visits, dates, Drug screens (i.e. positive or negative), dates, Patient number (on UDS) – was not requested, however due to the labs (urine drug screens) in a separate system, the data has to be merged and Medication dosing, length of stay**
☒	The use or disclosure of protected health information involves no more than a minimal risk to the privacy of individuals, based on, at least, the presence of the following elements: (Check if "**Yes**". All must be checked)

	☒	An adequate plan to protect the identifiers from improper use and disclosure. **The Vice President of Administrative Services instructed the Information Systems Manager to provide the requested data elements for the research study once IRB approval with waiver or alteration of the authorization is received. The IS Manager will save the data set on the Agency's server for the primary researcher (Vierne Placide) to access. Data will be recoded for analysis and secured (password-protected) on the Agency's server with only the primary researcher (Vierne Placide) having access. All identifiable information will be deleted once recode is completed (maximum three month-timeframe from date received). The study's data set will be deleted after the required retention period of 5 years. Data will only be reported in aggregate form.**
	☒	An adequate plan to destroy the identifiers at the earliest opportunity consistent with conduct of the research, unless there is a health or research justification for retaining the identifiers or such retention is otherwise required by law. **All identifiable information will be deleted once recode is completed (maximum three month-timeframe from date received) for analysis.**
	☒	Adequate written assurances that the protected health information will not be reused or disclosed to any other person or entity, except as required by law, for authorized oversight of the research study, or for other research for which the use or disclosure of protected health information for which an authorization or opportunity to agree or object is not required by 45 CFR 164.512. **The PHI will be recoded, and deleted at the earliest date possible (within a maximum 3-month timeframe) to protect the privacy and confidentiality of participants. The data will then be saved on a secure server and password-protected. Data analysis and reporting will be shared in aggregate form. In accordance with HIPAA and CFR 42, I Vierne Placide, agree to not reuse or disclose PHI to any other person or entity, except required by law, for authorized oversight of the research, or for other research for which the use or disclosure of PHI would be permitted by the regulations. The primary researcher (Vierne Placide) has also signed a Business Associate Agreement with the Agency to ensure federal guidelines in compliance with Confidentiality of Substance Use Disorder Patient Records, 42 CFR Part 2; and the Health Insurance Portability and Accountability Act (HIPAA), 45 CFR Parts 142, 160, 162, and 164.**

☒	The research could **NOT** practicably be conducted without the waiver or alteration. **The Behavioral Health agency is requesting a waiver or alteration of consent. Although a limited data set will be utilized, initial data will include identifying information before being recoded; therefore, use and disclosure for PHI for Research under the Privacy rule permits covered entities to use or disclose PHI for research purposes without authorization if certain conditions are met.** **HIPAA, covered entities (Behavioral Agency) may use and disclose data for health services research purposes if it obtains satisfactory documentation of an IRB's waiver or alteration of consent authorization requirement that satisfies section 164.512(i) of the Privacy Rule.** **Therefore, it would not be practical to conduct the research without the waiver or alteration of consent.**
☒	The research could **NOT** practicably be conducted without access to and use of the protected health information. **The use of PHI will be limited to accessing the necessary data for survival analysis required for the research study. The PHI will be recoded, and deleted at the earliest date possible (within a maximum 3-month timeframe) to protect the privacy and confidentiality of participants. Under no circumstances will PHI be disclosed, except as required by law. Although a limited data set will be utilized, initial data will include identifying information before being recoded; therefore, use and**

CHECKLIST: HIPAA Waiver of Authorization		
NUMBER	DATE	PAGE
HRP-441	7/27/2017	2 of 2

disclosure for PHI for Research under the Privacy rule permits covered entities to use or disclose PHI for research purposes without authorization if certain conditions are met.

Using the expedited review procedure the designated reviewer signing below has determined that the above requirements are met, access to the protected health information described in the protocol is necessary, and has waived or altered the requirement for authorization.

Reviewer Signature:	*[signature]*	Date:	07/27/2017

APPENDIX E: MEDICAL EXAMINERS COMMISSION DRUG REPORT USAGE APPROVAL

RE: Comments From - Placide, Vierne

Martin, James <JamesMartin@fdle.state.fl.us>
Tue 1/9, 11:03 AM
Vierne Placide; Koenig, Vickie <VickieKoenig@fdle.state.fl.us> ⌄

DISSERTATION

Flag for follow up. Start by Tuesday, January 09, 2018. Due by Tuesday, January 09, 2018.

You replied on 1/11/2018 8:51 AM.

Vierne Placide,

The Medical Examiners Commission Drug Report is a public record under Florida law and is available to anyone to use.

