UNDERSTANDING MARIJUANA'S ROLE IN TREATMENT EXPERIENCE, TREATMENT ENGAGEMENT, AND RELAPSE AMONG PEOPLE IN TREATMENT FOR SUBSTANCE USE CHALLENGES

by

CHARLES A. WARNOCK

(Under the Direction of Jessica L. Muilenburg)

ABSTRACT

Nearly two million people enter treatment to address substance use challenges each year in the United States. A large proportion of those entering treatment use marijuana and this use is likely to persist during treatment. This proportion of people entering treatment who use marijuana is likely to increase in conjunction with marijuana's changing legal status. The purpose of this dissertation was to gain a comprehensive understanding of marijuana's effects on formal treatment/recovery support attendance, alcohol use, crack/cocaine use, and opioid use as well as to describe perceptions, beliefs, and experiences with marijuana among people in treatment for substance use. Two studies were conducted to accomplish this purpose. Participants were recruited from two sites in Georgia and Connecticut. For the first study, participants completed daily surveys over a 90-day period. This study examined within-subject concurrent (same day) and prospective (next day) associations as well as the between-subject associations between marijuana use and formal treatment/recovery support attendance alcohol use, crack/cocaine use, and opioid use. This study found that 25.0% of participants used marijuana

during the 90-day period. At the within-subjects level, using marijuana on a certain day was associated with using alcohol concurrently. At the between-subjects level, marijuana was associated with more alcohol use and more crack/cocaine use across days. Marijuana was not associated with formal treatment/recovery support attendance or opioid use both concurrently and prospectively. The second study described experiences, perceptions, and beliefs around marijuana among people in treatment for substance use challenges. This study found that although participants believed that marijuana use may be related to initiation and return to other substance use, many people in treatment for substance use have beliefs and experiences around marijuana as a beneficial medicine to address co-occurring mental health concerns and to relieve symptoms of other substance use disorders. These beliefs and experiences are often coupled with stigma and shame due to persistent marijuana use while identifying as *sober* or *in treatment.* Findings suggest that marijuana use during treatment is negatively related to other substance use outcomes and provides interventional points for which providers can dispel positive beliefs around marijuana as a beneficial/inconsequential substance.

INDEX WORDS: Alcohol, Marijuana, Multilevel Modeling, Opioids, Relapse Prevention Model, Substance Use Treatment

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B.S., The University of Georgia, 2016

M.P.H., The University of Georgia, 2020

A Dissertation Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

ATHENS, GEORGIA

2023

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May 2023

ACKNOWLEDGMENTS

This dissertation was a labor of love made possible by the support of my family and friends. Towards the completion of this dissertation, I first want to thank my wife, Onyale, who has supported me through this entire process. Thank you to my family, especially my mom, who supported me financially and emotionally as a graduate student. Thank you to Drs. Jessica Muilenburg and Trace Kershaw who provided mentorship to me, supported my research, and allowed me to pursue my interests under the umbrella of Project RENEW. Thank you to Dr. Tamora Callands who has always been my biggest cheerleader and has always helped me remember to "Just get it done". Also, thank you to Ashlin Ondrusek who spent time with me coding and developing qualitative themes. I could not have done it without you all. Thank you to the entire Project RENEW team who helped me to collect data. Towards my completion of this degree generally, thank you to Dr. Carol Poe who took a chance on me and gave me my first opportunity to work as a funded graduate student. Thank you to Drs. Rebecca Matthew and Pamela Orpinas who gave me my first opportunities in research as a graduate student. I would not be here today if not for their initial belief in me. Finally, thank you to my dog Dudley who has been with me for every moment of my time as a graduate student in the aftermath of COVID-19 and has been by my side for every word written of my dissertation.

TABLE OF CONTENTS

Page

ACKNOWLEDGMENTS iv

LIST OF TABLES viii

LIST OF FIGURES ix

CHAPTER

1 INTRODUCTION 1

Changing Landscape Around Marijuana in the U.S. 1

Public Health Impact of Marijuana and Marijuana Dependence 2

Drug Use and Harm in the United States 4

Treatment Engagement, Recovery, Relapse, Repeat 5

Marijuana Use among People in Treatment for Substance Use Disorder 6

Purpose and Study Aims 7

2 LITERATURE REVIEW 10

Substance Use Disorder (SUD) 10

Relapse 12

Recovery 13

Types of SUD Treatment and Interventions: In-Patient Residential Treatment 15

Types of SUD Treatment and Interventions: Counseling 17

Types of SUD Treatment and Interventions: Behavioral Therapies 17

Types of SUD Treatment and Interventions: Pharmacotherapies 20

Peer Recovery Support Programs and Groups 22

Harm Reduction as an Integral Part of SUD Treatment 23

Marijuana Use as a Predictor of Relapse 24

Conceptual Framework 25

3 Marijuana Use Among People in Treatment for Substance Use: Associations with Treatment/Recovery Support Attendance, Alcohol Use, Crack/Cocaine Use, and Opioid Use in a 90-Day Daily Diary Study[1] 30

Abstract 31

Introduction 32

Methods 36

Results 40

Discussion 41

4 “Sneaking and Geeking”: Perceptions and Beliefs Around Marijuana Among People in Treatment for Substance Use[1] 49

Abstract 50

Introduction 51

Methods 53

Results 56

Discussion 65

5 CONCLUSIONS 71

Introduction 71

Chapter 3 Summary 72

Chapter 4 Summary 73

Key Findings 74

Strengths 74

Limitations 75

Summary and Future Directions 76

REFERENCES 78

APPENDICES 99

PARTICIPANT SCREENER 99

PARTICIPANT INFORMED CONSENT LETTER 116

PARTICIPANT BASELINE SURVEY 125

DAILY SURVEY MEASURES 148

MARIJUANA AND TREATMENT QUALITATIVE SCRIPT 157

LIST OF TABLES

Page

Table 3.1: Demographic Characteristics of the Sample……..……46

Table 3.2: Descriptive Statistics……47

Table 3.3: Concurrent and prospective associations between marijuana use, formal treatment/recovery support attendance, alcohol use, crack/cocaine use, and opioid use……..……..…48

Table 4.1: Demographic Characteristics of the Sample……70

LIST OF FIGURES

Page

Figure 2.1: Marlatt and Gordon's Relapse Prevention Model ……..……..……26

CHAPTER 1

INTRODUCTION

Changing Landscape Around Marijuana in the U.S.

From 2002 to 2019, the prevalence of marijuana use within the past-year among U.S. adults increased from 10.4% to 18.0% and daily use increased from 1.3% to 3.9% (Substance Abuse and Mental Health Services Administration, 2020a). Although federally prohibited in the U.S. since 1937, there has been a surge in public and political interest to decriminalize or outright legalize marijuana consumption and distribution in recent decades. The percentage of Americans favoring marijuana legalization for recreational purposes rose from ~20% to ~60% between 1986 and 2016 (Daniller, 2019). State-level efforts to legalize marijuana for recreational use and distribution have succeeded in 19 U.S. states via referendum or legislation since Colorado and Washington first legalized in 2012, and a further 12 U.S. states have decriminalized the possession of small amounts of marijuana for personal and recreational use. These changes in public approval and policy are driven by evolving societal perceptions and attitudes towards marijuana as a more acceptable recreational drug with lower harm potential in comparison to other drugs and as a potentially lucrative source of tax revenue (Caputo & Ostrom, 1994; Hasin, 2018; Keyes et al., 2016; McGinty et al., 2016). Between 2002 and 2014, the perception that using marijuana involves great risk declined from ~50% to ~30% among adults in the U.S while the perception that using marijuana involves no risk increased from ~6% to ~15%. (Compton, Han, Jones, Blanco, & Hughes, 2016). As for revenue, legal states like Colorado collected ~$35 million per month in state excise taxes on recreational marijuana sales

in 2021 and has collected over $2 billion since the tax was implemented in 2014 (Colorado Department of Revenue, 2022).

Public Health Impact of Marijuana and Marijuana Dependence

Although legalization is gaining ground and attitudes towards marijuana in the U.S. are growing more positive, evidence of poor health outcomes among people who use marijuana is emerging. From an injury prevention perspective, the risk of accidental injury or death in a motor vehicle is elevated among people intoxicated due to marijuana. Motor vehicle fatalities involving marijuana more than doubled from 2000 to 2018, and research examining driving performance in the context of marijuana intoxication consistently finds significant impairments in the cognitive and motor skills required to drive safely among people who drive "high" (Hasin, 2018; Lira et al., 2021; Ramaekers, Berghaus, van Laar, & Drummer, 2004; Rogeberg & Elvik, 2016). From a chronic disease perspective, people who smoke marijuana are at higher risk of developing lung and cardiovascular issues, although the evidence is still being disentangled from the effects of co-occurring tobacco smoking (Tashkin, 2013; Thomas, Kloner, & Rezkalla, 2014). The greatest risks associated with marijuana may involve the psychological and behavioral health of the user. People who use marijuana are more likely to experience depression, anxiety, and lower life satisfaction (Compton et al., 2016; Degenhardt, Hall, & Lynskey, 2001; Patton et al., 2002; Subramaniam et al., 2018). Along with mood problems, marijuana is also associated with dependency, the initiation of other drug use, and further co-occurring use of other drugs and alcohol (Secades-Villa, Garcia-Rodríguez, Jin, Wang, & Blanco, 2015; Vijapur, Levy, & Martins, 2021). Although popularly thought of as a drug with limited potential for dependence, ~10-30% of people who use marijuana develop a dependency issue with it (Hasin et al., 2016; Hasin et al., 2015; Lopez-Quintero et al., 2011). Many people with a marijuana dependency issue

trying to cease or reduce their use report withdrawal symptoms like nausea, vomiting, and irritability that can last as long as 30 days and make quitting more difficult (Budney, Moore, Vandrey, & Hughes, 2003; Hasin, 2018).

Marijuana is often used in conjunction with other substances like opioids, stimulants, and alcohol, and there is strong evidence within the literature that marijuana can act as a "gateway" or initiatory drug among adolescents and young adults, beginning a progressive trajectory into more risky substance use (Compton, Valentino, & DuPont, 2021; Vijapur et al., 2021; Warnock, Lauckner, & Ingram, 2021; A. R. Williams, 2020; Zhang, Wu, Wu, Durkin, & Marsiglia, 2021). People with a problem with alcohol or other substances that also use marijuana may also face poor outcomes in relation to their substance use challenges. People who have an alcohol use disorder (AUD) and use marijuana are more likely to have the AUD be persistent at three-year follow-up in comparison to people with an AUD who do not use marijuana (Weinberger, Platt, & Goodwin, 2016). People who are dependent on opioids and use marijuana are more likely to experience financial difficulties and to be involved in needle sharing in comparison to opioid-dependent people who do not use marijuana (Budney, Bickel, & Amass, 1998). Although initially heralded as an "exit drug" in the wake of falling overdose rates in legal states immediately post-legalization for medicinal purposes, recent research finds those overdose trends to be reversed with legal states experiencing ~20% greater opioid overdose mortality rate than expected in comparison to other states in the U.S (Bachhuber, Saloner, Cunningham, & Barry, 2014; Shover, Davis, Gordon, Humphreys, & Wachter, 2019). More research is needed to further understand the effects of marijuana on other substance use behavior especially in the context of the synthetic opioid driven "Third Wave" of drug overdose deaths currently plaguing the U.S.

Drug Use and Harm in the United States

In 2019, more than 20 million people in the United States had a substance use disorder (SUD), and around one out of every ten people with a SUD entered or received some form of SUD treatment (Substance Abuse and Mental Health Services Administration, 2020b, 2020c). Although the overall prevalence of SUD has not significantly changed in the U.S. over the last 10 years, the risk of death and harm related to substance use has magnified with the proliferation of synthetic opioids like fentanyl and synthetic opioid-tainted illicit drugs (Scholl, Seth, Kariisa, Wilson, & Baldwin, 2019). Since 2013, most U.S. States have experienced significant increases in deaths due to drug-related overdose and the rate of these deaths has been rapidly escalating year-to-year (Centers for Disease Control and Prevention, 2020). In 2015, 52,404 people (16.3 people per 100,000) in the U.S. died due to a drug overdose compared to 70,630 in 2019 (21.6 people per 100,000) and 91,799 (28.3 people per 100,000) in 2020 (Ahman, Rossen, & Sutton, 2021; Hedegaard, Minino, & Warner, 2020). While nearly every major demographic category across race, age, and gender has experienced significant increases in rates of drug-related overdose death since 2013, men, racial and ethnic minorities, and people living in urban areas have experienced the most rapid increases in overdose death rates during this period (Centers for Disease Control and Prevention, 2020). Although data specific to people who identify as LGBTQ+ is currently unavailable, a rapid increase during this period in drug-related overdose deaths among sexual minorities may similarly be extant due to elevated indicators of risky substance use among that population (Johns et al., 2019; Medley et al., 2016; Moazen-Zadeh et al., 2019). Along with death due to overdose are other major health and social concerns related to substance using behavior like acquiring severe disease (e.g. HIV/AIDS or hepatitis C), interpersonal problems, and criminal behavior (Han, Gfroerer, & Colliver, 2010; Harrison &

Gfroerer, 1992; Hassel, Nordfjærn, & Hagen, 2013; King, Nguyen, Kosterman, Bailey, & Hawkins, 2012). Key to the improvement of the health and wellbeing of people in the U.S. experiencing substance use challenges is continued treatment for these challenges as well as the identification of potential strategies to reduce the risk of death and other harm associated with continued substance use until recovery and sobriety can be achieved.

Treatment Engagement, Recovery, Relapse, Repeat

In 2019, there were nearly two million admissions to Federally and State-funded treatment centers (Substance Abuse and Mental Health Services Administration, 2020c). Critical to recovery from SUD and long-term sobriety is sustained engagement in treatment (National Institute on Drug Abuse, 2018). Although any participation at all in drug and alcohol treatment programs is associated with positive substance use outcomes, consistent and sustained engagement in effective treatment programs is associated with higher rates of continued sobriety and recovery (National Institute on Drug Abuse, 2018; Prendergast, Podus, Chang, & Urada, 2002). SUD treatment is also associated with a multitude of other positive effects in addition to primary substance use outcomes like improved quality of life, decreased illegal activity and criminal behavior, and increased likelihood of employment (Gottfredson, Kearley, & Bushway, 2008; Pasareanu, Opsal, Vederhus, Kristensen, & Clausen, 2015; Sahker, Ali, & Arndt, 2019). However, significant barriers to sustained treatment engagement exist for people experiencing substance use challenges. People in treatment must cope with a range of personal and environmental contributors to substance use like co-morbid mental health problems, environmental exposure to alcohol and other drugs, and personal relationships with substance using others (Ellis, Bernichon, Yu, Roberts, & Herrell, 2004; Harris & Edlund, 2005; Kingston, Marel, & Mills, 2017). These barriers are so great that about half of all people who enter

treatment for alcohol or other substances are likely to relapse within the first 90-days (McKay, 2017; McKay & Weiss, 2001; Moore et al., 2014). Although people experiencing substance use challenges are likely to relapse and drop-out of treatment, they are also likely to re-engage in treatment. In 2019, 59% of people entering publicly funded SUD treatment centers were re-entering treatment after a relapse or dropout from another program: 69% of those re-entering treatment were entering for their 3rd, 4th, or 5th times (Substance Abuse and Mental Health Services Administration, 2020c). Studies repeatedly show that, generally, people reach sustained recovery and sobriety after three to four treatment episodes over a period of years (Dennis & Scott, 2007; Dennis, Scott, Funk, & Foss, 2005; Scott, Dennis, & Foss, 2005). In this light, SUD can be viewed as a chronic illness with periods of relapse and remittance in which treatment engagement is critical towards sustained periods of sobriety, relapse is deadly due to escalating harms associated with a worsening synthetic opioid crisis, and recovery is hard won over an extended period of time (Dennis & Scott, 2007; McKay, 2017; Saitz, Larson, Labelle, Richardson, & Samet, 2008).

Marijuana Use among People in Treatment for Substance Use Disorder

Although the prevalence of marijuana use in the general population of the U.S. has increased in conjunction with more permissive attitudes and state-level legalization efforts, the proportion of SUD treatment admissions for marijuana use primarily fell 38% between 2009 and 2019 from 18.2% (372,418 people) to 11.2% (208,843 people) of all admissions (Substance Abuse and Mental Health Services Administration, 2020c). This reduction in treatment admissions for marijuana as the primary drug of use has not been accompanied by a reduction in treatment admissions indicating marijuana as a secondary or tertiary drug of use (Substance Abuse and Mental Health Services Administration, 2020c). Some research indicates that the

proportion of people with a SUD that use marijuana in addition to other drugs may be as large as 50-70% in the U.S. and Canada (Rosic et al., 2021; Tzilos, Reddy, Caviness, Anderson, & Stein, 2014). Among people with an AUD or SUD and who also use marijuana, marijuana use is likely to persist during the early phases of treatment. (Hermann, Klages, Welzel, Mann, & Croissant, 2005; M. Mojarrad, J. H. Samet, D. M. Cheng, M. R. Winter, & R. Saitz, 2014; Scavone, Sterling, Weinstein, & Van Bockstaele, 2013). Some reasons for this persistence include to subjectively ease withdrawal symptoms due to the cessation of opioids or as a substitute in place of drugs with greater harm potential (Bergeria, Huhn, & Dunn, 2020; Lau et al., 2015). However, the effects of marijuana use on treatment outcomes among this population remains under investigation. Research examining marijuana use in the context of SUD treatment has found poor treatment outcomes like increased rates of premature treatment dropout, persistent injection drug use, and relapse among opioid-dependent patients (Budney et al., 1998; Franklyn, Eibl, Gauthier, & Marsh, 2017; Wasserman, Weinstein, Havassy, & Hall, 1998). However, much of this research has focused solely on opioid-dependent patients in medication-assisted treatment programs, been conducted in Canada where marijuana has been legalized on a national-level since 2018, occurred prior to the successes of the legalization/decriminalization movement in the U.S, or is methodologically questionable (McBrien et al., 2019). There is a need to understand how marijuana affects treatment outcomes for people with substance use challenges in this new context in the U.S with innovative methods.