James D. Martin, Deputy General Counsel
Florida Department of Law Enforcement
Post Office Box 1489
Tallahassee, Florida 32302-1489
850-410-7679

From: FDLE Comments
Sent: Monday, January 08, 2018 11:39 AM
To: Culbertson, Doug
Subject: FW: Comments From - Placide, Vierne

Good morning,

The following email was sent by Vierne Placide asking about use of figures published by the Medical Examiner Commission reports on drugs in deceased persons. Thank you for your assistance with his inquiry.

Brian Harlow
Crime Intelligence Analyst II
Florida Department of Law Enforcement
Office of Executive Investigations
Phone: (850) 410-8258

From: vplacide@knights.ucf.edu [mailto:vplacide@knights.ucf.edu]
Sent: Monday, January 08, 2018 10:28 AM
To: FDLE Comments

The comment below was sent by an internet user

E-mail vplacide@knights.ucf.edu

First
name Vierne Placide
Last
name

Phone
number 954-648-6044

Address Doctoral Program in Public Affairs College of Health and Public Affairs University of Central
Florida 12805 Pegasus Drive HPA I (Bldg. 80), Suite 220 Orlando, FL 32816-3680

Your
message Good Morning, Per the University of Central Florida's Dissertation formatting guidelines,
permission is needed to use tables/figures which are to be included in the dissertation
document, not originally created by the student author. For my doctoral dissertation (The
influence of personal characteristics, socio-economic factors, readiness to change, support
systems, and integrated care on treatment outcomes in opioid dependent medication-assisted
treatment patients), I would like to include 4 figures from the Medical Examiners Commission
Drug Report 2015 to illustrate the significance of the issue in Florida. The figures are: 1)
Occurrences of Hydrocodone, Oxycodone, and Methadone, 2) Historical Overview of Fentanyl
Occurrences, 3) Historical Overview of Cocaine Occurrences, and 4) Historical Overview of
Heroin Occurrences. I am requesting copyright permission to use these 4 figures in my
dissertation. If there is a specific procedure or an additional form I would not to complete, I
would appreciate your assistance in providing me with the required information. Best Regards,
Vierne E. Placide, PhD(c), MPH, CPHQ

Form
inserted 1/8/2018 10:27:37 AM

Form
updated 1/8/2018 10:27:37 AM

REFERENCES

Alford, D. P. (2016). Opioid prescribing for chronic pain – achieving the right balance through

    education. *New England Journal of Medicine*, *374*(4), 301-303.

    doi:10.1056/NEJMp1512932

Allison, P. D. (1999). *Multiple regression: A primer*. Thousand Oaks: Pine Forge Press.

Allison, P.D. (2014). *Event history and survival analysis* (2nd ed.). Available from

    http://methods.sagepub.com/book/event-history-analysis-2e

American Society of Addiction Medicine. (n.d.). Opioid addiction 2016 facts & figures.

    Retrieved from http://www.asam.org/docs/default-source/advocacy/opioid-addiction-

    disease-facts-figures.pdf

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision*

    Processes, 50(2), 179-211. doi:10.1016/0749-5978(91)90020-T

Babbie, E. (2014). *The basics of social research* (6th ed.) Belmont, CA: Wadsworth

Bailey, P. (2017, February 9). ACA repeal would jeopardize treatment for millions with

    substance use disorders, including opioid addiction. Retrieved from

    https://www.cbpp.org/research/health/aca-repeal-would-jeopardize-treatment-for-

    millions-with-substance-use-disorders

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*.

    Englewood Cliffs, NJ: Prentice Hall

Bandura, A. (1999). A sociocognitive analysis of substance abuse: An agentic perspective.

    Psychological Science, 10(3), 214-217.

Banta-Green, C., Maynard, C., Koepsell, T., Wells, E., & Donovan, D. (2009). Retention in

    methadone maintenance drug treatment for prescription-type opioid primary users

    compared to heroin users. *Addiction*, *104*(5), 775-783. doi:10.1111/j.1360-

    0443.2009.02538.x

Barker, C. (2009). The mean, median, and confidence intervals of the Kaplan-Meier survival

    estimate: Computations and applications. *The American Statistician*, *63*(1), 78-80.

    doi:10.1198/tast.2009.0015

Caccavale, J. (2016). Heroin addiction: The consequences of unfettered opioid prescribing.

    National Association of Peer Program Professionals Monthly Newsletter, *11*(5), 11-13.

Carlson, M. A., & Morrison, R. S. (2009). Study design, precision, and validity in observational

    studies. *Journal of Palliative Medicine*, *12*(1), 77-82. doi:10.1089/jpm.2008.9690

Cavaiola, A. A., Fulmer, B. A., & Stout, D. (2015). The impact of social support and attachment

    style on quality of life and readiness to change in a sample of individuals receiving

    medication-assisted treatment for opioid dependence. *Substance Abuse*, *36*(2), 183-191.

    doi:10.1080/08897077.2015.1019662

Centers for Disease Control and Prevention. (2011). Vital signs: Overdoses of prescription

    opioid pain relievers - United States, 1999 – 2008. *Morbidity and Mortality Weekly

    Report, 60*(43), 1487-1492.