Purpose and Study Aims

Due to the changing legal and cultural landscape around marijuana, it's high prevalence and potential impact on outcomes among people who are in treatment for substance use challenges, and the increasingly mortal risk among people who use substances, a thorough

investigation of marijuana and its effects on treatment and substance use outcomes among people in treatment for substance use challenges is warranted. Thus, the purpose of this research is to comprehensively examine the prevalence and effects of marijuana use among people entering treatment for substance use challenges and its effects on formal treatment/recovery support attendance, alcohol use, crack/cocaine use, and opioid use. Further, this research aims to collect experiences, perceptions, and beliefs around marijuana use among people in treatment for substance use challenges. The results of this research will further the literature on the relationship between substance use treatment outcomes and marijuana use. My specific aims are to:

1. Assess the extent to which people entering treatment for substance use challenges are using marijuana.
2. Assess the concurrent (*t*, same day) and prospective (*t* +1, next day) within-subject effects of marijuana use on formal treatment attendance and recovery support meeting attendance among people entering treatment for substance use challenges.
3. Assess the between-subjects effects of marijuana use on formal treatment attendance and recovery support meeting attendance among people entering treatment for substance use challenges.
4. Assess concurrent (*t*, same day) and prospective (*t* +1, next day) within-subject effects of marijuana use on the use of alcohol, crack/cocaine, and opioid individually among people entering treatment for substance use challenges.
5. Assess the between-subjects effects of marijuana use on the use of alcohol, crack/cocaine, and opioid individually among people entering treatment for substance use challenges.

6. Describe beliefs, experiences, and perceptions around marijuana and marijuana use in relation to treatment and treatment goals among people entering treatment for substance use challenges.

CHAPTER 2

LITERATURE REVIEW

Substance Use Disorder (SUD)

SUD is defined as compulsive and continued alcohol and/or drug use although the user experiences negative or harmful consequences (National Institute on Drug Abuse, 2018). Examples of these consequences are the failure to meet social, family, or work obligations due to substance use, physical dependence on substances resulting in tolerance and withdrawal, and poor health and wellbeing (National Institute on Drug Abuse, 2018). Although most people experiencing SUD desire and attempt to cease their substance use, a large proportion fail to achieve abstinence long-term or undergo a multitude of failed attempts over a long period of time before long-term abstinence is achieved (National Institute on Drug Abuse, 2018). Much of this difficulty in gaining and remaining abstinent is due to the nature of SUD as a complex disease with both neurobiological and psychosocial underpinnings. From a neurobiological perspective, people who use drugs and/or alcohol over a long period of time experience changes in dopaminergic activation of the orbitofrontal cortex and anterior cingulate gyrus. These are areas of the brain involved in cognitive and motivational functions that control the ability to inhibit cravings and otherwise modulate reward processes as part of the mesolimbic system (Blum et al., 2000; Goldstein & Volkow, 2002). Other brain changes associated with addiction and substance use include frontal lobe grey matter volume loss (a region of the brain associated with impulse control, problem-solving, and emotion regulation), with some studies finding volumes decreasing as years of substance use increase (Chanraud et al., 2007; Goldstein &

Volkow, 2002; Jernigan et al., 1991; Liu, Matochik, Cadet, & London, 1998). The implication of these brain changes is that long-term substance use potentially impairs the neurological structures involved in self-monitoring, motivational, and cognitive processes necessary to achieve long-term abstinence among people experiencing SUD (Chanraud et al., 2007; Goldstein & Volkow, 2002; Volkow, Fowler, Wang, & Swanson, 2004). From a psychosocial perspective, people experiencing SUD often have a variety of environmental, social, and psychological factors contributing to their inability to remain abstinent. Adverse life experiences like combat-stress, sexual abuse, and other life stress and traumas (especially those experienced in childhood) increase the risk of substance use and addiction with substance use serving as a possible coping mechanism to deal with negative emotions associated with stressful and traumatic life events (Caprioli, Celentano, Paolone, & Badiani, 2007; Kalisch et al., 2017; Kendler et al., 2000; Saladin, Brady, Dansky, & Kilpatrick, 1995). Environmental and social cues like observing others participate in substance use behavior, engaging in activities previously associated with substance use, and going to places where an individual previously used substances can contribute to substance-seeking behavior and impair efforts towards long-term abstinence (Caprioli et al., 2007; Ferguson & Shiffman, 2009; Hone-Blanchet, Wensing, & Fecteau, 2014). Psychologically, people living with mental illness or who are experiencing negative emotions who use substances are likely to return to substance use when experiencing symptoms of their illness or negative emotions as a coping mechanism of avoidance and escape (Baker, Piper, McCarthy, Majeskie, & Fiore, 2004; Flynn & Brown, 2008). Thus, SUD can be thought of as a complex disorder with both neurobiological and psychosocial components related to an inability to remain abstinent from drugs and/or alcohol.

Relapse

As a chronic illness with periods of relapse and remittance, people with SUD often experience periods of return to substance-using behavior prior to achieving recovery. As a significant barrier to recovery and continued treatment engagement, twelve-month relapse rates across a variety of substance use behaviors range from 50-95% (Brandon, Vidrine, & Litvin, 2007; Kirshenbaum, Olsen, & Bickel, 2009; Substance Abuse and Mental Health Services Administration, 2020c). Relapses in substance-using behavior can occur even after long periods of symptom abatement but is more common in the initial stages of treatment or during initial attempts at sobriety (Schellekens, de Jong, Buitelaar, & Verkes, 2015; Xie, Drake, McHugo, Xie, & Mohandas, 2010). However, the operational definition of "relapse" often used in the context of SUD is inconsistent, ranging from a transitional, ongoing process that occurs over a long period of time to a discrete, dichotomous treatment outcome. For this research, relapse in the context of SUD is defined in agreement with Hendershot, Witkiewitz, George, and Marlatt (2011) and Marlatt and Donovan (2005) as a reversal that occurs during the process of behavior change interrupting progress towards initiation or maintenance of abstinence from substance use. This process is dynamic and continuous with relapse behavior subject to rapid, non-linear change or progression with various factors and contexts interplaying to affect the severity and timing of relapse (Hendershot et al., 2011; Witkiewitz & Marlatt, 2004). Multiple distal risks (e.g., family history, support, previous trauma, etc.) and transient risks (e.g., affective state, physical withdrawal, coping, context, etc.) combine, feed into, or modulate the individual effects of each other to directly influence the relapse process (Hendershot et al., 2011). An example of this dynamic interplay involving post-traumatic stress and withdrawal is well documented within nicotine and smoking cessation literature. Multiple studies examining post-traumatic stress

disorder (PTSD) and smoking relapse have found that nicotine withdrawal acutely exacerbates the PTSD-related emotional vulnerabilities of combat-exposed veterans leading to an increased risk of smoking relapse (Cook, Jakupcak, Rosenheck, Fontana, & McFall, 2009; Cook, McFall, Calhoun, & Beckham, 2007; McFall et al., 2010). In this population, smoking lapses serve to relieve the negative emotional state exacerbated by nicotine withdrawal, creating and reinforcing a feedback process encouraging lapses and further increasing the risk of relapse (Cook et al., 2007). A similar relationship is thought to exist across other substances with research showing relapse to be more likely among people who have experienced trauma and have a problem with alcohol and opioids (Heffner, Blom, & Anthenelli, 2011). While often occurring rapidly, relapse rarely occurs as a discrete event and is instead continuous. Relapse begins with an initial episode of return to use – a *lapse*, but relapse is the end point of a process that often occurs over a period of days or weeks and is characterized by multiple intermittent lapses and attempts to reestablish sobriety (Hendershot et al., 2011; Kirchner, Shiffman, & Wileyto, 2012; Shiffman et al., 2006). Therefore, relapse can be thought of more as a dynamic process of return to the beginning of the behavior change process rather than an individual event or setback.

Recovery

Recovery has a similar definitional challenge as to relapse. In 2010, the Substance Abuse and Mental Health Services Administration (SAMHSA) developed "SAMHSA's Working Definition of Recovery: 10 Guiding Principles of Recovery" which developed a working definition of recovery from substance use and other mental disorders. This definition is given as "A process of change through which individuals improve their health and wellness, live a self-directed life, and strive to reach their full potential" (Substance Abuse and Mental Health Services Administration, 2010, p. 3). For many in the U.S., recovery is assumed to include a total abstinence from alcohol

and drugs. Indeed, “health and wellness” in this SAMHSA definition of recovery is clearly explicated by SAMHSA as meaning abstinence from alcohol and drugs as the goal of recovery for people with SUD (Substance Abuse and Mental Health Services Administration, 2010, p. 3). This definition stands in contrast with other proposed definitions that seek to include the varied pathways to recovery that may not involve total abstinence from drugs and alcohol and instead focus on biopsychosocial functioning and quality of life. Although abstinence is the ideal outcome for people seeking recovery from a SUD, significant recent research indicates that reductions in drug and/or alcohol use are related to meaningful improvements in health and well-being among people who continue to drink or use (Pauly et al., 2016; Saloner et al., 2018; Stockwell et al., 2018; Vallance et al., 2016). The acceptance of non-abstinent recovery goals among addiction health professionals in treatment settings has become more popular since the 1990’s (Rosenberg, Grant, & Davis, 2020). These non-abstinent recovery goals typically have two components: 1) reduced quantity or frequency of use in comparison to the individual’s typical problematic level of use, and 2) fewer experiences with substance-related medical and life problems (Davis & Rosenberg, 2013; Rosenberg, 1993). One review of the literature examining acceptance of non-abstinence as an outcome goal found that addiction professionals were more likely to accept non-abstinence goals among clients who seem less severely impaired by their use and among people whose treatment targeted substances are alcohol or marijuana (Rosenberg et al., 2020). Regarding personal meaning for people identifying as being in recovery, recovery may have multiple dimensions that do not include abstinence. Kaskutas et al. (2014)’s study of people who described themselves as being in recovery from alcohol and/or drugs found that the most frequently endorsed elements of recovery had no mention of abstinence, and instead focused on self-improvement, “working on oneself”, or being able to

enjoy life. “Abstinence in recovery” was the least endorsed element. In 2022, the National Institute on Alcohol Abuse and Alcoholism (NIAAA) created its own alcohol-specific definition in the context of alcohol use disorder (AUD) that emphasizes non-abstinent recovery outcomes like remission from AUD as diagnosed by DSM-5, cessation from heavy drinking, and biopsychosocial functioning (Hagman, Falk, Litten, & Koob, 2022). Thus, it is important to emphasize the changing definitions around recovery and recognize the diverse individual personal meanings that recovery may have from both a human, practical, and research perspective.

Types of SUD Treatment and Interventions: In-Patient Residential Treatment

Residential treatment programs offer substance use treatment with a primary feature of living in a treatment setting under the supervision of trained staff (National Institute on Drug Abuse, 2018). Residential treatment programs can have both short- and long-time spans. Long-term treatment programs typically last from 6 to 12 months and usually take place in a non-hospital setting. Short-term residential treatment programs typically last 3 to 6 weeks and usually take place in a hospital setting (National Institute on Drug Abuse, 2018). (National Institute on Drug Abuse, 2018). Residential treatment programs generally offer a variety of evidence-based treatment and intervention approaches commonly used in an outpatient setting like pharmacotherapies, counseling, and behavioral therapies (National Institute on Drug Abuse, 2018). Residential treatment programs generally offer a variety of evidence-based treatment and intervention approaches commonly used in an outpatient setting like pharmacotherapies, counseling, and behavioral therapies (National Institute on Drug Abuse, 2018). In terms of effectiveness, a large body of research has found that longer residential treatment periods are associated with longer post-treatment substance use abstinence times in comparison to shorter

residential treatment periods (Brunette, Mueser, & Drake, 2004; Conners, Grant, Crone, & Whiteside-Mansell, 2006; Reif et al., 2014; Shane, Jasiukaitis, & Green, 2003).

Short-Term Residential Treatment Programs

Most short-term residential treatment programs are based on a modified 12-step approach (originally developed to treat alcohol problems) as well as featuring a detoxification component (National Institute on Drug Abuse, 2018; Worley, 2021). Detoxification is a part of treatment designed to manage the uncomfortable and potentially dangerous psychological and physiological effects of drug and alcohol withdrawal (Worley, 2021). The expectation following 3 to 6-week residential treatment stay is extensive outpatient follow-up care and participation in peer support recovery groups like Alcoholics Anonymous (AA) and Narcotics Anonymous (NA) to reduce relapse risk after an individual leaves the residential setting.

Long-Term Residential Treatment Programs

Long-term residential programs generally follow a different treatment model from short-term residential programs called "therapeutic community" (TC) (Sacks, Banks, McKendrick, & Sacks, 2008). These long-term residential TC programs use their entire treatment program community (staff, residents, and a highly structured recovery social context) as active components of treatment to address an individual's social and psychological problems contributing to their SUD (National Institute on Drug Abuse, 2018; Sacks et al., 2008). TCs take a holistic approach to SUD treatment with activities designed to address residents' destructive patterns, beliefs, and social deficits (National Institute on Drug Abuse, 2018; Sacks et al., 2008). These long-term programs often offer support services onsite to address employment, mental health, family violence, and legal problems to holistically address social, emotional, and mental health problems common among people experiencing SUD (National Institute on Drug Abuse, 2018).

Types of SUD Treatment and Interventions: Counseling

Counseling for SUD focuses on addressing areas of poor social and emotional functioning like social relationships, employment, and criminal activity along with reducing or stopping drug and alcohol use (National Institute on Drug Abuse, 2018). Counselors work with clients to develop coping strategies and behavioral tools aimed at abstaining from substance use and reducing the risk of relapse (National Institute on Drug Abuse, 2018). Counselors can also make referrals for other needed or supplemental services like employment training and mental health treatment among people with co-occurring mental health issues. Counseling can come in both individual and group forms (National Institute on Drug Abuse, 2018). While both individual and group forms focus on developing strategies to reduce or stop substance use, group counseling uses peer discussion, social support, common experience, and therapeutic relationships as a method of social reinforcement to potentially enhance positive recovery outcomes (Jhanjee, 2014; National Institute on Drug Abuse, 2018). Counseling, like most other forms of treatment for SUD, is often provided in combination with other therapies like pharmacotherapy or residential treatment (National Institute on Drug Abuse, 2018).

Types of SUD Treatment and Interventions: Behavioral Therapies

A variety of behavioral therapies and interventions exist to help engage people in SUD treatment, provide incentives for continued engagement and/or abstinence, and teach coping skills to handle environmental cues and stresses that may trigger drug and alcohol cravings. Many of these therapies attempt to provide tools or motivational enhancements to reduce the risk of relapse. These include cognitive-behavioral therapy (CBT), contingency management (CM), and motivational enhancement therapy (MET). As with most interventions targeting SUD, these are typically delivered in combination with other SUD interventions and therapies like residential treatment, counseling, and pharmacotherapy (National Institute on Drug Abuse, 2018).

Cognitive-Behavioral Therapy (CBT)

CBT is based on the notion that most psychological disorders (like SUD) are rooted in dysfunctional thinking or learning processes that create maladaptive patterns of behavior (Beck & Beck, 2011). CBT has been used as an intervention to treat problems with alcohol, marijuana, cocaine, methamphetamine, and nicotine and involves the identification and correction of behaviors by anticipating problems and developing coping skills that enhance both self-control and self-monitoring (Beck & Beck, 2011; National Institute on Drug Abuse, 2018). Specific ways in which CBT affects these self-regulation behaviors include exploring the consequences (both positive and negative) of continued substance use, developing mindfulness and self-monitoring skills to recognize early signs of cravings, identify triggers, and impart learning strategies to cope with cravings and high-risk contexts (Jhanjee, 2014; National Institute on Drug Abuse, 2018).

Contingency Management (CM)

CM is a behavioral therapy where individuals are reinforced with tangible rewards for submitting evidence of behavior change. Rooted in classical behavior therapy, a desired behavior is performed and then immediately reinforced with some kind of reward or treat (Petry, 2006, 2011).The closer the reinforcement is to the desired behavior, the more likely this behavior will recur (Petry, 2011). In the context of treatment for SUD, this evidence of positive behavior change is usually negative urine drug screens, attending treatment sessions, or participation in or submission of other recovery-related behavior change (National Institute on Drug Abuse, 2018). CM interventions have been used to treat problems with alcohol, stimulants, opioids, marijuana, and nicotine (National Institute on Drug Abuse, 2018). These interventions generally involve monetary rewards, but other types of motivational vouchers like movie passes, food items, and

others consistent with recovery-related fun or behavior can also be given (National Institute on Drug Abuse, 2018; Petry, 2006). In some CM interventions, instead of set rewards or vouchers, chances at a monetary prize can be the reward. An example of this is drawings from a bowl or other lottery with a chance of winning a monetary prize usually between $1 and $100 (Petry, 2011). Rewards in CM feature two different reward or prize schedule: 1) a static schedule where individuals receive set rewards each time positive evidence of recovery-related behavior change is submitted and 2) an escalating schedule where successive submission of positive evidence of recovery-related behavior change results in escalating rewards (Petry, 2011). Despite the potential for effectiveness to treat SUD, CM is poorly utilized in the U.S. due to perceptions of high monetary cost. In fact, most U.S.-based SUD treatment providers are not likely to be aware of CM as an effective intervention to reduce substance use (Petry, 2006, 2011).

Motivational Enhancement Therapy (MET) and Motivational Interviewing

MET interventions have been used in the context of treatment for alcohol, opioids, marijuana, and nicotine (National Institute on Drug Abuse, 2018). Motivational interviewing techniques are often used in this form of therapy as a motivational intervention to reduce substance use (Jhanjee, 2014; National Institute on Drug Abuse, 2018). This serves to motivate people to stop using substances by identifying mixed and conflicting attitudes about substance use and strengthening reasons and intentions to change substance use behavior. Addiction professionals who use motivational interviewing utilize four general principles: 1) express empathy, 2) develop discrepancy, 3) roll with resistance, and 4) support self-efficacy (Fiore et al., 2008). First, the addiction professional expresses empathy and understanding with the individual. Second, the addiction professional helps the individual identify mixed and ambivalent attitudes to develop a discrepancy between feelings and behavior. Throughout the process, the

addiction professional should "roll with resistance" meaning that if the individual is not ready for change, the addiction professional will not use persuasion to convince the client as that is likely to push the client deeper into the behavior (Fiore et al., 2008; National Institute on Drug Abuse, 2018; Substance Abuse and Mental Health Services Administration, 2019). Finally, the addiction professional should support self-efficacy by promoting belief in the individual's ability to stop using substances or by focusing on past successes. When mixed or ambivalent feelings about substance use are uncovered, addiction professionals who practice motivational interviewing elicit and support change talk and commitment reasons among clients by addressing the "5 R's": relevance, risks, rewards, roadblocks, and repetition (Substance Abuse and Mental Health Services Administration, 2019). Relevance involves encouraging the individual to identify the personal relevance of quitting or reducing substance use. Risks involves the individual identifying negative consequences of substance use. Rewards involves the individual identifying the potential benefits of stopping or reducing substance use. Roadblocks involves the individual identifying potential barriers to stopping or reducing substance use. Finally, Repetition involves repeating the motivational interview intervention with unmotivated individuals and continuing to support motivated ones (Fiore et al., 2008; Substance Abuse and Mental Health Services Administration, 2019).

Types of SUD Treatment and Interventions: Pharmacotherapies

A variety of prescription medications are available for people experiencing SUD depending on the substance that the individual is dependent upon. Especially in the context of opioid and alcohol dependence, pharmacotherapy is often a treatment of first resort and is almost always combined with other counseling, behavioral, and/or residential treatments for SUD (National Institute on Drug Abuse, 2018).

Pharmacotherapies to Treat Opioid Dependence

For people who are dependent on opioids, methadone, buprenorphine, and naltrexone are available to ward off symptoms of withdrawal and to assist and individual to remain abstinent (National Institute on Drug Abuse, 2018). Methadone is a medication that can reduce cravings, help relieve withdrawal symptoms, and block the effects of other opioids (Brown, Kraus, Fleming, & Reddy, 2004; National Institute on Drug Abuse, 2018). It works as a long-acting opioid receptor agonist, binding to and activating mu-opioid receptors in the brain and blocking the up-take of other, potentially illicit opioids by those receptors (Brown et al., 2004). Buprenorphine is a medication with a similar mechanism of action to methadone and works by reducing opioid withdrawal symptoms (Lutfy & Cowan, 2004). As opioid receptor agonists, both methadone and buprenorphine have the potential to be abused or diverted and require monitoring by qualified prescribers (National Institute on Drug Abuse, 2018). Naltrexone is an opioid antagonist medication which works by binding tightly to mu-opioid receptors and outcompeting and blocking the up-take of other, illicit opioids that act as receptor agonists (Broglio & Matzo, 2018). Naltrexone is commonly used as an opioid reversal medication and an emergency treatment for opioid overdose but has applications among motivated individuals that wish to stop their opioid use (Comer, Sullivan, & Hulse, 2007; National Institute on Drug Abuse, 2018).

Pharmacotherapies to Treat Alcohol Dependence

For people who are dependent on alcohol, disulfiram, acamprosate, topiramate, and naltrexone are available as pharmacotherapies. Disulfiram is a medication that causes acetaldehyde to build up at large concentrations when a person drinks alcohol and leads to unpleasant effects like nausea, vomiting, heart palpitations, and flushing as a method of reinforcing alcohol abstinence among highly motivated individuals or individuals anticipating a

high-risk situation for returning to drinking. Acamprosate is a medication that can reduce unpleasant symptoms associated with alcohol withdrawal like insomnia, restlessness, and anxiety. It acts to renormalize gamma-aminobutyric acid (GABA) and glutamate neurotransmitter systems in people who are dependent on alcohol. Topiramate is a medication with a similar mechanism of action as acamprosate that is often used off-label to reduce withdrawal symptoms among people who are dependent on alcohol. Naltrexone is a medication that works to block the pleasurable, narcotic effects of alcohol via the same neurobiological mechanism as to its use among people dependent on opioid.

Peer Recovery Support Programs and Groups

Peer recovery support in the context of SUD and recovery is defined as non-clinical and non-professional support from individuals with similar alcohol or drug-related problems to facilitate long-term recovery (Tracy & Wallace, 2016). This support can come in the form of TC within residential treatment and sober living programs, 12-step programs like AA or NA, and other forms of community reinforcement like online peer support groups and individual peer recovery coaches (Tracy & Wallace, 2016). Peer recovery support is not a replacement for formal treatment approaches as non-professional peers often do not have the training or clinical expertise to effectively manage co-occurring psychiatric and conditions as well as navigate high-risk situations for relapse (Tracy & Wallace, 2016). Instead, peer recovery programs and groups fulfill a critical role as an addition to formal treatment promoting long-term recovery as part of a sustained recovery management approach within the treatment continuum for people with a SUD (Tracy & Wallace, 2016). Peer support groups and programs serve to reduce substance use and relapse rates, increase engagement and reduce recidivism in formal treatment settings, reduce HIV risk behaviors among people who use injection drugs, and assist in community reintegration

among people who were recently imprisoned related to substance using behaviors (Boisvert, Martin, Grosek, & Clarie, 2008; Tracy, Burton, Nich, & Rounsaville, 2011; Tracy & Wallace, 2016).

Harm Reduction as an Integral Part of SUD Treatment

In 2021, the U.S. Department of Health and Human Services (HHS) announced a new $30 million Overdose Prevention Strategy codifying harm reduction as part of the continuum of care for people experiencing SUD and prioritizing advancement in research on innovative approaches to harm reduction (U.S. Department of Health and Human Services, 2021). Harm reduction is defined by the Substance Abuse and Mental Health Services Administration (SAMHSA) as "a proactive and evidence-based approach to reduce the negative personal and public health impacts of behavior associated with alcohol and other substance use at both the individual and community levels" (Substance Abuse and Mental Health Services Administration, 2022). Currently accepted harm reduction strategies by SAMHSA and HHS at the individual level include targeted overdose education, opioid reversal medication, and fentanyl test strip distribution to people at risk of an overdose as well as needle exchanges for people who use intravenous drugs (Substance Abuse and Mental Health Services Administration, 2022; U.S. Department of Health and Human Services, 2021). Strategies at the community level include Good Samaritan & Reduced Liability laws along with overdose bystander education (Substance Abuse and Mental Health Services Administration, 2022). Other harm reduction strategies like safe injection sites and drug substitution (purposefully using another drug that may cause less harm than a preferred drug) are less widely accepted by policymakers but nevertheless remains in practice by people with a SUD (Blanken, Hendriks, van Ree, & van den Brink, 2010; Kerr, Small, Moore, & Wood, 2007; Lucas et al., 2013; Valleriani et al., 2020).

Marijuana Use as a Predictor of Relapse

Using marijuana may be a predictor of poor substance use outcomes and relapse among people in treatment for SUD. The use of multiple substances in general is a predictor of poor substance use outcomes, and marijuana use is common among people experiencing SUD with 50-70% of people using marijuana in addition to other drugs or alcohol (Connor, Gullo, White, & Kelly, 2014; M. Mojarrad et al., 2014; Rosic et al., 2021; Tzilos et al., 2014). Like other narcotic substances, marijuana has reinforcing and rewarding properties that may play a role in relapse through activation of the dopaminergic mesolimbic system implicated in the neurobiological disease model of addiction (Bossong et al., 2015). Delta-9-tetrahydrocannabinol (Δ-9-THC), the main psychoactive chemical in marijuana, has been shown to have similar dopaminergic activation and rewarding properties as alcohol, stimulants, and opioids (Bossong et al., 2015). This could induce the same narcotic cues associated with continued drug-seeking behavior and compulsive substance use, increasing the risk of relapse to other substances the individual may be in treatment for, trying to reduce use of, or attempting to abstain from. Some research has investigated this relationship between marijuana use among people in treatment for SUD and relapse risk. Aharonovich et al. (2005)'s study of post-discharge marijuana use among 250 residential SUD treatment patients found that marijuana use was five times as likely among people who had returned to use of alcohol, heroin, and/or cocaine. Subbaraman, Metrik, Patterson, and Swift (2017)'s study of treatment outcomes among people (n=1,383) who did and did not use marijuana during the treatment for AUD as part of the COMBINE study (a randomized control trial of combination behavioral and pharmacological treatments for AUD) found that people who used marijuana were more than twice as likely to be non-abstinent from alcohol throughout the course of treatment and on average had almost 20 fewer alcohol abstinent

days at one-year follow-up. Another study examining people after completion of residential treatment for alcohol and/or other substance use (n=563) found that marijuana use was associated with a 27% reduction in odds of abstinence from heavy alcohol use and other substance use six-months post-treatment discharge (M. Mojarrad et al., 2014). Despite these findings, there is some popular perception among clinicians and people in treatment for SUD that marijuana use is inconsequential and perhaps even beneficial for people in treatment for SUD as marijuana use becomes more widespread and negative perceptions of harm due to marijuana use become less impactful. Much of this perception is due to the notion that people who use substances perceived to be more harmful than marijuana (like alcohol, cocaine and other stimulants, and opioids) may be likely to substitute their use of these substances for marijuana (Adinoff & Cooper, 2019; Humphreys & Saitz, 2019; Mikuriya, 2004; Valleriani et al., 2020). But the evidence for this substitution effect is sparse and of methodologically poor quality, often subject to contradictory findings upon secondary analysis, having short follow-up periods, or small sample sizes (Humphreys & Saitz, 2019; Shover et al., 2019). With the presence of conflicting evidence and opinions as to the harm, utility, or inconsequence of marijuana use among people in treatment for SUD, there is a need to examine marijuana use in this population using innovative methods that can capture the complexities of substance use and relapse and its relationship to marijuana use.

Conceptual Framework

The conceptual framework for this study is Marlatt and Gordon's Relapse Prevention (RP) Model. Originally developed as an extension of traditional behavioral approaches to treat SUD, the RP model seeks to provide a social-cognitive explanation for relapse along with identifying social-cognitive skills and coping strategies to prevent relapse (Marlatt & Donovan,

2005). RP postulates that a variety of tonic, relatively stable or slowly changing background and rapidly fluctuating transient factors centered on high-risk situations interact to determine the vulnerability and severity of return to a behavior that the individual is working to change (i.e., compulsive substance using and seeking behavior) (Hendershot et al., 2011). Tonic factors include distal risks like previous history, dependence, and exposures. Transient factors include affective state, coping behavior, and relapse/prolapse behavior. Relapse in the RP Model is described as an on-going, dynamic process that is understood as a setback that occurs during the behavior change process towards which progress towards a behavior change goal is disrupted (Hendershot et al., 2011). RP works by emphasizing contextual factors and their interaction with social-cognitive domains and background risks as antecedents to relapse (Hendershot et al., 2011).

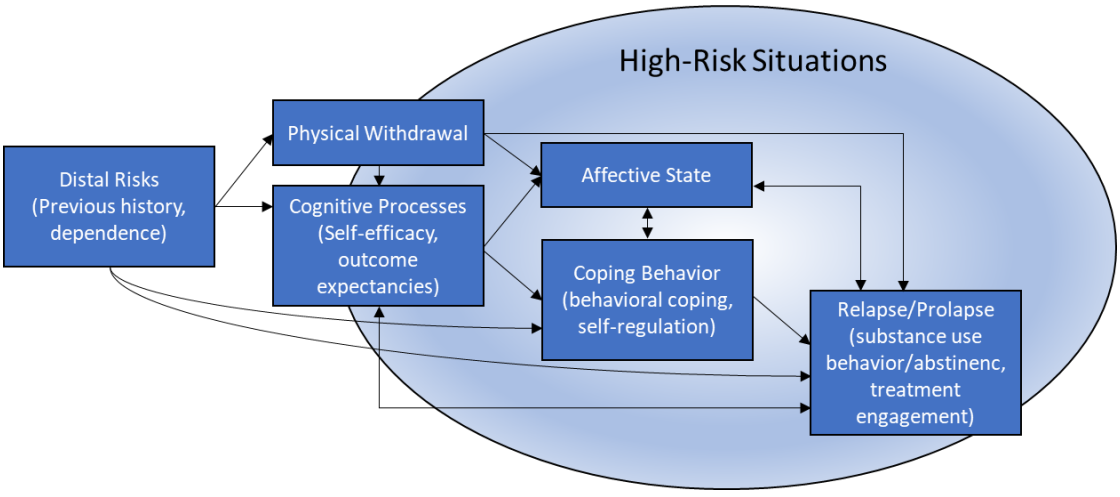

Figure 2.1: Marlatt and Gordon's Relapse Prevention Model

Understanding Relapse in the RP Model

The RP model provides a unique understanding of relapse as an on-going, commonly-experienced process among people attempting to change a problem behavior like substance use (Hendershot et al., 2011). Rather than being an endpoint or dichotomous treatment outcome, relapse in the RP model is a dynamic, fluctuating, and rapidly evolving process that begins before and extends beyond the initial return to a behavior an individual is working to change (Hendershot et al., 2011). An initial return to a behavior after a period of abstention (a lapse) is not the end of the road of the recovery process but is instead a bifurcation between relapse and prolapse (Hendershot et al., 2011; Marlatt & Donovan, 2005). Prolapse is when the target behavior is corrected following a lapse and a desired behavior reinstated and reconstituted (Hendershot et al., 2011). The implication of this bifurcation is that, although lapses greatly increase the risk or relapse, a lapse can be viewed as short-term setbacks that presents a critical learning opportunity to remain on course towards recovery and develop coping skills to deal with a similar high-risk situation leading to the lapse in the future (Hendershot et al., 2011). In the RP Model, relapse is not treatment failure and is instead contributed mostly to contextual causes rather than internal ones, leading to a more optimistic and tolerant view of the relapse and recovery process (Hendershot et al., 2011). Relapse can instead be seen as the process towards abandonment of abstinence goals and behaviors that support abstinence goals but from which recovery can still be achieved.

High-Risk Situations and Transient Antecedents to Relapse

A high-risk situation is defined in the RP model as a context that makes an individual vulnerable to engage in a behavior they are attempting to change (Hendershot et al., 2011; Marlatt & Donovan, 2005). High-risk contexts and situations are transient and include emotional or affective states, environmental or cognitive cues and coping contingencies, and physiological

states like acute withdrawal (Hendershot et al., 2011; Marlatt & Donovan, 2005). Although the effect of a high-risk situation or context and its contribution to relapse risk vary over time and by individual, these contexts frequently serve as immediate antecedents to relapse (Hendershot et al., 2011). Emotional and affective states like anxiety, depression, anger, and boredom are most closely associated with relapse in comparison to other transient situations, and intrapersonal perceptions of affective situations or reactions to environmental events generally cause these high-risk emotional states (Marlatt & Donovan, 2005). Environmental and cognitive cues include conditioned drug cues that can serve to trigger cravings and lead to relapse. These generally have properties of conditioned reinforcement, incentive motivation, and discriminative control which serve to facilitate return to a behavior like compulsive substance use and seeking (Hendershot et al., 2011; Perry, Zbukvic, Kim, & Lawrence, 2014). Physiological states include processes like withdrawal and pain experience (Hendershot et al., 2011). Physiological experiences like withdrawal from a variety of substances and pain can be acutely alleviated by a return to the behavior like substance use and place individuals at high risk of relapse (Becker, 2008; Budney, Vandrey, Hughes, Thostenson, & Bursac, 2008; Hendershot et al., 2011; Jakubczyk et al., 2016). Whether these high-risk situations end in a lapse or further into a relapse depends on the individual's coping response as a contingent strategy to manage a high-risk situation and self-efficacy to enact a successful coping strategy (Hendershot et al., 2011; Marlatt & Donovan, 2005). Navigating these high-risk situations serve to enhance self-efficacy and decrease the risk of lapses and relapse in the face of future, similar high-risk situations (Hendershot et al., 2011).

Distal Risks to Relapse

The strength of these proximal, transient risk factors varies depending on distal risk factors. Distal risks include stable background factors like previous family or trauma history, social and

family support, and specific substance dependence that determine initial susceptibility to relapse (Hendershot et al., 2011). These risks are often tonic, stable, or otherwise unchanging as they are due to previous exposure as a part of personal history, previous experience, or even biological or genetic risk (Hendershot et al., 2011). Thus, these distal risks often determine *who* is at risk of relapse while the previously described transient risks determine *when* an individual is at risk of relapse (Hendershot et al., 2011). Of key importance to the RP Model is the complex interplay between these transient and distal risks for relapse and how distal risks serve to modulate the transient risk of high-risk situations and contexts (Hendershot et al., 2011; Marlatt & Donovan, 2005).

CHAPTER 3

Marijuana Use Among People in Treatment for Substance Use: Associations with Treatment/Recovery Support Attendance, Alcohol Use, Crack/Cocaine Use, and Opioid Use in a 90-Day Daily Diary Study[1]

[1]Warnock, C. A., Kershaw, T., & Muilenburg, J. L. To be submitted to *Journal of Substance Use and Addiction Treatment*

Abstract

Introduction: People in treatment for substance use challenges are likely to persistently use marijuana throughout treatment. An understanding of how this persistence relates to treatment and other substance use outcomes is needed.

Methods: Using data from participants recruited at a dual site study situated in Georgia and Connecticut, this 90-day daily diary study examines the prevalence of marijuana use among people in treatment to address substance use challenges and assesses the concurrent (*t*, same day) and prospective (*t* +1, next day) within-subject and between-subject associations between persistent marijuana use during treatment and formal treatment/recovery support attendance, alcohol use, crack/cocaine use, and opioid use.

Results: We found that a quarter of participants used marijuana during the 90-day study period. More than a third of participants who used marijuana during the 90-day period used it on more than 10 days. At the within-subjects level, using marijuana on a certain day was associated with using alcohol that same day (concurrently). At the between-subjects level, using marijuana was associated with more alcohol use and more crack/cocaine use across days. Marijuana use was not associated with formal treatment/recovery support attendance or opioid use both concurrently and prospectively.

Conclusions: As marijuana becomes more ubiquitous in U.S. culture and perceptions of marijuana as harmless become more widespread, more people in treatment for substance use challenges are likely to use marijuana. This requires more research investigating the effects of persistent marijuana use on treatment outcomes as well as interventional efforts to address persistent marijuana use among people in treatment for substance use challenges.