Centers for Disease Control and Prevention. (2016). CDC guideline for prescribing opioids for

    chronic pain. Retrieved from

    https://www.cdc.gov/drugoverdose/pdf/guidelines_factsheet-a.pdf

Centers for Disease Control and Prevention. (2016, December 16). Drug overdose death data.

    Retrieved from https://www.cdc.gov/drugoverdose/data/statedeaths.html

Centers for Disease Control and Prevention. (2017, October 23). Opioid overdose.

    https://www.cdc.gov/drugoverdose/index.html

Chan, Y. H. (2004). Biostatistics 203. Survival Analysis. *Singapore Medical Journal, 45(6)*, 249-

    256.

Compton, W.M. & Volkow, N.D. (2006). Abuse of prescription drugs and the risk of addiction.

    Drug and Alcohol Dependence 83S, S4-S7.

Connery, H. S. (2015). Medication-assisted treatment of opioid use disorder: Review of the

    evidence and future directions. *Harvard Review of Psychiatry*, *23*(2), 63-75.

    doi:10.1097/HRP.0000000000000075

Cushman, P., Trussell, R., Gollance, H., Newman, R., & Bihari, B. (1976). Methadone

    maintenance treatment of narcotic addiction: A unit of medical care based on over 50,000

    patient treatment years. *The American Journal of Drug and Alcohol Abuse*, *3*(2), 221-

    233.

Darker, C. D., Ho, J., Kelly, G., Whiston, L., & Barry, J. (2016). Demographic and clinical

    factors predicting retention in methadone maintenance: Results from an Irish cohort. *Irish*

    Journal of Medical Sciences, 185(2), 433-441. doi:10.1007/s11845-015-1314-5

Deck, D., & Carlson, M. J. (2005). Retention in publicly funded methadone maintenance

    treatment in two western states. *Journal of Behavioral Health Services & Research*,

    32(1), 43-60.

Dennis, B. B., Bawor, M., Naji, L., Chan, C. K., Varenbut, J., Paul, J., & ... Samaan, Z. (2015).

    Impact of chronic pain on treatment prognosis for patients with opioid use disorder: A

    systematic review and meta-analysis. *Substance Abuse: Research and Treatment*, 9, 59-

    80. doi:10.4137/SART.S30120

Despa, S. (n.d.). What is survival analysis? *Cornell Statistical Consulting Unit.* Retrieved from

    https://www.cscu.cornell.edu/news/statnews/stnews78.pdf

Dole, V. P., & Joseph, H. (1978). Long-term outcome of patients treated with methadone

    maintenance. *Annals of the New York Academy of Sciences*, *311*(1), 181.

    doi:10.1111/j.1749-6632.1978.tb16775.x

Dole, V. P., & Nyswander, M. E. (1976). Methadone maintenance treatment. A ten-year

    perspective. *Journal of American Medical Association*, *235*(19), 2117-2119.

Dowell, D., Haegerich, T. M., & Chou, R. (2016, March 15). CDC guideline for prescribing

    opioids for chronic pain − United States, 2016. *Morbidity and Mortality Weekly Report.*

    Retrieved from http://www.cdc.gov/mmwr/volumes/65/rr/rr6501e1.htm

Drazdowski, T. K. (2016). A systematic review of the motivations for the non-medical use of

    prescription drugs in young adults. *Drug and Alcohol Dependence*, 162, 3-25.

    doi:10.1016/j.drugalcdep.2016.01.011

Duran, N. X. (2018, January 8). Lawmakers must confront opioid addiction crisis. *Miami*

    Herald. Retrieved from http://www.miamiherald.com/opinion/op-

    ed/article193659794.html

Farber, E., Hodari, K., Motley, V., Pereira, B., Yonker, M., Sharma, S., & Campos, P. (2012).

    Integrating behavioral health with medical services: Lessons from HIV care. *Professional*

    Psychology Research and Practice, *43*(6), 650-657.

Farrokhyar, F., Reddy, D., Poolman, R. W., & Bhandari, M. (2013). Why perform a priori

    sample size calculation? *Canadian Journal of Surgery*, *56*(3), 207-213.

    doi:10.1503/cjs.018012

Fiorentine, R., & Hillhouse, M. P. (2003). When low self-efficacy is efficacious: toward an

    addicted-self model of cessation of alcohol- and drug-dependent behavior. *American*

    Journal on Addictions, *12*(4), 346-364.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to*

    theory and research. Reading, MA: Addison-Wesley.

Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action*

    approach. New York, NY: Taylor & Francis Group.