Introduction

There were nearly two million admissions to Federal and State-funded treatment centers to address substance use challenges in 2019 (Substance Abuse and Mental Health Services Administration, 2020c). Critical to recovery from substance use disorder (SUD) and long-term sobriety is sustained engagement and participation in treatment (National Institute on Drug Abuse, 2018). Although any participation at all is associated with positive substance use outcomes, consistent and sustained engagement in effective treatment programs increases the likelihood of long-term sobriety and recovery (National Institute on Drug Abuse, 2018; Prendergast et al., 2002). Treatment for SUD is also associated with a multitude of other positive effects in addition to primary substance use outcomes like improved quality of life, decreased illegal activity and criminal behavior, and increased likelihood of employment (Gottfredson et al., 2008; Pasareanu et al., 2015; Sahker et al., 2019). However, significant barriers to sustained treatment engagement exist for people with substance use challenges. People in treatment must cope with a range of personal and environmental contributors to substance use like co-morbid mental health problems, environmental exposure to alcohol and other drugs, and personal relationships with substance using others (Ellis et al., 2004; Harris & Edlund, 2005; Kingston et al., 2017). These barriers are so great that about half of all people who enter treatment for alcohol or other substances relapse and disengage from treatment within the first 90-days of treatment entry (McKay, 2017; McKay & Weiss, 2001; Moore et al., 2014).

From 2002 to 2019, the prevalence of marijuana use within the past-year among U.S. adults increased from 10.4% to 18.0% and daily use increased from 1.3% to 3.9% (Substance Abuse and Mental Health Services Administration, 2020a). Although the prevalence of marijuana use in the general population of the U.S. has increased in conjunction with more

permissive attitudes and state-level legalization efforts, the proportion of SUD treatment admissions for marijuana use primarily fell 38% between 2009 and 2019 from 18.2% (372,418 people) to 11.2% (208,843 people) of all admissions (Substance Abuse and Mental Health Services Administration, 2020c). This reduction in treatment admissions for marijuana as the primary drug of use has not been accompanied by a reduction in treatment admissions indicating marijuana as a secondary or tertiary drug of use (Substance Abuse and Mental Health Services Administration, 2020c). Some research indicates that the proportion of people with a SUD that use marijuana in addition to other drugs may be as large as 50-70% in the U.S. and Canada (Mohammadali Mojarrad, Jeffrey H. Samet, Debbie M. Cheng, Michael R. Winter, & Richard Saitz, 2014; Rosic et al., 2021; Tzilos et al., 2014). Among people with an AUD or SUD and who also use marijuana, marijuana use is likely to persist during the early phases of treatment. (Hermann et al., 2005; Scavone et al., 2013). Some reasons commonly given for this persistence include to subjectively ease withdrawal symptoms due to the cessation of opioids or as a substitute in place of drugs with greater harm potential (Bergeria et al., 2020; Lau et al., 2015).

However, the effects of persistent marijuana use on treatment outcomes remains under investigation. Research examining marijuana use in the context of concurrent SUD treatment has found poor treatment outcomes like increased rates of premature treatment dropout, persistent injection drug use, and relapse among opioid-dependent patients (Budney et al., 1998; Franklyn et al., 2017; Wasserman et al., 1998). Some research has examined marijuana use and other substance use outcomes post-discharge. Aharonovich et al. (2005)'s study of post-discharge marijuana use among 250 residential SUD treatment patients found that patients who used marijuana were five times more likely to return to alcohol, heroin, and/or crack/cocaine use than patients who did not use marijuana. Another study examining 563 patients after completion of

residential treatment for alcohol and/or other substance use found that marijuana use was associated with a 27% reduction in odds of remaining abstinence from heavy alcohol use and other substance use six-months post-treatment (M. Mojarrad et al., 2014).

Despite these findings, there is some popular perception among clinicians and people in treatment that marijuana use is inconsequential and perhaps even beneficial to use among people in treatment for SUD as marijuana use becomes more widespread and negative perceptions of harm due to marijuana use have become less impactful. Much of this perception is due to the notion that people who use substances perceived to be more harmful than marijuana (like alcohol, cocaine and other stimulants, and opioids) may be likely to substitute their use of these substances for marijuana (Adinoff & Cooper, 2019; Humphreys & Saitz, 2019; Mikuriya, 2004; Valleriani et al., 2020). But the evidence for this substitution effect is sparse and of methodologically poor quality, often subject to contradictory findings upon secondary analysis, having short follow-up periods, or small sample sizes (Humphreys & Saitz, 2019; Shover et al., 2019).

To date, much of this research examining marijuana use among people in treatment for substance use challenges has focused solely on opioid-dependent patients in medication-assisted treatment programs, been conducted in Canada where marijuana has been legalized on a national-level since 2018, occurred prior to the successes of the marijuana legalization/decriminalization movement in the U.S, or is methodologically questionable (McBrien et al., 2019). With the presence of conflicting evidence and opinions as to the harm, utility, or inconsequence of marijuana use among people in treatment for SUD, there is a need to examine marijuana use in this population using innovative methods like ecological momentary assessment that can capture the complexities of substance use and relapse and its relationship to

marijuana use. Ecological momentary assessment and daily dairy methods allow for the capture of data repeatedly and closer to when a particular behavior occurs in comparison to other retrospective methodologies. Many past studies have examined marijuana use in adults (Buckner et al., 2015; Johnson, Barrault, Nadeau, & Swendsen, 2009; K. T. Phillips, Phillips, Lalonde, & Prince, 2018; M. M. Phillips, Phillips, Lalonde, & Dykema, 2014). However, no studies examined these behaviors using these methods among people in treatment for substance use challenges. Capturing data repeatedly allows for the investigation of both with-in subject associations (differences in marijuana use and outcomes over time within an individual) and between-subject associations (differences in marijuana use and outcomes between individuals). By examining both levels of variability (within and between), a better understanding may be developed of how daily marijuana use may contribute to treatment and recovery behaviors over time as well as how individual marijuana use influences these behaviors across individuals. This approach accounts for the complex interplay between marijuana use and recovery/substance use behaviors, which may be influenced by individual and daily patterns of use. By parsing this variability between the within- and between-subject levels, we can gain a more comprehensive understanding of how marijuana use contributes to other recovery and substance use behaviors.

Thus, the aims of this research was 1) Assess the extent to which people in treatment for substance use are using marijuana; 2) Examine the between-subject effects of marijuana use on formal treatment/recovery support attendance, alcohol use, crack/cocaine use, and opioid use; and 3) Examine the concurrent (same day, *t*) and prospective (next day, *t* +1) within-subject effects of marijuana use on formal treatment/recovery support attendance, alcohol use, crack/cocaine use, and opioid use.

Methods

Procedure

This research was part of a larger project focusing on relapse in the context of health behaviors, social networks, and geographic settings among people entering treatment for substance use challenges over a period of six months. Participants in this study were recruited using a mix of both purposive and snowball sampling in Georgia and Connecticut. Potential participants were approached at treatment centers by research staff. Enrolled participants were asked to optionally refer people they were acquainted with that were also in treatment for substance use challenges and may be interested in participating in the study. The eligibility criteria for this larger study included: 1) at least 18 years old; 2) entered some form of formal treatment or counseling for substance use in the past 12 months; 3) reported drinking alcohol in the past 12 months; and 4) owned a smartphone. Potential participants took a brief, online screener to determine eligibility. Those who met the eligibility criteria were then contacted by a research team member to complete the consent process and enroll in the study. All enrolled participants in this larger study completed a baseline data collection interview followed by two follow-up data collection tele-interviews spaced regularly. The baseline data collection visit collected demographic information from participants as well as data about physical and psychological health and substance use behaviors. Participants also completed daily surveys via a mobile app throughout their participation in the study. These mobile app daily surveys asked questions about 1) health behaviors, 2) substance use, and 3) treatment/meeting attendance the previous day. Data collection for this research took place from January 2020 to November 2022.

The mobile app daily and location-triggered surveys were delivered in 3 30-day periods (months 1, 2, and 3). Participants could earn up to $190 for completing all parts of the study, $40

for baseline data collection visit and $150 for completion of the mobile app surveys. Participants were compensated $30 for each 30-day period they completed mobile-app surveys. Participants that completed 15 to 21 mobile app surveys within the 30-day period received a $10 bonus, and participants that completed 22 or more mobile app surveys received a $20 bonus.

This research utilizes demographic information collected in the baseline interview as well as the first 90 days of daily surveys in order to avoid inconsistency in participation timelines due to these ad hoc changes as well as to understand early treatment experiences among participants. The daily survey portion of this study included 90 daily surveys delivered via mobile app and participants had the opportunity to complete each between the hours of 7:00AM and 11:59PM EST each day. Participants could not complete a daily survey after 11:59PM each day when the survey window closed. Participants were sent regular reminder text messages and emails to complete daily surveys. Each survey took around five minutes to complete. Participants completed an average of 74.5% of the daily surveys during the 90-day study period. Participants who did not complete a baseline interview collecting demographic information were not included in this analysis. This research was reviewed and approved by the Institutional Review Board at both the University of Georgia and Yale University.

Participants

The analytic sample (N = 188) was recruited from two sites in Georgia (43.6%) and Connecticut (56.4%). The majority of the sample identified as White (65.4%) and about half of the sample identified as male (50.5%). Participants predominately identified as straight/heterosexual (78.7%) with a smaller proportion of participants identifying as bisexual (10.6%) or gay/lesbian (7.4%). Slightly less than half (44.6%) of participants identified as

housing insecure. The average age was 40.6 years old (*SD* = 10.1 years). See **Table 3.1** for more information about the sample's demographics.

Measures

Formal treatment and recovery support meeting attendance, marijuana use, opioid use, cocaine use, and alcohol use were assessed using mobile app daily surveys delivered daily across 90 successive days. Participants were asked about their substance use since their last mobile app daily survey. Demographic and trauma history covariates were collected at the baseline data collection interview at study enrollment.

Marijuana, Opioid/Opiate, and Cocaine Use. Marijuana, opioid, and cocaine use was assessed using one item. Participants were asked "Since your last survey, did you use any of the following substances? Select all that apply." Participants could then select from a list of substances they may had or had not used since their previous daily survey. Marijuana was listed as "Marijuana (smoked, edible, or vaped)", cocaine was listed as "Cocaine/crack", and opioids/opiates were listed as both "Heroin (smack, dope, dragon, etc)" and "Opioids/prescription pain medication (codeine, oxycodone, morphine, methadone, fentanyl, Vicodin, etc.)". Heroin and opioids/prescription pain medication were combined to create one opioid/opiate use variable. For each of these three substance use variables, we created separate daily use variables representing use across each of the 90 days. Participants who reported "Yes" to using each substance for each day were coded as a 1 on that respective daily substance use variable across each of the 90 days. Participants who did not report using each substance for each day were coded as a 0.

Alcohol Use. Alcohol use was assessed using one item. Participants were asked "Since your last survey, did you drink any alcohol?". Participants could then select "Yes" or "No". Like

the marijuana, opioid/opiate/ and cocaine use variables, we created a separate variable representing alcohol use across each of day the 90 days. Participants who reported "Yes" to using alcohol each day were coded as a 1 while "No" was coded as a 0.

Formal Treatment and Meeting Attendance. Formal treatment and meeting attendance was assessed with one item. Participants were asked "Did you attend any of the following yesterday? Select all that apply." Participants could then select from a list of options including "AA/NA", "Formal treatment", and "Therapy Outside of Treatment Facility". Formal treatment attendance, AA/NA meeting attendance, and other therapy outside of the facility were then transformed into one variable, formal treatment/recovery support attendance days. Like the previous variables, we created separate variables representing formal treatment/recovery support attendance on each day across each of the 90 days. Participants who reported "Yes" to attending to any of formal treatment, AANA, and other therapy each day were coded as a 1 while all others were coded as a 0 each day

Demographic and Trauma History Covariates. Covariates known to be associated with both marijuana use and relapse including age, gender, housing status, past trauma history, and legal/mandated treatment requirement were collected at the baseline data collection tele-interview (Farley, Golding, Young, Mulligan, & Minkoff, 2004; Kevorkian et al., 2015; Pan et al., 2020; Walitzer & Dearing, 2006). Gender was assessed with a single item asking participants "How would you describe your gender?" Participants who identified as male were coded as a 1 while all other participants were coded as a 0. Housing status was assessed with a single item "Do you currently have your own place to live or sleep?" from which participants could then select "Yes" or "No." Participants who selected "No" were coded as a 1, and participants who selected "Yes" were coded as a 0. Past trauma history was assessed using the Brief Trauma

Questionnaire (BTQ). The BTQ is a 10-item questionnaire that assesses exposure to traumatic events or situations where the respondent may have felt their life was in danger (Schnurr, Vielhauer, & Weathers, 1999)

Results

A total of 12,605 daily surveys were completed by the 188 participants. The mean completion rate was 74.5%. Individual completion rates varied from 2.2% to 100%. Marijuana use was reported on 4.8% of total survey days across the sample, with 23% of the variability in using marijuana occurring at the between-subject level. Among the participants, 25.0% reported using marijuana at least once during the 90-day study period. The majority of participants who indicated marijuana use reported using marijuana 1 to 10 times during the study period (65.9%), the rest (34.1%) indicated using marijuana 11 to 90 times during the study period. The range for marijuana use days across participants during the 90 day study period was between 0 and 90 days. ICCs for formal treatment/recovery support days, alcohol use days, crack/cocaine use days, and opioid use days ranged from .10 to .60 meaning that 10% to 60% of the variance for these variables was due to differences between persons. Intraclass correlations (ICCs), means, and standard deviations for the primary study variables are presented in **Table 3.2.**

Associations With Marijuana Use and Formal Treatment/Recovery Support, Alcohol Use, Crack/Cocaine Use, and Opioid Use.

We examined the concurrent (*t*, same day) and prospective (*t* +1, next day) within-subject effects of using marijuana and formal treatment/recovery support attendance, alcohol use, crack/cocaine use, and opioid use among people in treatment to address substance use challenges. *Betas and confidence intervals for significant results in the text are adjusted from log odds presented in* ***Table 3.3*** *to exponentiated, standard odds to ease interpretation*. At the

within-subject level, using marijuana was associated only with alcohol use. Specifically, on days when participants used marijuana, they were 7.53 times (95% CI [2.46, 90.0], $p = .015$) more likely to also report using alcohol than on days when they did not use marijuana. The within-subject associations with crack/cocaine and opioid use were marginal (See **Table 3.3**). For formal treatment/recovery support, using marijuana was not associated with the likelihood of attending formal treatment or recovery support the same day. None of the prospective associations were significant meaning that using marijuana was not associated with next day ($t + 1$) formal treatment/recovery support attendance, alcohol use, crack/cocaine use, or opioid use. At the between-subject level, using marijuana over the course of the study period was associated with a 5.70 time (95% CI [2.86, 11.24], $p < .001$) increased likelihood of using alcohol and 10.80 time (95% CI [4.75, 24.53], $p = .015$) increased likelihood of using crack/cocaine across the 90 days.

Discussion

This study examined the relationship between marijuana use and formal treatment/recovery support attendance, alcohol use, crack/cocaine use, and opioid use among people in treatment to address substance use challenges using a 90-day daily diary study framework. Among the 188 participants, 25.0% reported using marijuana at some point during the study period. A large proportion of participants (34.1%) used marijuana on more than 10 days across the 90-day daily diary period. These findings support prior research showing that the use of marijuana is likely to persist during treatment (Hermann et al., 2005; Scavone et al., 2013). This research also suggests that a large portion of people in treatment may use marijuana frequently.

This study's within-subject analyses showed that using marijuana on a given day was associated with a higher likelihood of using alcohol on that given day. However, the associations between marijuana use on a given day and the likelihood of using crack/cocaine and opioids on that day were marginal but ultimately not significant. These findings around alcohol use are consistent with the previous literature showing that people in treatment for substance use challenges who use marijuana are more likely to also use alcohol in comparison to people in treatment who do not use marijuana (Aharonovich et al., 2005; Budney et al., 1998; M. Mojarrad et al., 2014). However, the insignificant association between marijuana and crack/cocaine and opioid use contrasts with previous literature showing a positive relationship between persistent marijuana use during treatment and the use of these substances (Aharonovich et al., 2005; M. Mojarrad et al., 2014). This could be due to methodological differences between these studies and the present research. Many of these studies group categories of substance use together rather than examine them separately. For example in M. Mojarrad et al. (2014)'s study, the use of opioids, crack/cocaine, and other substances were grouped into one variable indicating "abstinence" or "non-abstinence" from all of these substances as a whole whereas in this research, alcohol, crack/cocaine, and opioids were categorized and considered separately. This suggests that there may be some differences in the effects of marijuana use on different sub-populations of people who use or prefer different kinds of substances and may indeed be inconsequential for sub-groups of people who prefer crack/cocaine or opioids. However, due to the marginal nature of the significance tests associated with crack/cocaine ($p = .061$) and opioid use ($p = .058$) variables in the multi-level model, caution is advised when interpreting and extrapolating these results to sub-populations of people in treatment for substance use challenges with a preference towards crack/cocaine and opioids. This caution should only be heightened by

the fact that between-subjects analyses found marijuana use to be significantly related to more alcohol use and crack/cocaine use across days. The between-subjects analysis examining marijuana use and opioid use was similarly marginal (p = .080). More research is needed to understand the effects of marijuana use on substance use outcomes among people who use or prefer different types of substances to understand if marijuana is truly inconsequential in relation to separate substance use outcomes.

This research also examined the within-subject and between-subject effects of using marijuana on a given day and attending formal treatment or recovery support on that day and found no association. These results around treatment and recovery support attendance contrast with previous research finding marijuana to be associated with disengagement (Budney et al., 1998). However, it is important to note that many of these studies occurred prior to major state-level successes in the marijuana decriminalization and legalization movement. Treatment provider and staff attitudes towards marijuana may have changed in recent years as the perception of marijuana as a medicinal or inconsequential substance has become more widespread (Keyes et al., 2016; McGinty et al., 2016). More positive provider perceptions towards marijuana have been found in other medical and healthcare provider fields (Holland et al., 2016; Wildberger & Katz, 2019). It is possible that similar shifts towards positive attitudes and perceptions exist among substance use treatment providers. Evolving provider attitudes and changing legal status in the U.S. around marijuana may have led to fewer opportunities for marijuana use and possession to lead to negative consequences like administrative discharge and incarceration, both known factors highly related to treatment disengagement (I. L. Williams, 2016).