Fleary, S. A., Heffer, R. W., & McKyer, E. J. (2011). Dispositional, ecological and biological

    influences on adolescent tranquilizer, ritalin, and narcotics misuse. *Journal of*

    Adolescence, *34*(4), 653-663. Doi:10.1016/j.adolescence.2010.09.007

Fleming, M. L., Driver, L., Sansgiry, S. S., Abughosh, S. M., Wanat, M., Sawant, R. V., & ...

    Todd, K. H. (2016). Physicians' intention to prescribe hydrocodone combination products

    after rescheduling: A theory of reasoned action approach. *Research in Social and*

    Administrative Pharmacy, 1-10. doi:10.1016/j.sapharm.2016.07.001

Florida Administrative Code. (2006). 65D-30.014 Standards for medication and methadone

    maintenance treatment. Retrieved from

    https://www.flrules.org/gateway/ruleno.asp?id=65D-30.014

Florida Department of Children and Families. (2018, January 1). Florida substance abuse and

    mental health annual plan update: State and regional plan update fiscal year 2016-2017.

    Retrieved from

    http://www.dcf.state.fl.us/programs/samh/publications/substance%20Abuse%20and%20

    Mental%20Health%20Services%20Plan%202017%20Update.pdf

Florida Department of Law Enforcement. (2016, September). 2015 Medical Examiners

    Commission drug report. Retrieved from http://www.fdle.state.fl.us/MEC/Publications-

    and-Forms/Documents/Drugs-in-Deceased-Persons/2015-Annual-Drug-Report.aspx

Florida House of Representatives. (2018). HB1025: Substance Abuse Treatment. Retrieved from

    https://www.flsenate.gov/Session/Bill/2018/01025

Florida Senate. (2011). CS/CS/HB 7095: Prescription drugs. Retrieved from

    https://www.flsenate.gov/Session/Bill/2011/7095/ByVersion

Florida Senate. (2018). HB 5001: General Appropriations Act. Retrieved from

    https://www.flsenate.gov/Session/Bill/2018/5001/BillText/__/PDF

Fox, J. & Weisberg, S (2011, February 23). An appendix to an R companion to applied

    regression, second edition. Retrieved from

    https://socserv.socsci.mcmaster.ca/jfox/Books/Companion/appendix/Appendix-Cox-

    Regression.pdf

Franckowiak, B. A., & Glick, D. F. (2015). The effect of self-efficacy on treatment. *Journal of*

    Addictions Nursing, *26*(2), 62-70. doi:10.1097/JAN.0000000000000073

Galea, S., & Vlahov, D. (2002). Social determinants and the health of drug users: Socioeconomic

    status, homelessness, and incarceration. *Public Health Reports, 117*, S135-145.

Gullo, M. J., Matveeva, M., Feeney, G. F., Young, R. M., & Connor, J. P. (2017). Social

    cognitive predictors of treatment outcome in cannabis dependence. *Drug & Alcohol*

    Dependence, *170*74-81. doi:10.1016/j.drugalcdep.2016.10.030

Haddad, M. S., Zelenev, A., & Altice, F. L. (2013). Integrating buprenorphine maintenance

    therapy into federally qualified health centers: Real-world substance abuse treatment

outcomes. *Drug & Alcohol Dependence*, *131*(1), 127-135.

doi:10.1016/j.drugalcdep.2012.12.008

Harrell, P., Trenz, R., Scherer, M., Martins, S., & Latimer, W. (2013). A latent class approach to treatment readiness corresponds to a transtheoretical ("stages of change") model. *Journal of Substance Abuse Treatment*, *45*(3), 249-256.

Hartwell, T. D., Steele, P. D., French, M. T. & Rodman, N. F. (1996). Prevalence of drug testing in the workplace. *Monthly Labor Review*, *119*(11), 35-42.

Heiman, H. J., & Artiga, S. (2015, November 4). Beyond health care: The role of social determinants in promoting health and health equity. *The Henry J. Kaiser Family Foundation.* Retrieved from http://kff.org/disparities-policy/issue-brief/beyond-health-care-the-role-of-social-determinants-in-promoting-health-and-health-equity/

Hubbard, R. L., Craddock, S. G., & Anderson, J. (2003). Overview of 5-year follow-up outcomes in the drug abuse treatment outcome studies (DATOS). *Journal of Substance Abuse Treatment*, 25(3), 125-134.

Hwang, C. S., Turner, L. W., Kruszewski, S. P., Kolodny, A., & Alexander, G. C. (2016). Primary care physicians' knowledge and attitudes regarding prescription opioid abuse and diversion. *The Clinical Journal of Pain, 32*(4), 279-284. Doi:10.1097/AJP.0000000000000268

Jacobsen, K. (2017*). Introduction to health research methods: A practical guide* (2nd ed.). Sudbury, MA: Jones & Bartlett Learning.

Jeffers, A. J., Benotsch, E. E., Green, B. A., Bannerman, D., Darby, M., Kelley, T., & Martin, A. M. (2015). Health anxiety and the non-medical use of prescription drugs in young adults: A cross-sectional study. *Addictive Behaviors*, *50,* 74-77.

Joe, G. W., Simpson, D. D., & Broome, K. M. (1998). Effects of readiness for drug abuse treatment on client retention and assessment of process. *Addiction*, *93*(8), 1177-1190.

Johnston, K. L., White, K. M., & Norman, P. (2004). An examination of the individual-difference approach to the role of norms in the theory of reasoned action. *Journal of Applied Social Psychology*, *34*(12), 2524-2549.

Jones, B. A., Fullwood, H., & Hawthorn, M. (2012). Preventing prescription drug abuse in adolescence: A collaborative approach. *Prevention Researcher*, *19*(1), 13-16.

Jones, C. M., Campopiano, M., Baldwin, G., & McCance-Katz, E. (2015). National and State treatment need and capacity for opioid agonist medication-assisted treatment. *American Journal of Public Health*, *105*(8), e55-e63.

Kelly, S. M., O'Grady, K. E., Mitchell, S. G., Brown, B. S., & Schwartz, R. P. (2011). Predictors of methadone treatment retention from a multi-site study: A survival analysis. *Drug and Alcohol Dependence*, *117,*170-175. doi:10.1016/j.drugalcdep.2011.01.008

Kennedy-Hendricks, A., Richey, M., McGinty, E. E., Stuart, E. A., Barry, C. L., & Webster, D. W. (2016). Opioid overdose deaths and Florida's crackdown on pill mills. *American Journal of Public Health*, *106*(2), 291-297. doi:10.2105/AJPH.2015.302953

Kleinbaum, D. G., & Klein, M. (2005). *Survival analysis: A self-learning text*. (2nd ed.). New York, NY: Springer.

Kleinman, B., Millery, M., Scimeca, M., & Polissar, N. (2002). Predicting long-term treatment utilization among addicts entering detoxification: The contribution of help-seeking models. *Journal of Drug Issues*, *32*(1), 209-230.

Kreek, M., Borg, L., Ducat, E., & Ray, B. (2010). Pharmacotherapy in the treatment of
addiction: methadone. *Journal of Addictive Diseases*, *29*(2), 200-216.
doi:10.1080/10550881003684798

Kresina, T. F. & Lubran, R. (2011). Improving public health through access to and utilization of
medication assisted treatment. *International Journal of Environmental Research and
Public Health, 8*(10), 4102-4117. doi:10.3390/ijerph8104102

Madden, T. J., Ellen, P. S., & Ajzen, I. (1992). A comparison of the theory of planned behavior
and the theory of reasoned action. *Personality & Social Psychology Bulletin*, *18*(1), 3-9.

Matson, S., Hobson, G., Abdel-Rasoul, M., & Bonny, A. (2014). A retrospective study of
retention of opioid-dependent adolescents and young adults in an outpatient
buprenorphine/naloxone clinic. *Journal of Addiction Medicine*, *8*(3), 176-182.

Maxwell, J. C. (2015). The pain reliever and heroin epidemic in the United States: Shifting
winds in the perfect storm. *Journal of Addictive Diseases*, *34*(2-3), 127-140.
Doi:10.1080/10550887.2015.1059667

McGinty, J., & Anderson, G. (2008). Predictors of physician compliance with American Heart
Association guidelines for acute myocardial infarction. *Critical Care Nursing Quarterly*,
31(2), 161-172.

McLellan, A., Lewis, D., O'Brien, C., & Kleber, H. (2000). Drug dependence, a chronic medical
illness - Implications for treatment, insurance, and outcomes evaluation. *Journal of the
American Medical Association*, *284*(13), 1689-1695.

Millstein, S. (1996). Utility of the theories of reasoned action and planned behavior for
predicting physician behavior: A prospective analysis. *Health Psychology*, *15*(5), 398-
402.

Moeller, K. E., Lee, K. C., & Kissack, J. C. (2008). Review: Urine drug screening: Practical
      guide for clinicians. *Mayo Clinic Proceedings*, *83*(1), 66-76. doi:10.1016/S0025-
      6196(11)61120-8.

Moore, B., Fiellin, D., Barry, D., Sullivan, L., Chawarski, M., O'Connor, P., & Schottenfeld, R.
      (2007). Primary care office-based buprenorphine treatment: Comparison of heroin and
      prescription opioid dependent patients. *Journal of General Internal Medicine*, *22*(4), 527-
      530.