This is the first study to these authors' knowledge that examined marijuana use and prospective (*t* +1) formal treatment/recovery support attendance, alcohol use, crack/cocaine use, and opioid use among people in treatment to address substance use challenges. None of these prospective associations were significant. This suggests that using marijuana on a given day does not influence formal treatment/recovery support attendance, alcohol use, crack/cocaine use, or opioid use on the next day. This lends credence to the notion that marijuana may not be associated with escalating substance use among people in treatment to address substance use challenges. However more research is needed to examine substance using trajectories among people in treatment for substance use and how marijuana use affects these trajectories.

Limitations

These findings must be interpreted with several limitations. First, the sample was self-selected. People who may have not agreed to participate in this research may have differed from people who did agree to participate in this research. It is also important to note that this research was presented to participants in formal treatment settings and may have been interpreted by participants as treatment-affirming. This may have biased the sample towards participants who are very serious and motivated to participate in treatment. On average, participants in this study reported high treatment/recovery support attendance rates which may have affected our study's findings. Similarly, a large proportion of participants were recruited using a snowball sampling method which allowed participants to refer their peers to participate in this research. People in treatment for substance use challenges often develop support networks of similarly sobriety minded peers (Shalaby & Agyapong, 2020). This could have led to the sample being largely participants highly motivated to engage in treatment and recovery support as well as maintain abstinence from alcohol and other substances. second, the daily surveys used in this research

asked participants about treatment attendance on the previous day and substance use "since your previous daily survey" potentially affecting the accuracy of reports of participant substance use. Fourth, this daily diary survey only examined a 90-day period. As treatment engagement, recovery, and relapse are processes that occur over a long period of time, long-term longitudinal methods are needed to examine the effects of marijuana use over a longer period of time.

Conclusions

In sum, the results of this research significantly extend the literature and understanding of day-to-day marijuana use and its association with formal treatment/recovery support attendance, alcohol use, crack/cocaine use, and opioid use among people in treatment to address substance use challenges. Our results indicate that on days when people use marijuana, they are likely to use alcohol on the same day. However, no significant association between day-to-day marijuana use and concurrent and prospective formal treatment/recovery support attendance, crack/cocaine use, and opioid use were found. Future research should examine the longer-term implications of using marijuana during treatment to better understand its effects on recovery journeys among people experiencing substance use challenges.

Table 3.1 Demographic Characteristics of the Sample (N = 188)

	N (%)
Age [Mean (SD)]	40.6 (10.1)
Race	
White	123 (65.4%)
Black/African American	55 (29.2%)
Another Identity	10 (5.3%)
Ethnicity	
Hispanic/LatinX	14 (7.4%)
Not Hispanic/LatinX	174 (92.6%)
Gender	
Male	95 (50.5%)
Female	91 (48.4%)
Gender Queer/Another Identity	2 (1.1%)
Sexual orientation	
Straight/Heterosexual	148 (78.7%)
Bisexual	20 (10.6%)
Gay/Lesbian	14 (7.4%)
Another Sexual Preference	6 (3.2%)
Substances in treatment to address[a]	
Alcohol	165 (81.5%)
Opioids	85 (40.7%)
Crack/Cocaine	94 (59.2%)
Amphetamines	55 (44.4%)
Housing insecure	
Yes	83 (44.1%)
No	105 (55.9%)
Trauma history	
Yes	168 (89.4%
No	20 (10.6%)
Mandatory treatment requirement	
Yes	63 (33.5%)
No	125 (66.5%)

Note: [a]Participants could select more than one answer choice for the "substances in treatment to address" item.

Table 3.2 Descriptive Statistics

Variable	*Mean*	*SD*	ICC
Marijuana	.048	.213	.23
Alcohol	.074	.262	.29
Opioids	.054	.227	.29
Crack/Cocaine	.024	.153	.10
Recovery Support	.366	.482	.60

Note. ICC = intraclass correlation

Table 3.3 Concurrent and prospective associations between marijuana use, formal treatment/recovery support attendance, alcohol use, crack/cocaine use, and opioid use.

	Marijuana Use Occurrence					
	Within-Subject Concurrent		Within-Subject Prospective		Between-Subjects	
Outcome	*b* (95% CI)	*p*	*b* (95% CI)	*p*	*b* (95% CI)	*p*
Formal treatment/Recovery Support	0.01 (0.00, 0.02)	.987	0.12 (0.00, 100.21)	.770	0.146 (-0.26, 0.55)	.481
Alcohol use	**2.02 (0.90, 4.50)**	**.015**	0.84 (0.25, 2.86)	.110	**1.74 (1.05, 2.42)**	**<.001**
Crack/cocaine use	2.16 (0.76, 6.14)	.061	1.28 (0.26, 6.30)	.219	**2.38 (1.56, 3.20)**	**<.001**
Opioid use	3.18 (1.13, 8.94)	.058	0.97 (0.17, 5.60)	.265	1.06 (-0.13, 2.25)	.080

Note. All models were estimated controlling for age at baseline, gender identity, race/ethnicity, housing status, trauma experience, and mandatory treatment requirement. Unstandardized regression coefficients are reported. Betas and CI presented in log odds due to logit link in each model. Prospective indicates $t + 1$ days. Bold indicates effects significant at $p < .05$. $N = 188$

CHAPTER 4

"Sneaking and Geeking": Perceptions and Beliefs Around Marijuana Among People in Treatment for Substance Use[1]

[1]Warnock, C. A., Ondrusek, A., Kershaw, T., & Muilenburg, J. L. To be submitted to *Substance Use and Misuse*

Abstract

Background: Over the past few decades, marijuana has increasingly been perceived as a harmless or inconsequential substance. Among people in treatment for substance use challenges, a large proportion use marijuana and this marijuana use is likely to persist during treatment.

Objectives: This qualitative study examined experiences and perceptions relating to: 1) experiences with marijuana prior to treatment, 2) perceptions and experiences with marijuana during treatment, and 3) perceptions of marijuana's impact on treatment experience.

Methods: Qualitative tele-interviews were conducted with people in treatment for substance use challenges in Georgia and Connecticut (N = 27). The interviews were semi-structured, audio-recorded, transcribed verbatim, and deidentified.

Results: Three themes emerged related to using marijuana during treatment for substance use challenges: 1) marijuana was an important early contributor to substance use journeys, 2) marijuana as a potential beneficial medicine to treat co-occurring mental health problems as well as alcohol and opioid use disorder, and 3) anxiety related to persistent marijuana use due to fears of treatment and legal consequences.

Conclusions. Findings suggest that although participants believed that marijuana use may be related to return to other substance use, many people in treatment for substance use challenges have a complex set of beliefs and experiences around marijuana as a potential beneficial medicine to address co-occurring mental health concerns and to relieve symptoms of opioid and alcohol use disorder. However, these beliefs and experiences are often coupled with stigma and shame due to persistent marijuana use while identifying as *sober*, *in recovery*, or *in treatment.*

Introduction

Marijuana use is highly prevalent among people experiencing substance use challenges (Rosic et al., 2021; Tzilos et al., 2014). Despite this high prevalence, between 2009 and 2019 substance use disorder (SUD) treatment admissions to address marijuana primarily fell from 18.2% of treatment admissions to 11.2% of treatment admissions (Substance Abuse and Mental Health Services Administration, 2020c). However, this reduction in treatment admissions for marijuana as the primary substance of concern has not been accompanied by a reduction in treatment admissions indicating marijuana as a secondary or tertiary substance of choice (Substance Abuse and Mental Health Services Administration, 2020c).

Among people entering treatment for SUD who also use marijuana, the use of marijuana is likely to persist during the early phases of treatment (Hermann et al., 2005; Scavone et al., 2013). Research examining the effects of this persistent marijuana use during treatment for SUD has found poor substance use outcomes. Among people with opioid use disorder (OUD) persistent marijuana use is associated with increased risk of premature treatment dropout, persistent injection drug use, and relapse (Budney et al., 1998; Franklyn et al., 2017; Wasserman et al., 1998). Among people who have an alcohol use disorder (AUD), persistent marijuana use is associated with persistent alcohol use at three-year follow-up in comparison to people with an AUD who do not use marijuana (Weinberger et al., 2016). Subbaraman et al. (2017)'s study of treatment outcomes among people who did and did not use marijuana during the treatment for AUD found that people who used marijuana were more than twice as likely to be non-abstinent from alcohol throughout the course of treatment and on average had almost 20 fewer alcohol abstinent days at one-year follow-up. Another study examining people after completion of residential treatment for alcohol and other substance use found that marijuana use was associated with a 27% reduction in odds of abstinence from heavy alcohol use and other substance use six-months post-treatment discharge (M. Mojarrad et al., 2014).

Although marijuana may be related to poor substance use treatment outcomes, some popular perceptions among clinicians and people in treatment for SUD may be that marijuana use is inconsequential or perhaps even beneficial for people with a SUD. Much of this perception of marijuana as a beneficial substance is due to the notion that people who use substances perceived to be more harmful than marijuana (like alcohol, stimulants, and opioids) may be likely to substitute their use of these substances for marijuana (Adinoff & Cooper, 2019; Humphreys & Saitz, 2019; Mikuriya, 2004; Valleriani et al., 2020). Indeed some reasons commonly given by people in treatment for SUD for persistent marijuana use include to subjectively ease withdrawal symptoms or as a substitute in place of substances with greater perceived harm potential (Bergeria et al., 2020; Lau et al., 2015). But the evidence for this substitution effect and withdrawal symptom easement is sparse and of methodologically poor quality, often having short follow-up periods, small sample sizes, and subject to contradictory findings upon secondary analysis (Humphreys & Saitz, 2019; Shover et al., 2019).

As the perception and use of marijuana as a medicinal substance has become increasingly prevalent over the past few decades, people in treatment for SUD may similarly view marijuana as a beneficial substance to treat problems that often co-occur with or worsen symptoms of SUD like anxiety and depression. People who use marijuana recreationally and medicinally commonly point to marijuana as a substance that decreases anxiety and depression symptomology (Mercurio, Aston, Claborn, Waye, & Rosen, 2019; Osborn et al., 2015). However, many studies have found that Δ9-tetrahydrocannabinol-potent marijuana products like those found in the recreational market may actually increase the risk of developing or worsen depressive and anxiety disorders (Bahorik et al., 2017; Lev-Ran et al., 2014). Nevertheless, people with depression and anxiety issues often use marijuana to manage depressive and anxiety symptoms, and some research has found that the use of Δ9-tetrahydrocannabinol-potent marijuana products may indeed relieve these symptoms acutely in the general population (Martin et al., 2021; Sarvet

et al., 2018). A similar self-medication phenomenon is likely to exist among people in treatment for SUD who are likely to be co-managing mood disorders like anxiety and depression.

More research is needed to understand how people in treatment for SUD use and understand marijuana in relation to their treatment and recovery goals. There is a lack of research on how people in treatment for SUD perceive marijuana and how this perception relates to treatment outcomes. As marijuana becomes more prevalent in the general population and perceptions of harm around marijuana decrease, more people in treatment for SUD are likely to have positive attitudes and beliefs towards marijuana and its use. To understand how these attitudes affect treatment experience and treatment outcomes, it is imperative to understand this population's perspectives and experiences with marijuana during treatment. Thus, using qualitative methods, this study aimed to understand beliefs, perceptions and experiences with marijuana among people in treatment for SUD.

Methods

Participants and Setting

This research was part of a larger study (Project RENEW, R01AA025954) longitudinally examining relapse in the context of health behaviors, social networks, and geographic settings among people entering treatment with alcohol-related problems. Participants in this study were recruited using a mix of purposive and snowball sampling at substance use treatment centers in Connecticut and Georgia. Eligible participants in this larger study were: (1) 18 years old or older, (2) spoke English, (3) entered treatment for substance use within the previous 12 months, and (4) reported drinking alcohol during the previous 12 months. Participants in this larger study were offered the opportunity to participate in this research between May and November of 2022. Informed consent for this research was obtained as participants entered this larger study during which participants were informed about the opportunity to participate in additional recorded

interviews regarding their behaviors and experiences during treatment for substance use. Using marijuana while in treatment was not established as criteria for inclusion or exclusion in this research as people who may have not used marijuana since entering treatment are likely to have meaningful perspectives and experiences around marijuana during treatment.

Data Collection

Members of the research team conducted semi-structured tele-interviews using Zoom's audio recording feature. Only research team members and the participant were present for each tele-interview. Interviews lasted approximately 30 minutes with a range of 11 to 50 minutes and were conducted in English. The interview guide for this study was developed and pilot tested by the research team before data collection began. The guide was created using principles of grounded theory and sought to collect and understand perceptions and experiences with marijuana and how they impact an individual treatment and recovery journey. The interview guide included questions about experiences with marijuana both prior to and during treatment; marijuana use behaviors during treatment; perceptions of marijuana during treatment and its impact on treatment experience; and attitudes towards marijuana use during treatment. The interview guide is available as supplementary material (**See Appendix)**

Prior to the interview at entry to the larger study, participants completed a survey to assess demographic information, substance use behaviors (including marijuana), and substance use treatment type (outpatient/inpatient). Each participant received $40 debit card or equivalent Amazon gift card in compensation for participating in the interview. All research activities were approved by the Institutional Review Boards at Yale University and the University of Georgia.

Data Analysis

Interviewers were digitally recorded using Zoom's audio recording feature. Each interview was then transcribed using audio transcription software. Each transcript was then de-identified for confidentiality and reviewed for accuracy by the research team. Interview

transcripts were analyzed line-by-line using a constant comparative method and guided by grounded theory (Charmaz, 2002; Glaser, 1965). A two-person team consisting of CW and AO coded the transcripts collaboratively. A preliminary coding structure and qualitative codebook was created by CW based on interview questions and participant responses (Miles & Huberman, 1994; Glasser & Strauss, 1967). The codebook was edited and agreed upon by CW and AO in an iterative fashion until a final comprehensive codebook was created. The final codebook was then used to code each interview line-by-line individually and then collaboratively by CW and AO. First, CW and AO coded each transcript individually. The transcripts were then collaboratively and comparatively coded by CW and AO until 100% agreement was met. Nvivo qualitative data analysis software was used to facilitate qualitative data and code organization and retrieval. Codes were then compared across interview text data to yield salient themes. For quantitative survey data, descriptive statistics were calculated using R Version 4.2.2.

Positionality Statement

All members of the research team trained or were experienced in interviewing and qualitative research methodology. Author 1 is a White male who was a doctoral candidate at the time of the interviews. He has a previous history of working in the field of substance use. Author 2 is a White female who was a research assistant at the of conducting the interviews. She has extensive experience working on substance use and treatment research studies. Author 3 is a White male who was a Professor at the time of the interviews. He has worked on numerous projects related to substance use and treatment primarily related to HIV prevention. Author 4 is a White female who was a Professor at the time of the interviews. She has worked on a number of projects related to treatment experience among people in treatment for substance use problems. The authors were all employed or otherwise affiliated with academic institutions at the time of the interviews, and each brings their own understanding and experiences with marijuana and, substance use, substance use treatment, and sobriety.

Sample Characteristics

We conducted 27 interviews (16 in at the Georgia site and 11 at the Connecticut site). Among the 27 participants, most identified as White (70.4%) and Female (55.6%). The majority (71.4%) had previously been incarcerated at some point in their lives. Nearly half (48.1%) reported using marijuana in the previous three months.

Participants reported the substances that they were receiving treatment for by selecting from a list of substances. Participants were able to select more than one substance. On average, they selected three substances for which they were receiving treatment to address. Most participants (81.5%) were receiving treatment to address problems with alcohol. Slightly less than half (44.4%) were receiving treatment to address problems with amphetamines. More than half (59.2%) were receiving treatment to address problems with crack or cocaine, and 37.0% were receiving treatment to address problems with marijuana. Less than half (40.7%) were receiving treatment to address problems with opioids. **See Table 4.1.**

Results

Emergent Qualitative Themes

We identified and categorized experiences and perceptions of marijuana to identify emergent themes. Based on this identification and categorization, three major themes emerged: (1) marijuana was often perceived as an important contributor to individual substance use journeys especially early substance use initiation; (2) marijuana was commonly viewed as a medicinal substance that has the potential to improve mental health and manage cravings for other narcotic substances; and (3) participants expressed fear and anxiety related to marijuana due to the risk of consequences like administrative discharge from their treatment provider, problems with family and child services, and ongoing legal problems.

Theme 1: Marijuana as an important contributor to early substance use journeys

All the participants had used marijuana at some point in their lifetime. The majority had their first experience with marijuana as an adolescent teen or pre-teen. This first experience was usually a positive one that occurred with friends.

> Participant 22: *I would have been like 15 and it was a couple of friends. I haven't thought about that in a long time. I don't even know whose it was or how it even came about. But the main thing that I can remember is just us laughing nonstop and not being able to stop laughing… I guess it was kind of like, "Wow, that was fun." Because, like I said, all we did was just laugh for I don't even know how long.*

> Participant 19: *The first time I got really stoned, I was at my buddy's house in the basement… I got some from my sister because we wanted some. And we sat down, and we just smoked, like, a whole, like, $20 of weed to ourselves. And we were like 14, maybe 13 or 14 and just got super stoned. And it was like, I just remember being like, okay, this is where I need to be all the time. This is great.*

Another participant described their first-time using marijuana and how it led to their first sexual experience, leaving a lasting positive impression:

> Participant 23: *I was with this girl in high school. And this girl liked me. And when I was getting out of school, no one would be at my house and I lived in walking distance from the school. So she ended up coming over to my house. We smoked in the basement and then, you know, next thing you know, we're like fooling around and stuff like that. So it was also the first time I did something else too. So that's why I remember it (participant laughs). I would say I had a good experience.*

In the face of these positive initial experiences with marijuana, some participants discussed marijuana as being the first drug that led to social problems like worsening academic achievement and feelings of addiction.