Mower, L. (2018, March 8). Legislators set to approve massive opioid bill, but lawmakers wish it
      did more. *Tampa Bay Times*. Retrieved from http://www.tampabay.com/florida-
      politics/buzz/2018/03/08/legislators-set-to-approve-massive-opioid-bill-but-lawmakers-
      wish-it-did-more/

Nargiso, J. E., Ballard, E. L., & Skeer, M. R. (2015). A systematic review of risk and protective
      factors associated with nonmedical use of prescription drugs among youth in the United
      States: a social ecological perspective. *Journal of Studies on Alcohol and Drugs*, *76*(1), 5-
      20.

National Drug Intelligence Center. (2010). *National threat assessment: The economic impact of
      illicit drug use on American society*. Washington, DC: United States Department of
      Justice.

National Institute on Drug Abuse. (2011, March 2). Understanding drug abuse and addiction.
      Retrieved from https://www.drugabuse.gov/sites/default/files/understanding.pdf

National Institute on Drug Abuse. (2014, January). Abuse of prescription pain medications risks
      heroin use. Retrieved from https://www.drugabuse.gov/related-topics/trends-
      statistics/infographics/abuse-prescription-pain-medications-risks-heroin-use

Neufeld, K., Kidorf, M., King, V., Stoller, K., Clark, M., Peirce, J., & Brooner, R. (2010). Using enhanced and integrated services to improve response to standard methadone treatment: Changing the clinical infrastructure of treatment networks. *Journal of Substance Abuse Treatment*, *38*(2), 170-177.

Norris, L. (2017, January 2). Florida and the ACA's Medicaid expansion. Retrieved from https://www.healthinsurance.org/florida-medicaid/

Nosyk, B., Geller, J., Guh, D., Oviedo-Joekes, E., Brissette, S., Marsh, D., & ... Anis, A. (2010). The effect of motivational status on treatment outcome in the North American Opiate Medication Initiative (NAOMI) study. *Drug and Alcohol Dependence*, *111*(1), 161-165.

O'brien, R. M. (2007). A Caution regarding rules of thumb for variance inflation factors. *Quality and Quantity*, *5*(41), 673-690. doi:10.1007/s11135-006-9018-6

O'Connell, D. J., Enev, T. N., Martin, S. S., & Inciardi, J. A. (2007). Working toward recovery: The interplay of past treatment and economic status in long-term outcomes for drug-involved offenders. *Substance Use & Misuse*, *42*(7), 1089-1107. doi:10.1080/10826080701409453

Office of Behavioral and Social Sciences Research (n.d.). Social and behavioral theories. Retrieved from http://www.esourceresearch.org/Portals/0/Uploads/Documents/Public/Glanz_FullChapter.pdf

Office of Disease Prevention and Health Promotion. (2017, January). Social determinants of health. Retrieved from https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-of-health

Office of Governor Rick Scott. (2017, September 26). Gov. Scott to propose major legislation

    and $50 million investment to combat opioid abuse. Retrieved from

    https://www.flgov.com/2017/09/26/gov-scott-to-propose-major-legislation-and-50-

    million-investment-to-combat-opioid-abuse/

Pantalon, M., Nich, C., Frankforter, T., & Carroll, K (2002). The URICA as a measure of

    motivation to change among treatment-seeking individuals with concurrent alcohol and

    cocaine problems. *Psychology of Addictive Behaviors*, *16*(4), 299-307.

Park, H. & Bloch, M. (January 19, 2016). How the epidemic of drug overdose ripples across

    America. *The New York Times.* Retrieved from

    http://www.nytimes.com/interactive/2016/01/07/us/drug-overdose-deaths-in-the-

    us.html?_r=2

Parmar, M. K. B., & Machin, D. (1995). *Survival analysis: A practical approach*. Chichester,

    NY: J. Wiley.

Paulozzi, L. J. (2012). Prescription drug overdoses: A review. *Journal of Safety Research*, *43*,

    283-289. Doi:10.1016/j.jsr.2012.08.009

Pecoraro, A., Ma, M., & Woody, G. E. (2012). The science and practice of medication-assisted

    treatments for opioid dependence. *Substance Use & Misuse*, *47*, 1026-1040.

    doi:10.3109/10826084.2012.663292

Phillips, J. (2013). Prescription drug abuse: Problem, policies, and implications. *Nursing

    Outlook*, *61,* 78-84. Doi:10.1016/j.outlook.2012.06.009

Prochaska, J. O., Redding, C. A. & Evers, K. E. (2002). In Glanz, K., Rimer, B. K., & Lewis, F.

    M. (Eds.), *Health behavior and health education: Theory, research, and practice* (97-

    121). San Francisco, CA: Jossey-Bass.

Prochaska, J. O., & Velicer, W. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion*, *12*(1), 38-48.