> Participant 7: *I loved marijuana. My grades went down a little bit. I was almost a straight-A student. But then I started not minding about getting B's and then C's, and then I was sneaking out of the house to go do it with these people. I loved it so much, if there wasn't weed, I smoked the seeds.*

Other participants discuss marijuana being their first "love affair" with substances leading to other types of drugs when it was difficult to procure or use marijuana due to issues related to probation or employment. This often was related to exposure to other kinds of substances

> Participant 13: *The sad part is, is like marijuana is my first love affair with drugs. And I mean, it became harder and harder to find that particular drug in the circles that I was in because nobody wanted to smoke weed. Everybody was on probation. It took too long to get out of your system. Their job would drug test for that specifically. So it became very rare to even be able to find quality marijuana in my circles. That's not what they wanted to sell to you. They wanted you to get something that was going to be cheaper. Something you were going to come back for more and more and more of throughout the day.*

Further, some participants discussed their early experiences with marijuana as associated with other substance use, especially alcohol. Participants described how alcohol and marijuana were often related during their early experiences using marijuana.

> Participant 18: *It was the first time I smoked and I remember putting a piece of gum in my mouth and there was like sand because I had cottonmouth and I was thirsty, you know? So, my buddy gave me a bottle of orange juice. I chugged the whole thing, and then he got mad at me. And he was like, "That was liquor you*

idiot!". So, I ended up drinking the first time on same day I first smoked pot. I just felt these waves going up and down, up and down, you know what I mean? In my body it was, it was crazy.

Participant 25: *I don't know if you're familiar with the term "getting twisted", but that was a big thing where you would drink alcohol and smoke. So that was a big thing. So, we don't now, obviously, but if you know, you were up at school or several years ago partying or whatever. If you're drinking, people would say "Oh, where's the weed? Let's smoke some weed" or vice versa. And so there was a time where they were definitely intertwined.*

Many participants described marijuana specifically as their "*gateway drug*" in adolescence to the feelings of addiction they currently experience. While marijuana itself was not viewed by participants as an addictive substance, using marijuana may lead to a desire to try other drugs or "*awaken that phenomenon of craving"* in the future.

Participant 23: *So, like, you know, just once you do this drug* (marijuana) *and then you experience this high and then next thing you know, you're going to hang out with somebody else and they might have cocaine and you're going to want to experience that high. But, you know, whereas weed isn't really addictive in my in my mind, like weed's not addictive, but like cocaine and heroin are, so it's like a different monster. I think it is true. Like it's the gateway drug, you know, it's the drug that gets you started into doing drugs.*

Participant 7: *I first started smoking weed. I loved it. That was the only thing I ever did. That's all I did. That was my gateway drug, right there was weed and then then ecstasy and all that. But because that weed was so good, I thought, what else would be? And it just turned out I just found my addictive personality through weed.*

When asked specifically how they thought using marijuana ever played a role in triggering other substance use, Participant 2108 explicitly denied its relation to other substance use and delineated between marijuana and alcohol.

> Participant 6: *I really wouldn't say weed has as much of an effect as alcohol would. I know that if I were to drink right now, I would definitely take it like 15 steps further than that versus like me smoking a joint and just, you know, going to sleep or something like that.*

Along these lines, other participants compared the triggering effects of marijuana, specifically delineating marijuana as a less triggering substance in comparison to other substances.

> Participant 12: *Marijuana is not a trigger for me. Alcohol and cocaine are my triggers.*
>
> Participant 20: *I can give or take marijuana. It is, like, not on my mind. It's not. It's not there. It's not a thing that I need. but alcohol is something I need. You want to come over and hang out and, you know, you can smoke my pot whatever, but you touch my alcohol, I might kill you. I could care less about the marijuana. But you touch my alcohol and there's a problem.*

In contrast to some participants' discussions around marijuana as a less triggering substance, other participants described using marijuana or being around it as a significant trigger to relapse to their drug of choice. One participant described feeling frustrated and stressed when coworkers use marijuana, triggering him to want to drink.

> Participant 19: *I will say, though, that being around it all the time and smelling it and stuff is a little bit tough going to work or in situations like that. It's like, yeah, everybody's stoned now which makes my job harder because I'm trying to manage everybody stoned trying to get set up for a job. It's like trying to watch five cats at once, you know, everybody's wandering or whatever. Like, it's like trying to watch*

like cats and get them all in the bathtub at the same time. It's, like, ridiculous. Which stresses me out, makes me want to have a drink.

Another participant described how they avoid marijuana because being inebriated in any way could potentially lead to them returning to use of their drug of choice.

Participant 24: *I love marijuana. I know that it's not my drug of choice. And if I get inebriated in any way, shape or form, my drug of choice will always come into play. So I know that I have to stay away from marijuana.*

Theme 2: Marijuana as a medicine

Participants commonly described marijuana as a substance with potential medical benefit especially sleep and mental health problems with fewer side effects than other types of mental health medication.

Participant 2: *Weed for me does not fall under, you know, a drug. I only just do it, you know, randomly, occasionally for anxiety or when I need to eat. So I know that marijuana would never, ever be an issue for me.*

Participant 13: *I feel like marijuana is medicine. It is medicine. It would be amazing if they would use it for something like anxiety or something like that or deal with like sleep issues. I think it works well as a mood stabilizer. I do. I definitely feel like it would probably have less side effects than all the different medications that they have some of these people on for those very things that come with or other side effects or, you know, some that come with the whole like "May cause suicidal thoughts" or, you know, whatever.*

One participant compared the mood-altering effects of their current mental health medication to the effects of marijuana, describing the effects as similar.

Participant 3: *Marijuana can be medicinal for somebody. I mean, I think that marijuana would probably help somebody that's a real nervous person. I think it*

probably helps with pain, anxiety, and all that. I take Cymbalta, which is mind-altering and marijuana, it's probably the same. It could be the same thing. Maybe not as bad. You know, if you just, like, smoked a little bit, not smoked the whole bunch, it would probably be the same effect as Cymbalta.

Some participants saw marijuana as a potential medicine to be used in treatment like Suboxone or Methadone.

Participant 11: *I think marijuana is helpful during treatment. I mean, no more worse than any MAT medication like Suboxone or Methadone.*

Along these lines, several participants commented that after they used marijuana, they experience decreased or more manageable cravings for other drugs.

Participant 1: *It was always either I was smoking weed or I was doing hard drugs, but never both simultaneously. Like, it's not like it kills cravings. But let's say if I am having some kind of craving and then I do smoke marijuana. The desire to go to the lengths to fulfill that craving are pretty much quelched*.

Another participant said that using marijuana allows them to sleep without having to use another drug like fentanyl.

Participant 17: *It's really hard for me to sleep. So when I smoke, I can actually, like, go to sleep without, like, using fentanyl. So that's like a really big thing for me. I really don't smoke unless I'm going to sleep because I know I really don't like marijuana that much. It's just I'm able to, like, knock out from it.*

In conjunction with the perception of marijuana as a beneficial medicine, participants expressed dissonance between living as a person in a treatment setting where total sobriety is affirmed like in a 12-steps program and believing in the medicinal benefits of marijuana.

Participant 6: *I definitely look at it like medicine. I'm in a 12-step program type situation, so all chemically mind-altering substances and stuff aren't allowed in*

that way of thinking. They think that that will just take you back out into full blown addiction with, you know, the stuff that I was using. I don't believe the same thing, but I just kind of stay quiet about that because, again, I'm in this program and it's working for me.

Theme 3: Marijuana as a source of anxiety and negative consequences during treatment

Despite this belief in the medicinal value of marijuana, participants recognized that using marijuana while participating in settings and activities that emphasize total sobriety like many treatment settings could lead to negative perceptions or consequences for their recovery journey. For example, Participant 2059 acknowledged that his use of marijuana could potentially "*tarnish my testimony of recovery"*.

Participant 1: *I know it* [using marijuana] *is frowned upon in the recovery community. So it is probably the only secret that I have in my life today about anything…. I have come off of all of my mental health medication, partially with the assistance of marijuana. Honestly, I wish that I could feel this good and this level headed without the aid of any substance. However, due to my mental health diagnosis as well as other factors, I don't know that that's an option for me and I feel more comfortable with it being plant based and natural than it being a prescription.*

When discussing using marijuana as people in treatment for substance use problems, participants emphasized this secrecy and discussed its effects among people who use marijuana while in treatment.

Participant 7: *The only reason weed is dangerous is because we have to hide it. So when we're sneaking and geeking and trying to smoke without people knowing, like if we can't be ourselves, then we're probably going to look suspicious. And that just makes other it opens doors like other weird behaviors that we do.*

Much of this desire for secrecy stemmed from the potential for consequences from their treatment providers. For example, Participant 11 discussed their experience after a drug test indicated they had used marijuana: "*It was a negative because I got in trouble"*. When asked explicitly what they thought their experience using marijuana would have been like if they did not experience consequences from their treatment provider, they said there experience using marijuana would have likely been a positive one: "*If I wouldn't have got in trouble probably it would have been positive."*

Other participants discussed seeing their peers in treatment experience consequences like administrative discharge from their treatment facility for using marijuana.

> Participant 10: *We've had a few people that have come through that have gotten kicked out for it* [using marijuana].
>
> Participant 13: *There are people who have been discharged in the last month for getting high here.*

One participant acknowledged the damage that an administrative discharge could do to someone's treatment journey when asked if they had witnessed anyone experience consequences at their treatment center for using marijuana.

> Participant 12: *The people in my treatment? No, because they drug test. So they were to use marijuana here, they would get kicked out which could cause them to go and do something way worse than marijuana.*

The potential for consequences due to using marijuana were not limited to the treatment setting. Participants also discussed the potential for consequences stemming from family and child services issues they are currently facing. One participant discussed talking to their Department of Family and Child Services (DFCS) caseworker about buying a marijuana vape pen to self-treat their problems with anxiety.

Participant 2: *I do have DFCS involved in my life. And I told my caseworker before I bought the* [marijuana] *vape pen, and I thought, well, I talked to him about it, and he was okay with it. But because of the fact that there's also a judge that has a higher say so and just knowing that my son's actually still in the state system, I didn't feel comfortable with it. So, I just went ahead and put the vape away. And, you know, I'm just going to have to deal with my anxiety for now.*

Participants who reside in states where marijuana currently remains a prohibited substance similarly discussed marijuana in the context of legal issues and its status as an illegal drug.

Participant 9: *If I could use marijuana, and I knew I could get away with it. I don't feel it makes my recovery whatsoever. And if I knew, my probation officer would let me get away with smoking marijuana, I would be smoking today. The only reason I don't, and it's got nothing to do with recovery, it has to do with going back to jail or prison.*

Discussion

This research is among the first studies to collect experiences with and perceptions of marijuana among people in treatment to address substance use challenges. We found that, while participants associated marijuana strongly with the initiation of substance use behavior in adolescence and somewhat with the return to other substance use, many people in treatment for substance use have a complex set of beliefs and experiences with marijuana as a potential beneficial and medicinal substance. Participants referenced marijuana as a substance used to manage cravings related to other drugs like opioids and reduce symptomology related to co-occurring mental health problems like anxiety. These medicinal beliefs and experiences are often coupled with stigma and shame due to using marijuana while identifying as “in treatment” or participating in recovery-related activities. Similarly, we found a culture of fear and anxiety

around using marijuana while in treatment due to the potential for negative peer perception and consequences like administrative discharge and ongoing legal and family and child services challenges. Our results fill gaps in the research as to how marijuana may be related to treatment experience for people who do and do not use marijuana while in treatment for substance use.

There is strong evidence within the literature that suggests marijuana is an initiatory or "gateway" substance leading to other substance use later in life (Secades-Villa et al., 2015; A. R. Williams, 2020). In agreement with these studies, participants in this research often identified marijuana as their first substance of use and choice, often using the term "*gateway drug"* themselves. Some of our participants discussed how marijuana was often related to other substance use, especially alcohol, in their youth. This matches previous research showing the use of marijuana as often one of the first substance use experiences in adolescence among people experiencing challenges with substance use in adulthood (Secades-Villa et al., 2015). Similarly, participants discussed a relationship between using marijuana in adolescence and the desire to try other substances later in life when marijuana was not available or when offered other substances with a narcotic effect during the early stages of substance use seeking. This finding seems to agree with other research associating marijuana with a potentiation or priming effect for other subsequent substances used after trying marijuana (A. R. Williams, 2020). Research examining this potentiation and priming effect in mice and other animals has found that exposure to marijuana can increase subsequent opioid preference and tolerance (Mitchell, Berridge, & Mahler, 2018). Further, using marijuana during adolescence is associated with an increased risk of developing depression later and other psychiatric conditions later in life (Fine et al., 2019). Considering that people in treatment for substance use challenges often grapple with co-morbid psychological problems that are related to persistent problems substance use, it is possible that marijuana facilitates subsequent opioid use through worsening psychiatric conditions later in life.

Contrary to other studies tying marijuana to the persistence of other substance use among people in treatment for substance use challenges, marijuana's relationship to return to use was less clear in this study (Aharonovich et al., 2005; M. Mojarrad et al., 2014). While a couple of participants identified marijuana as a potential trigger to relapse, it is important to note that these participants did not mention *personal use* of marijuana as a trigger but instead discussed being around people who had recently used marijuana and are "high" as a trigger. Much of this trigger effect was attributed by participants to anger or frustration when interacting with people who had recently used marijuana. Studies examining the relationship between anger and daily stressors with substance use have found a link between such stressors and increased substance use relapse vulnerability (Amaro, Sanchez, Bautista, & Cox, 2021). However, other participants specifically delineated marijuana as a less triggering substance in comparison to others like alcohol or stated that marijuana has no effect on their current substance use patterns. The results of this investigation suggest that the triggering effects of marijuana may differ based on individual characteristics like substance preference, but more research is needed to better explain the effects of using marijuana as a trigger to relapse or persist in other substance use among people experiencing substance use challenges.

This lack of clarity around marijuana's relationship to the return to or persistence of other substance use may be explained by prevailing beliefs among participants around marijuana as a beneficial, medicinal substance with a similar effect to the mental health medications they are already taking. As U.S. states have legalized marijuana for medicinal purposes, the perception of marijuana as a medicinal substance has become increasingly popular (Keyes et al., 2016; McGinty et al., 2016). According to this research, this perception of marijuana as a medicinal substance has similarly extended to people who are in treatment for substance use. Many participants mentioned marijuana as a medicinal substance to treat mental health concerns like anxiety with fewer side effects than other pharmaceutical medications. Some participants even

favorably compared the effects of marijuana to their mental health medication. Population-based studies examining the effects of medical marijuana and other substance use have been mixed. Initially heralded as an "exit drug" in the wake of falling overdose rates in legal states immediately post-legalization for medicinal purposes, recent research finds those overdose trends to be reversed with legal states experiencing ~20% greater opioid overdose mortality rate than expected in comparison to other states in the U.S (Bachhuber et al., 2014; Shover et al., 2019). Similarly, other research in the general population finds that people who use marijuana are less likely to decrease their opioid use over a three-year period in comparison to people who do not use marijuana (Olfson, Wall, Liu, & Blanco, 2018). More research is needed examining how marijuana is used for medicinal purposes among people with substance use challenges and how this use relates to sobriety and recovery journeys.

Relating to the use of marijuana for medicinal concerns, this research found fear and anxiety among people in treatment for substance use concerns related to using marijuana for medicinal purposes. Much of this fear stemmed from the potential to experience treatment program-related consequences like administrative discharge. Treatment programs usually operate with a plethora of rules and expectations to create a supportive and safe environment for patients (I. L. Williams, 2016). These programs generally take an abstinence-only approach to substance use. Discharge from treatment services for violations of these rules or expectations can lead to a variety of dire consequences like worsening substance use, treatment programs admissions recycling, and total treatment disengagement (I. L. Williams, 2016). Similar fears existed around legal and family service concerns among participants. It is important to note that the majority of participants were located in Georgia, a state that has not legalized marijuana for recreational or medicinal purposes, leading to understandable legal concerns around marijuana especially considering that the vast majority of participants have experienced some form of incarceration in their lifetime.

More research is needed to better understand marijuana's effect on treatment engagement, treatment experience, and the return to use of other substances among treatment-seeking population. Several participants discussed how systemic and contextual factors, such as extended marijuana washout periods for legal and employment-related drug screening and the likelihood of being exposed to other substances through marijuana-related contexts, could contribute to the transition from marijuana use solely to the use of other substances like opioids and crack/cocaine. A greater understanding of these systemic and contextual factors is needed to disentangle the physically triggering effects of marijuana from the contextually triggering effects of marijuana. Considering the growing movement around medicinal marijuana, it is similarly important to understand if people in treatment for substance use challenges can use marijuana safely or if treatment centers need to address marijuana in the context of its increasing popularity as a medicinal substance is required for people in treatment for substance use. Larger population-based studies are likely needed to examine the safety of using marijuana during treatment among this population especially at-risk of other substance use and risky behaviors. This study contributes to the developing literature about marijuana use in the context of this population and its unique challenges regarding substance use and treatment experience.

Table 4.1 Demographic Characteristics of the Sample (N = 27)

	N (%)
Age [Mean (SD)]	37.4 (9.4)
Race	
White	19 (74.1%)
Black/African American	6 (22.2%)
Other	1 (3.7%)
Ethnicity	
Hispanic/LatinX	1 (3.7%)
Not Hispanic/LatinX	26 (96.3%)
Gender	
Male	12 (44.4%)
Female	15 (55.6%)
Past three-month marijuana use	13 (48.1%)
Substances in treatment to address	
Alcohol	22 (81.5%)
Amphetamines	12 (44.4%)
Crack/Cocaine	16 (59.2%)
Opioids	11 (40.7%)
Marijuana	10 (37.0%)
Number of substances in treatment to address	3.2 (2.1)
Incarceration History	
Yes	20 (71.4%)
No	7 (28.6%)

CHAPTER 5

CONCLUSIONS

Introduction

Millions of people enter treatment each year to address substance use challenges. Among people who enter treatment, a large proportion use marijuana and this marijuana use is likely to persist during the initial phases of treatment (Hermann et al., 2005; Scavone et al., 2013). Previous research has shown a relationship between marijuana and poor treatment and substance use outcomes among people in treatment to address substance use challenges (Aharonovich et al., 2005; Budney et al., 1998; M. Mojarrad et al., 2014). However, much of this research investigating marijuana's relationship to substance use treatment adherence and substance use outcomes was conducted prior to the successes of the marijuana decriminalization/legalization movement in the U.S, is methodologically poor in quality, or has focused solely on opioid-dependent individuals receiving medication-assisted treatment (McBrien et al., 2019). A greater understanding of how marijuana is related to relapse and treatment experience among people in treatment for substance use challenges is needed to understand the effects of marijuana use on treatment adherence and other substance use challenges in this new societal context. The purpose of this dissertation was to understand how prevailing attitudes and perceptions around marijuana among people in treatment to address substance use challenges as well as to examine the effects of using marijuana during treatment on formal treatment and recovery support attendance, alcohol use, crack/cocaine use, and opioid use. This was accomplished through two studies described in Chapter 3 and Chapter 4 of this dissertation. Each chapter is reviewed briefly below.