Proctor, S. L., Copeland, A. L., Kopak, A. M., Hoffmann, N. G., Herschman, P. L., & Polukhina, N. (2015). Predictors of patient retention in methadone maintenance treatment. *Psychology of Addictive Behaviors*, *29*(4), 906-917. doi:10.1037/adb0000090

Rash, C. J., Andrade, L. F., & Petry, N. M. (2013). Income received during treatment does not affect response to contingency management treatments in cocaine-dependent outpatients. *Drug and Alcohol Dependence*, *132,* 528-534. doi:10.1016/j.drugalcdep.2013.03.020

Rash, C. J., Olmstead, T. A., & Petry, N. M. (2009). Income does not affect response to contingency management treatments among community substance abuse treatment-seekers. *Drug and Alcohol Dependence*, *104*(3), 249-253. doi:10.1016/j.drugalcdep.2009.05.018

Rich, A., Brandes, K., Mullan, B., & Hagger, M. (2015). Theory of planned behavior and adherence in chronic illness: a meta-analysis. *Journal of Behavioral Medicine*, *38*(4), 673-688. doi:10.1007/s10865-015-9644-3

Roberto, A. J., Shafer, M. S., & Marmo, J. (2014). Predicting substance-abuse treatment providers' communication with clients about medication assisted treatment: A test of the theories of reasoned action and planned behavior. *Journal of Substance Abuse Treatment*, *47*(5), 307-313. doi:10.1016/j.jsat.2014.06.002

Rudd R. A., Seth P., David F. & Scholl L. (2016). Increases in drug and opioid-involved overdose death – United States, 2010 – 2015. *Morbidity Mortality Weekly Report*. 65(50-51), 1445–1452 doi: http://dx.doi.org/10.15585/mmwr.mm6550e1

Rusch, L. M. (2016). A reality check: The need for a deeper understanding of opioid abuse

    treatment options: A policy statement from the American College of Clinical

    Pharmacology. *Journal of Clinical Pharmacology*, *56*(1), 7-10. Doi:10.1002/jcph.645

Saunders, E. C., McGovern, M. P., Lambert-Harris, C., Meier, A., McLeman, B., & Xie, H.

    (2015). The impact of addiction medications on treatment outcomes for persons with co-

    occurring PTSD and opioid use disorders. *The American Journal on Addictions*, *24*, 722-

    731. doi:10.1111/ajad.12292

Saxon, A. J., Hser, Y., Woody, G., & Ling, W. (2013). Medication-assisted treatment for opioid

    addiction: Methadone and buprenorphine. *Journal of Food and Drug Analysis*,

    21(Supplement), S69-S72. doi:10.1016/j.jfda.2013.09.037

Schmidt, C., Bischof, G., Harting, M., & Rumpf, H. (2009). Motivation to change and readiness

    for counseling in prescription-drug-dependent patients in a general hospital population.

    Addiction Research & Theory, *17*(2), 186-190.

Sedgwick, P. (2014). Retrospective cohort studies: advantages and disadvantages. *British*

    Medical Journal, *348,* 1-2.

Sharma, M. (2005). Enhancing the effectiveness of alcohol and drug education programs through

    social cognitive theory. *Journal of Alcohol & Drug Education*, *49*(3), 3-7.

Smyth, B. P., Barry, J., Lane, A., Cotter, M., O'Neill, M., Quinn, C., & Keenan, E. (2005). In-

    patient treatment of opiate dependence: Medium-term follow-up outcomes. *British*

    Journal of Psychiatry, *187,* 360-365.

Song, J. W., & Chung, K. C. (2010). Observational studies: Cohort and case-control studies.

    Plastic and Reconstructive Surgery, *126*(6), 2234-2242.

    doi:10.1097/PRS.0b013e3181f44abc

Stone, R. & Katz, R. (1996). Thoughts on the future of integrated acute and long-term care. In R.

 Newcomer & A. Wilkinson (Eds.), *Annual review of gerontology and geriatrics: Focus*

 on managed care and quality assurance: Integrating acute and chronic care (16:217-

 245). New York City, NY: Spring Publishing Company

Stotts, A., Dodrill, C., & Kosten, T. (2009). Opioid dependence treatment: Options in

 pharmacotherapy. *Expert Opinion on Pharmacotherapy*, *10*(11), 1727-1740.

Substance Abuse and Mental Health Services Administration. (2012). The facts about naltrexone

 for opioid addiction treatment. Retrieved from

 https://store.samhsa.gov/shin/content/SMA12-4444/SMA12-4444.pdf

Substance Abuse and Mental Health Services Administration. (2013). *Results from the 2012*

 national survey on drug use and health: Summary of national findings, NSDUH Series

 H-46, HHS Publication No. (SMA) 13-4795. Rockville, MD: Substance Abuse and

 Mental Health Services Administration.

Substance Abuse and Mental Health Services Administration. (2013). TIP 43: Medication-

 assisted treatment for opioid addiction in opioid treatment programs. Retrieved from

 http://store.samhsa.gov/shin/content//SMA12-4214/SMA12-4214.pdf

Substance Abuse and Mental Health Services Administration. (2015). Report shows notable

 changes in substance use treatment admissions over past decade. Retrieved from

 https://www.samhsa.gov/newsroom/press-announcements/201512031000

Substance Abuse and Mental Health Services Administration. (2016, September 12). Naltrexone.

 Retrieved from https://www.samhsa.gov/medication-assisted-

 treatment/treatment/naltrexone

Timko, C., Schultz, N. R., Cucciare, M. A., Vittorio, L., & Garrison-Diehn, C. (2016). Retention

in medication-assisted treatment for opiate dependence: A systematic review. *Journal of Addictive Diseases*, *35*(1), 22-35. doi:10.1080/10550887.2016.1100960

Topp, S. M., Chipukuma, J. M., Chiko, M. M., Matongo, E., Bolton-Moore, C., & Reid, S. E. (2013). Integrating HIV treatment with primary care outpatient services: Opportunities and challenges from a scaled-up model in Zambia. *Health Policy and Planning*, *28*(4), 347-357. doi:10.1093/heapol/czs065

Tozzie, J. (2014, July 1). How Florida is fixing its prescription painkiller problem. *Bloomberg Business Week*. Retrieved from https://www.bloomberg.com/news/articles/2014-07-01/how-florida-is-fixing-its-prescription-painkiller-problem

Turk, D. C., Dansie, E. J., Wilson, H. D., Moskovitz, B., & Kim, M. (2014). Physicians' beliefs and likelihood of prescribing opioid tamper-resistant formulations for chronic noncancer pain patients. *Pain Medicine*, *15*(4), 625-636. doi:10.1111/pme.12352.

United States Department of Health and Human Services (2011). Medication-assisted treatment for opioid addiction. Retrieved from https://store.samhsa.gov/shin/content/SMA09-4443/SMA09-4443.pdf

United States Department of Health and Human Services (2016). Facing addition in America. The Surgeon General's report on alcohol, drugs, and health. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK424857/pdf/Bookshelf_NBK424857.pdf

Vogel, M., Dürsteler, K. M., Walter, M., Herdener, M., & Nordt, C. (2017). Rethinking retention in treatment of opioid dependence-The eye of the beholder. *International Journal of Drug Policy*, 39, 109-113. doi:10.1016/j.drugpo.2016.09.003

Wasserman, D. A., Stewart, A. L., & Delucchi, K. L. (2001). Social support and abstinence from

    opiates and cocaine during opioid maintenance treatment. *Drug and Alcohol Dependence*,

    65(1), 65-75. doi:10.1016/S0376-8716(01)00151-X

The White House, United States Government. (2017, October 26). President Donald J. Trump is

    taking action on drug addiction and the opioid crisis. Retrieved from

    https://www.whitehouse.gov/briefings-statements/president-donald-j-trump-taking-

    action-drug-addiction-opioid-crisis/

Wilson, K. (2017, September 26). Rick Scott announces support for new legislation, funding to

    fight opioid crisis. *Tampa Bay Times*. Retrieved from http://www.tampabay.com/florida-

    politics/buzz/2017/09/26/rick-scott-announces-support-for-new-legislation-funding-to-

    fight-opioid-crisis/

World Health Organization. (2009). Guidelines for the psychosocially assisted pharmacological

    treatment of opioid dependence. Retrieved from

    http://www.who.int/substance_abuse/publications/opioid_dependence_guidelines.pdf

Zee, A. V. (2009). The promotion and marketing of oxycontin: Commercial triumph, public

    health tragedy. *American Journal of Public Health*, *99*(2), 221-227.

    doi:10.2105/AJPH.2007.131714

Zezima, K. & Ingraham, C. (2017, March 9). GOP health-care bill would drop addiction

    treatment mandate covering 1.3 million Americans. Retrieved from

    https://www.washingtonpost.com/news/wonk/wp/2017/03/09/gop-health-care-bill-would-

    drop-mental-health-coverage-mandate-covering-1-3-million-

    americans/?utm_term=.b117aabc8d33

Zhang, Z., Friedmann, P., & Gerstein, D. (2003). Does retention matter? Treatment duration and improvement in drug use. *Addiction*, *98*(5), 673-684.

Zosel, A., Bartelson, B., Bailey, E., Lowenstein, S., & Dart, R. (2013). Characterization of adolescent prescription drug abuse and misuse using the Researched Abuse Diversion and Addiction-Related Surveillance (RADARS ®) System. *Journal of the American Academy of Child and Adolescent Psychiatry*, *52*(2), 196-204.

Zullig, K. J., Divin, A. L., Weiler, R. M., Haddox, J. D., & Pealer, L. N. (2015). Adolescent nonmedical use of prescription pain relievers, stimulants, and depressants, and suicide risk. *Substance Use & Misuse*, *50*(13), 1678-1689