Chapter 3 Summary

In Chapter 3, the concurrent (t, same day) and prospective ($t + 1$, next day) association between marijuana use and formal treatment/recovery support attendance, alcohol use, crack/cocaine use, and opioid use were examined using a 90-day daily diary study design. People who had entered treatment in the previous 12-months were recruited for the study that measured marijuana use, formal treatment/recovery support attendance, alcohol use, crack/cocaine use, and opioid use each day across all 90 days. Age, gender, housing status, trauma history, and legal treatment requirement were measured cross-sectionally at study entry. Using a multi-level binary logistic regression model, within-subject and between-subject effects of using marijuana on formal treatment/recovery support attendance, alcohol use, crack/cocaine use, and opioid use were run for each outcome separately. Age, gender, housing status, trauma history, and legal treatment requirement were covariates in each multi-level model. The sample included 188 participants with a mean age of 40.6 years. The sample was 50.5% male, 65.4% White, and 92.6% non-Hispanic/Latinx. Participants were able to indicate more than one substance for which they were receiving treatment. Among the participants, 81.5% reported they were receiving treatment to address problems with alcohol, 40.7% to address crack/cocaine use, 59.2% to address opioid use, and 44.4% to address amphetamine use. At the within-subjects level, marijuana use was significantly related to same day alcohol use. At the between-subjects level, marijuana use was significantly related to more alcohol use and more crack/cocaine use. None of the prospective within-subjects level outcomes were significantly related to marijuana use. These findings suggest that using marijuana may not be related to formal treatment/recovery support attendance but is related to increased alcohol use among people in treatment to address substance use challenges. The other findings examining marijuana's relationship to crack/cocaine use and opioid use showing a non-significant association should be interpreted with care as they were marginally insignificant. This data was limited by the short time period for which participants

were enrolled in the daily diary study as treatment and recovery journeys are life-long processes that are subject to sudden changes even after long period of treatment engagement and abstinence from other substance use.

Chapter 4 Summary

In Chapter 4, experiences, perceptions, and beliefs around marijuana use among people in treatment for substance use challenges were explored. Data for this research were collected in the form of interviews pertaining to past experiences with marijuana before entering treatment, experiences with marijuana after entering treatment, and beliefs and perceptions around marijuana currently. Interviews were collected from people who had entered treatment to address substance use challenges in the previous 12 months. The sample included 27 participants. Among the sample of interview participants, the average age was 37.4 years old, 74.1% were White, 44.4% were Male, and 96.3% were non-Hispanic/Latinx. A large proportion (48.1%) had used marijuana in the previous three months. Three major themes were found around 1) Marijuana as an important contributor to substance use journeys, 2) Marijuana as a medicine, and 3) Marijuana as a source of anxiety due to fears of treatment and legal consequences. This research revealed that, although personal marijuana use is related to return to other substance use and treatment disengagement, many people in treatment for substance use problems have a complex set of beliefs and experiences around marijuana as a potential beneficial medicine for opioid and alcohol use disorder. However, these beliefs and experiences are often coupled with stigma and shame due to persistent marijuana use while identifying as *sober*, *in recovery*, or *in treatment* that could lead to treatment service disengagement. These findings suggest people in treatment for substance use challenges have similarly positive perceptions and beliefs towards marijuana as a beneficial and medicinal substance as have recently been found in the general

population. These changing perceptions and beliefs may be attributed to the changing legal status of marijuana in the U.S. and its widespread presence within U.S. culture and society.

Key Findings

Several key findings have been identified from this research. First, the results for these studies demonstrate the marijuana use is related to more alcohol use. The first study presented in Chapter 3 found that using marijuana was positively related to both same day alcohol use and more alcohol use across the 90-day study period. Participants in the second study frequently linked their use of alcohol both as adolescents and as adults to their use of marijuana whether it be as a frequently co-used pair of substance or as a coping mechanism when around people who have recently used marijuana. Second, the second study presented in Chapter 4 provides evidence that people in treatment for substance use challenges hold beliefs around marijuana as a beneficial and medicinal substance although it may be related to other substance use or a negative treatment experience. As such, this qualitative research may provide potential beliefs and perceptions that could be subject to intervention to dispel ambivalent attitudes towards marijuana that may be held by people in treatment for substance use challenges. Finally, this research demonstrates that marijuana use is related to treatment experience and substance use outcomes (primarily around alcohol) and should be addressed among people in treatment for substance use challenges.

Strengths

The results from these studies come from a multi-site study with recruitment sites in Connecticut and Georgia increasing the generalizability to people in treatment to address substance use challenges in the U.S. Additionally, the dually focused nature of this research towards both quantitatively and qualitatively describing marijuana use and its effects on treatment experience and other substance use provides a more comprehensive understanding of

marijuana use while in treatment for substance use challenges than either approach alone. Finally, the 90-day daily diary study design presented in Chapter 3 allowed a multi-level modeling approach to the longitudinal, repeated measures examination of marijuana use during treatment. This multi-level modeling approach takes into account within-subject correlations and provides a more accurate estimation of the effects of marijuana use on formal treatment/recovery support attendance, alcohol use, crack/cocaine use, and opioid use than standard regression modeling alone.

Limitations

Several limitations are worth noting. The sample may not be representative of all people in treatment for substance use challenges. Firstly, this sample was self-selected and people who did not chose to participate in this research could have differed from people who did chose to participate in this research. This research project was presented to potential participants in formal treatment settings with the agreement of formal treatment provider partners. For this reason, it is possible that this research may have been viewed by participants as treatment-affirming, potentially leading to oversampling of people particularly motivated to participate or otherwise engage in treatment and recovery support functions. This limitation holds for both studies presented in Chapters 3 and 4. Second, the sample for both studies was overwhelmingly White and straight/non-LGBTQ+. This could lead to underrepresentation of people of color and people who identify as a sexual or sexual preference minority. Third, the measures for the study in Chapter 3 were all self-report and thus are subject to recall bias. Fourth, the study presented in Chapter 3 utilized daily surveys which asked participants about treatment attendance on the previous day and substance use “since your previous daily survey” potentially affecting the accuracy of reports of participant substance use. Finally, the study presented in Chapter 3 only examined a 90-day period. As treatment engagement, recovery, and relapse are life-long

processes for people with substance use challenges, this 90-day period fails to capture the complexity of recovery journeys over the long-term.

Summary and Future Directions

Considering that a large proportion of people who enter treatment to address substance use challenges are likely to persist in using marijuana throughout their treatment journey, it is critical to understand how this marijuana use affects treatment experience, treatment outcomes, and substance use outcomes (Scavone et al., 2013). The societal landscape around marijuana is changing in the U.S. as marijuana use becomes less unfavorable and perceptions of harm attributed to marijuana use decreases (Keyes et al., 2016; McGinty et al., 2016). This changing landscape may lead to an even larger proportion of people in treatment who use marijuana. In this dissertation, I provide evidence that using marijuana negatively impacts alcohol use and crack/cocaine use among people in treatment to address substance use challenges. I also revealed that people in treatment for substance use challenges hold a complex set of beliefs around marijuana as both a potential "gateway" to other substance use and as a potential beneficial medicine to address mental health problems and opioid/alcohol use disorder. However, these beliefs are often coupled with stigma and shame due to persistent marijuana use while in treatment.

Based on these results, I suggest that marijuana use among people in treatment for substance use challenges should be evaluated and addressed by treatment providers. It may be helpful for treatment providers to address and dispel the positive beliefs found in this research around marijuana as a beneficial medicine for mental health problems and other substance use.

In regard to future research, I suggest that we further evaluate the social and environmental context of persistent marijuana use and its relationship to treatment and other substance use outcomes. Many participants in the study presented in Chapter 4 mentioned that

other using marijuana in proximity to them impacts their desire to use marijuana or other substances. Similarly, the environmental context of marijuana use may have differential effects on treatment and other substance use outcomes. Many participants in the Chapter 4 study mentioned marijuana as a sleep aid that they use at night privately whereas other participants mentioned marijuana as a substance frequently used in a social, "party" context where exposure to alcohol and other substances is likely. The differing contexts of this marijuana use may lead to different treatment and substance use outcomes and should be investigated. An ecological momentary assessment (EMA) design study triggered by geographic context may be an advantageous research design to further understand the social and environmental context of using marijuana and how this relates to treatment engagement and other substance use.

Further, I suggest that we develop and test interventions that address beliefs around marijuana as a beneficial substance to treat mental health concerns like depression and anxiety that are commonly held by people in treatment for substance use challenges. There is a large amount of research showing that marijuana actually has a negative impact on depression and anxiety symptomology. A dynamic approach to such an intervention should be taken as beliefs and perceptions around marijuana are likely to change and become even more positive as marijuana become more available due to its changing legal status in the U.S.

Finally, an in-depth examination of attitudes and beliefs held by treatment providers towards marijuana should be undertaken. Some research shows that positive perceptions and beliefs around marijuana as an inconsequential or beneficial substance can be found among other healthcare practitioners (Holland et al., 2016). It is not known if these beliefs are similarly held by substance use treatment providers. It is important to understand if these treatment providers hold these beliefs around marijuana as a beneficial or inconsequential substances as these beliefs must be similarly addressed if the previous intervention described above is to be situated in treatment programs.

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APPENDICES

APPENDIX A

PARTICIPANT SCREENER

The University of Georgia and Yale University are currently recruiting participants from various substance use facilities for a 6-month study that looks at how friends and the places you hang out influence your behaviors and health. Through a participant's involvement we hope to improve health care and services for those entering treatment in the future.

Participants throughout the study will have interviews (in-person or online) asking questions about their health, health care, friends, family relationships, and the places you go. Additionally, participants will download a mobile phone app to answer shorty daily surveys at different timepoints during the study. Participants can earn up to $600 dollars for full participation of the study.

Are you interested taking a short survey to see if you are eligible for participation?

- ○ Yes (4)
- ○ No (5)

Skip To: End of Survey If The University of Georgia and Yale University are currently recruiting participants from various... = No

Page Break

Q1 Thank you for your interest in Project Renew. The next questions will determine if you are eligible to participate in the study. The survey will take less than 5 minutes to complete. You may stop the survey at any point.

Page Break

Q2 What is your age?

_____

Page Break

Q3 Do you have a smartphone?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If Do you have a smartphone? = Yes

Q4 What is the model of your phone? (example: iPhone, Samsung Galaxy, Google Pixel)

_____

Display This Question:

If Do you have a smartphone? = Yes

Q5 Do you have unlimited data?

- ○ Yes (1)
- ○ No (2)
- ○ Don't know (3)

Display This Question:

If Do you have a smartphone? = Yes

Q6 Have you ever had to limit your usage or turn off phone usage to avoid overage fees, running out of data, or minutes?

- ○ Yes (1)
- ○ No (2)

Page Break

Q83 What state do you currently live in?

▼ Alabama (1) ... Wyoming (50)

Q84 Please enter your current zip code

_____

Page Break

Q8 Are you in treatment, planning to enter treatment, or seeing a healthcare professional (medical doctor, social worker, or counselor) for a substance use related issue (including alcohol)?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If Are you in treatment, planning to enter treatment, or seeing a healthcare professional (medical d... = Yes

JS

Q12 What date did you enter (or re-enter) treatment?

Month (1)	▼ January (1) ... (150)
Day (2)	▼ January (1) ... (150)
Year (3)	▼ January (1) ... (150)

Display This Question:

If Are you in treatment, planning to enter treatment, or seeing a healthcare professional (medical d... = Yes

Q11 Where did you receive this treatment? (list all)

_____

Page Break

Q19
The following questions ask about your alcohol use in the **past 12 months, prior to starting treatment.**

Please review for the chart below for what is considered to be a standard "drink," and keep that in mind when reporting how much alcohol you have consumed.

In the **last year**, how often did you have a drink containing alcohol prior to entering treatment?

- ○ Never (1)
- ○ Monthly or less (2)
- ○ 2-4 times a month (3)
- ○ 2-3 times a week (4)
- ○ 4 or more times a week (5)

Q20 In the last year, how many drinks containing alcohol do you have on a typical day when you are drinking prior to entering treatment?

- ○ 1 or 2 (1)
- ○ 3 or 4 (2)
- ○ 5 or 6 (3)
- ○ 7 to 9 (4)
- ○ 10 or more (5)

Q21 In the last year, how often do you have six or more drinks on one occasion prior to entering treatment?

- ○ Never (1)
- ○ Less than monthly (2)
- ○ Monthly (3)
- ○ Weekly (4)
- ○ Daily or almost daily (5)

End of Block: Default Question Block

Start of Block: Not Eligible

Q22

Thank you for your interest in our study, but you don't meet the requirements to participate.

May we contact you in the future about other studies you might want to join? You are free to choose not to join future studies.

We just want your permission to contact you and invite you to hear about those studies. Please check one of the boxes below.

"I consent to be contacted by the research team about future studies."

- ○ Yes (4)
- ○ No (5)

Skip To: End of Survey If Thank you for your interest in our study, but you don't meet the requirements to participate. ... = No

Page Break

Display This Question:

If Thank you for your interest in our study, but you don't meet the requirements to participate. ... = Yes

Q23 To help us follow up with you, please share the below contact information with us:

- First Name (1) _____
- Last Name (2) _____
- Phone Number (3) _____
- Email (4) _____

Display This Question:

If Thank you for your interest in our study, but you don't meet the requirements to participate. ... = Yes

Q24 How do you prefer to be contacted?

- Phone call (1)
- Text Message (2)
- Email (3)

Display This Question:

If Thank you for your interest in our study, but you don't meet the requirements to participate. ... = Yes

Q25 Is it OK for us to leave you voicemail on your phone?

- Yes (1)
- No (2)

Display This Question:

If Thank you for your interest in our study, but you don't meet the requirements to participate. ... = Yes

Q26 Is it OK to contact you through email?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If Thank you for your interest in our study, but you don't meet the requirements to participate. ... = Yes

Q27 Is it OK to text you?

- ○ Yes (1)
- ○ No (2)

Page Break

End of Block: Not Eligible

Start of Block: How did you hear about the study

Q80 How did you hear about our study?

- Facebook (1)
- Instagram (2)
- Twitter (3)
- Flyer (4)
- ARC (5)
- Project Adam (6)
- Peers Empowering Peers (7)
- Mary Hall (8)
- Referred by someone (9)

Display This Question:

If How did you hear about our study? = Flyer

Q82 Where did you see the flyer?

_____

End of Block: How did you hear about the study

Start of Block: Dummy questions

Q86 Do you have medical insurance?

- Yes (1)
- No (2)

Display This Question:

If Do you have medical insurance? = Yes

Q87 What is the source? (check all that apply)

- ○ Private insurance (HMO, etc.) (1)
- ○ Medicaid (2)
- ○ CHIP/HUSKY/Peachcare for Kids (3)
- ○ Medicare (4)
- ○ Other (5) _____

End of Block: Dummy questions

Start of Block: Potentially eligible

Q28

Thank you for your interest in our study, you may be eligible to participate. If you are interested in learning more study will staff will contact you with more information.

Are you interested in learning more about participating in the study?

- ○ Yes (6)
- ○ No (7)

Q29
May we contact you in the future about other studies you might want to join? You are free to choose not to join future studies.

We just want your permission to contact you and invite you to hear about those studies. Please check one of the boxes below.

"I consent to be contacted by the research team about future studies."

- ○ Yes (4)
- ○ No (5)

Page Break

Display This Question:

If Thank you for your interest in our study, you may be eligible to participate. If you are interes... = Yes

Or May we contact you in the future about other studies you might want to join? You are free to choo... = Yes

Q30 To help us follow up with you, please share the below contact information with us:

- First Name (1) _____
- Last Name (2) _____
- Phone Number (3) _____
- Email (4) _____

Display This Question:

If May we contact you in the future about other studies you might want to join? You are free to choo... = Yes

Or Thank you for your interest in our study, you may be eligible to participate. If you are interes... = Yes

Q31 How do you prefer to be contacted?

- Phone call (1)
- Text Message (2)
- Email (3)

Display This Question:

If May we contact you in the future about other studies you might want to join? You are free to choo... = Yes

Or Thank you for your interest in our study, you may be eligible to participate. If you are interes... = Yes

Q32 Is it OK for us to leave you voicemail on your phone?

- Yes (1)
- No (2)

Display This Question:

If May we contact you in the future about other studies you might want to join? You are free to choo... = Yes

Or Thank you for your interest in our study, you may be eligible to participate. If you are interes... = Yes

Q33 Is it OK to contact you through email?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If May we contact you in the future about other studies you might want to join? You are free to choo... = Yes

Or Thank you for your interest in our study, you may be eligible to participate. If you are interes... = Yes

Q34 Is it OK to text you?

- ○ Yes (1)
- ○ No (2)

End of Block: Potentially eligible

Start of Block: Archive

Q13
May we contact you in the future about other studies you might want to join? You are free to choose not to join future studies.

We just want your permission to contact you and invite you to hear about those studies. Please check one of the boxes below.

"I consent to be contacted by the research team about future studies."

- ○ Yes (4)
- ○ No (5)

Q14 To help us follow up with you, please share the below contact information with us:

- First Name (1) _____
- Last Name (2) _____
- Phone Number (3) _____
- Email (4) _____

Q15 How do you prefer to be contacted?

- Phone call (1)
- Text Message (2)
- Email (3)

Q16 Is it OK for us to leave you voicemail on your phone?

- Yes (1)
- No (2)

Q17 Is it OK to contact you through email?

- Yes (1)
- No (2)

Q18 Is it OK to text you?

- Yes (1)
- No (2)

Display This Question:

If Are you in treatment, planning to enter treatment, or seeing a healthcare professional (medical d... = Yes

Q9 Is your treatment inpatient or outpatient?

- Inpatient (1)
- Outpatient (2)

Q7 Do you plan to move from Northeast Georgia in the next 12 months?

- Yes (1)
- No (2)

End of Block: Archive

APPENDIX B

PARTICIPANT INFORMED CONSENT LETTER

Block 2

CONSENT FOR PARTICIPATION IN A RESEARCH PROJECT

UNIVERSITY OF GEORGIA COLLEGE OF PUBLIC HEALTH & YALE SCHOOL OF PUBLIC HEALTH, & UNIVERSITY OF KENTUCKY COLLEGE OF MEDICINE

Study Title: RENEW

Principal Investigators:
Jessica Muilenburg, Ph.D.
University of Georgia, 105 Spear Road, Athens, GA 30606

Funding Source: National Institute on Alcohol Abuse and Alcoholism

Invitation to Participate and Description of Program

You are invited to participate in a study of how friends and places impact treatment engagement for alcohol-related problems and the likelihood of relapse. You are being invited to participate because you are entering a substance use treatment program or were identified as a potentially risky drinker. We want to learn about how your friends and the places you hang out influence your behaviors and your health. We hope that what we learn will help us to improve health care and services for those entering treatment in the future. Understanding things that influence relapse will allow the development of ways to retain clients in treatment, which is important to reduce alcohol-related problems.

In order to decide whether or not you wish to be a part of this research study, you should know enough about its risks and benefits to make an informed choice. This consent form gives you

information about this study and a member of the research team will talk to you about all of this information. This talk will go over all parts of the research: its purpose, what will happen, any risks, and any benefits. Once you understand the study and have been given a chance to ask questions, we will ask you if you want to participate; if so, we will ask you to sign this form. About 400 other people being treated for alcohol-related problems will be part of this study.

Description of Procedures

First, we will screen to see if you are eligible to participate in the study. This will include questions concerning your age, your treatment plan, and where you live.

If you choose to join this study, we will ask you to do an interview with one of our staff members, either face-to-face or remotely. During the interview we will ask you questions about your friends and family including their initials, and things you do and talk about with them. During part of the interview you will use a computer, tablet, or smartphone to answer questions about your health, health care, friends, family and relationships, as well as questions about your alcohol and drug use, your mental health and sexual practices. All of your answers in the interview are private. We will not share your answers with anyone outside the study. This study is based on self-reported data, not any information from your treatment program and we will not be contacting your alcohol or drug treatment providers for information or sharing the personal information that you give us.

During your first interview and with your permission we will download a mobile app on your phone that will provide study resources, direct you to surveys, and will monitor GPS locations (these are retrieved from your cell phone to provide information on the places you visit) for the next 6 months. We are doing this to learn more about how the places you go and the people you see may affect your behavior. At any time, you can temporarily turn off tracking services. However, extended periods of inactivity for tracking may make you ineligible for future phases of the study, and could impact compensation.

At the first interview, we will create a list based on places that you regularly visit or you identify as important from the past 12 months and will ask you questions about each location in terms of who you went with to the location and what you did. After completion of these questions, we will program the locations you frequent the most and you will be asked to complete a brief survey when you visit one of those locations during the next 90 days. Each morning, we will also ask you questions about what may have occurred the day before. In order to limit your burden, you will never get more than 2 brief surveys per day. If your GPS signal has not moved or you are not responsive to the survey questions for more than 24-48 hours we will reach out to you within the app and then by phone, email, or text.

After 3 months, we will ask you to do another interview on a computer, tablet, or phone. This interview will be very similar to the first interview. We will update your locations map based on the phone app in case anything has changed. We will then continue the same protocol as above for another 90 days.

Month 6 will be your final interview. At your final interview, we will remove the software from your phone and we will stop tracking and sending surveys. We will never see your cell phone data again.

Your saliva or urine will be tested for the evidence of drug and alcohol use at month 6. You will be mailed a saliva or urine based drug and alcohol test. You will then complete the test and share the results with our study staff. The results will be recorded by our staff and only associated with your study ID. No one outside the study will have access to your individual results.

Portions of the in-person interviews will be audio recorded. This recording will be transcribed, and no identifying information will be included in the transcripts. After the transcription is complete, the audio recording will be permanently deleted. By signing this consent form, you indicate that you consent to be recorded in the qualitative interviews. If you do not wish to be recorded, you are not eligible to participate in this research.

You may be invited to join additional optional interviews by study staff. These interviews will be recorded and transcribed. You will be informed prior to these optional interviews and will be further compensated for your participation. Choosing to participate or not participate will not impact your involvement in other parts of the study.

We also want your permission to contact you in the future about other studies you might want to join. You are free to choose not to join future studies. We just want your permission to contact you and invite you to hear about those studies. Please check one of the boxes below.

"I consent to be contacted by the research team about future studies"

Yes

No

Risks and Inconveniences

There is no physical risk for joining this study. We will keep all information private and confidential. You do not have to answer any questions you do not want to answer.

Benefits

This study may not benefit you directly, but it will help us learn more about how social environment and health can impact the sobriety of those entering treatment for alcohol-related problems. By joining this study, you may help our research and, in the future, may help in improving the health of those entering treatment for alcohol and drug use.

Economic Considerations

You will be paid up to $600 for participating in the study. Face-to-face participants will be paid in cash, a debit card loaded with funds throughout the duration of the study, or their choice of gift card. Remote participants will be paid with a debit card loaded with funds throughout the duration of the study or their choice of gift card. You will receive up to $230 for completion of all of the 5 interviews (the baseline, 3, and 6-month interviews and 2 qualitative interviews) and up to $300 for completing the app-based part of the study.

The amount you can earn will increase throughout the study. You will be paid a total of $40 for your first appointment ($1 for downloading the app and $39 for the completing the first interview), $50 for completing the month 3 interview, $60 for the completing the month 6 interview, you will be paid $40 for each of the 2 qualitative interviews you participate in.

The mobile app daily surveys are broken into six 30-day payment periods, which occur at month 1, month 2, month 3, month 4, month 5, month 6. You will be paid $30 per 30-day month block that you complete surveys. If you complete 50-74% (15-21) in a 30-day period you will earn a $10 bonus, or if you complete 75%-100% of surveys (22 or more) in a 30-day period you will earn a $20 bonus, which could bring total compensation for a 30-day period to $50.

At the end of the study, if you complete the 3 month-based interviews, you will receive a $50 bonus, or if you complete all 3 month-based interviews and 1 qualitative interview the bonus will be $60, or if you complete all 3 month-based interviews and complete both qualitative interviews the bonus will be $70

You will have the opportunity to earn additional money for completing optional tasks related to the study. You can earn money for successful referrals (meaning the referred individual is enrolled in the study). $10 can be earned for each successful referral up to 10 people (up to $100). The referral must be confirmed with the referral code provided by study staff and the referred participant must be successfully enrolled in the study.

For in person payments, you will be asked to initial a receipt log to confirm that you have received payment. Debit cards will be mailed to you directly and require a mailing address and your date of birth. Debit cards take 7-10 business days to be delivered. Debit cards will be sent after you are consented to the study and study staff has verified that you have downloaded the app. Participants

who do not provide a mailing address or their date of birth may be limited in their compensation methods for completing segments of the study. Additional payments to the card take 24-48 hours to process after you complete a study segment. Study staff cannot expedite payments or make advances for future participation. For gift cards, a receipt will be generated indicating that the gift card was sent to your email account after you complete a daily survey segment or interview. It may take 24-48 hours for email delivery of the gift card. Receipts will be kept separately from your responses and will not be associated with your data in any way. According to the rules of the Internal Revenue Service (IRS), payments that are made to you as a result of your participation in a study may be considered taxable income.

What Will It Cost You to Participate?

You and/or your insurance company, Medicare, or Medicaid will be responsible for the costs of all care and treatment that you would normally receive for any conditions you may have. These are costs that are considered medically necessary and will be part of the care you receive even if you do not take part in this study. The University of Georgia may not be allowed to bill your insurance company, Medicare, or Medicaid for the medical procedures done strictly for research, including drug and alcohol testing. Therefore, these costs will be paid by the sponsor, the National Institute of Alcohol Abuse and Alcoholism.

What Happens If You Get Hurt or Sick During the Study?

If you believe you are hurt or if you get sick because of something that is due to the study, you should call Dr. Jessica Muilenburg at 706-296-8509 immediately. Dr. Muilenburg will help to determine what type of treatment, if any, is best for you at that time. In case of emergency, dial 911.

It is important for you to understand that the University of Georgia does not have funds set aside to pay for the cost of any care or treatment that might be necessary because you get hurt or sick while taking part in this study. Also, the University of Georgia will not routinely pay for any wages you may lose if you are harmed by this study.

Medical costs related to your care and treatment because of study-related harm will be your responsibility. You do not give up your legal rights by signing this form.

Confidentiality and Privacy

At all times we will protect your confidentiality and privacy to the best of our ability. If you decide to take part in this research study, we will ask you to give us personal information about your health, health related behaviors, and the places that you go. We will assign you a code number when you begin the study, so the information you provide will be attached to the code number and not your

name. The information we get will be used for the purposes of data analysis and all analyses will be conducted by code numbers only. The research study is independent from the treatment facility. Any information disclosed or collected during this study will not be shared with the treatment facility.

We have obtained a Certificate of Confidentiality for this project from the Federal government. A Certificate of Confidentiality protects your privacy by allowing staff to refuse to disclose your name or other identifying information to anyone outside this research project. However, we cannot know for sure how much protection the Certificate provides because it has rarely been challenged in the courts. In the unlikely event of an audit by the funding agency, the National Institute on Alcohol Abuse and Alcoholism staff may have to reveal your name, but only to the agency's authorized representatives. The University of Georgia Human Subjects Office Committee, Yale University Human Subjects Committee, The University of Kentucky Human Subjects Committee, or WCG IRB may also inspect study records. However, if we learn about abuse of a child or elderly person, that you intend to harm yourself or someone else, we will report that to the proper authorities right away.

The link to your personal information will be kept for the duration of this study, after which time the link will be destroyed and the data will become anonymous. The data will be kept in this anonymous form indefinitely.

Voluntary Participation and Withdrawal

Participating in this study is voluntary. You are free to choose to not take part in this study. Refusing to participate will involve no penalty or loss of benefits to which you are otherwise entitled (such as your health care outside the study, the payment for your health care, and your health care benefits). However, you will not be able to enroll in this research study and will not receive study procedures as a study participant if you do not allow use of your information as part of this study. If you do not sign this form, you will not be able to be part of this research study. You do not give up any of your legal rights by signing this form.

Withdrawing from the Study

If you do become a participant, you are free to stop and withdraw from this study at any time during its course or to refuse to answer any individual survey questions without penalty or loss of compensation. If you sign this authorization, you may change your mind at any time, but the researchers may continue to use information collected before you changed your mind to complete the research. To withdraw from the study, you can call a member of the research team at any time and tell them that you no longer want to take part. This will cancel any future appointments. Withdrawing from the study will involve no penalty or loss of benefits to which you are otherwise

entitled. It will not harm your relationship with your own doctors or with the Yale School of Public Health or the University of Georgia College of Public Health.

Questions

We have used some technical terms in this form. Please feel free to ask about anything you don't understand and to consider this research and the consent form carefully – as long as you feel is necessary – before you make a decision.

Communication about the Study

To help us contact you with information about interviews, we would like to know the ways to contact you. Please provide information about how you would like to be contacted about the study by email, text messages, phone call, or US Mail. Please check the appropriate boxes and sign this Consent below.

May we contact you by email address?

Yes

No

Email address

May we contact you by text message?

Yes

No

Phone number for text message:

May we contact you by phone call?

Yes

No

Phone number for phone call:

May we leave a voice message at this phone number?

Yes

No

If you are getting paid by the Bank of America debit card we need a mailing address where you can currently receive the mail. Please provide a mailing address below. Additionally, to issue the debit card we will need your date of birth (DOB), please enter your DOB below.

What is your US mailing address?

Street address

City/town

State

Zip code

Date of Birth

Day

Month

Year

Who is someone we can contact in case we can't get in touch with you?

Phone number of contact

Email address of contact

I authorize the use of the above communication methods when communicating with me and my

authorized individual.

× SIGN HERE

clear

Authorization and Permission

Participant's signature:

× SIGN HERE

clear

Signature of Person Obtaining Consent

APPENDIX C

PARTICIPANT BASELINE SURVEY

RENEW ACASI Baseline

Start of Block: Intro

Project RENEW Study The first part of the study will be an online survey. The survey is going to ask a range of questions about your health history, behavior, and relationships. Please make sure you have approximately 45 minutes to 1 hour to complete this survey. Please answer these questions as thoroughly and honestly as possible. All responses are confidential and will not be shared with anyone outside the research team. Survey answers are only linked to your study ID number. If you have any questions or concerns while taking the survey, please contact the Project RENEW research team by phone or email. Connecticut participants can call (203) 584-8337 or send an email to renew.study@yale.edu. Georgia participants can call (706) 224-9007 or send an email to renewugastudy@gmail.com We will respond to you within one business day to address any problems that come up.

End of Block: Intro

Start of Block: Demographics

The following questions are going to ask about your demographics, housing, health history, and health behavior.

How old are you?
(1)

▼ 18 (1) ... 99 (82)

How would you describe your gender?

_____

How would you describe your sexual orientation?

_____

Which of the following best describes you? (select all that apply)

- [ ] American Indian or Alaska Native (1)
- [ ] Asian (2)
- [ ] Native Hawaiian (3)
- [ ] Pacific Islander (4)
- [ ] Black or African American (5)
- [ ] White (6)
- [ ] Hispanic/Latino (7)
- [ ] Middle Eastern/North African (8)
- [ ] Other (please describe) (9)

_____

Page Break

X→

How would you best describe yourself? (select all that apply)

- [ ] Single, never married (1)
- [ ] Dating someone (2)
- [ ] Not married, but living with a partner (3)
- [ ] Married (4)
- [ ] Separated/divorced (5)
- [ ] Widowed (6)

X→

Are you currently in a romantic relationship?

- ○ Yes (1)
- ○ No (0)
- ○ Don't know (-99)

Skip To: DEM8_1 If Are you currently in a romantic relationship? != Yes

X→

How long have you been with your current partner?

- ○ Less than 1 year (1)
- ○ 1 year or more (2)

Skip To: DEM8_1 If How long have you been with your current partner? = Less than 1 year

How many years have you been with your current partner?

_____

Page Break

X→

Are you currently pregnant?

- ○ Yes (1)
- ○ No (0)

X→

How many children do you have?

- ○ 0 (0)
- ○ 1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)
- ○ 5 or more (5)

Skip To: DEM17_1 If How many children do you have? = 0

X→

How many children do you have under the age of 18?

- 0 (0)
- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 or more (5)

X→

How many sons do you have?

- 0 (0)
- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 or more (5)

X→

How many daughters do you have?

- 0 (0)
- 1 (1)
- 2 (3)
- 3 (3)
- 4 (4)
- 5 or more (5)

X→

Who is responsible for the care of your children?

- Self (1)
- Me and spouse/significant other (2)
- Spouse/significant other (3)
- Grandparent (4)
- Foster care (5)
- Other (6)

How many of your children live with you full time?

▼ 0 (6) ... 5 (5)

How many of your children live with you part time?

▼ 0 (6) ... 5 (5)

How often are the children that don't live with you full time in the same household as you?

- ○ Never (0)
- ○ Some of the weekends or days during the week (1)
- ○ At least half of the time (2)

Page Break

X→

Were you ever in foster care as a child?

- ○ Yes (1)
- ○ No (0)

X→

Are you currently going to school?

- ○ Yes (1)
- ○ No (0)

X→

What is the highest grade you completed?

- ○ 9th grade or lower (1)
- ○ 10th grade (2)
- ○ 11th grade (3)
- ○ High school or GED (4)
- ○ Some college (5)
- ○ Graduated from college (6)
- ○ Some graduate or professional school (7)
- ○ Completed graduate or professional school (8)

Skip To: DEM21_1 If What is the highest grade you completed? != 9th grade or lower

---

X→

You said you completed 9th grade or less school. What is the highest grade you completed?

- ○ 1st grade (1)
- ○ 2nd grade (2)
- ○ 3rd grade (3)
- ○ 4th grade (4)
- ○ 5th grade (5)
- ○ 6th grade (6)
- ○ 7th grade (7)
- ○ 8th grade (8)
- ○ 9th grade (9)

Page Break

X→

What is your current employment status?

- ○ Not working (1)
- ○ Working part-time (2)
- ○ Working full-time (3)

X→

What are your sources of financial support? (check all that apply)

- ☐ Own job (1)
- ☐ Spouse or significant other (2)
- ☐ Parent or guardian (3)
- ☐ Other relatives (4)
- ☐ Public assistance (5)
- ☐ Other (please describe) (6) _____

X→ X→

What is your **household income** (the total income before taxes earned by all members of your household) per year?

- ○ $0 - $4,999 (1)
- ○ $5,000 - $9,999 (2)
- ○ $10,000 - $14,999 (3)
- ○ $15,000 - $19,999 (4)
- ○ $20,000 - $24,999 (5)
- ○ $25,000 - $34,999 (6)
- ○ $35,000 - $49,999 (7)
- ○ $50,000 or more (8)
- ○ Don't know (-99)

Skip To: DEM25_1 If What is your household income (the total income before taxes earned by all members of your househ... != $50,000 or more

X→ X→

You marked that your **household income** is $50,000 or greater. What is your household income (total income before taxes earned by all members of your household) per year?

- ○ $50,000 - $74,999 (1)
- ○ $75,000 - $99,999 (2)
- ○ $100,000 - $149,999 (3)
- ○ $150,000 - $199,999 (4)
- ○ $200,000 or more (5)

Page Break

X→

What is your **personal income** per year? (the total income before taxes earned by you)

- ○ $0 - $4,999 (1)
- ○ $5,000 - $9,999 (2)
- ○ $10,000 - $14,999 (3)
- ○ $15,000 - $19,999 (4)
- ○ $20,000 - $24,999 (5)
- ○ $25,000 - $34,999 (6)
- ○ $35,000 - $49,999 (7)
- ○ $50,000 or more (8)

Skip To: DEM27_1 If What is your personal income per year? (the total income before taxes earned by you) != $50,000 or more

X→

You marked that your **personal income** is $50,000 or greater. What is your personal income (total income before taxes earned by you) per year?

- ○ $50,000 - $74,999 (1)
- ○ $75,000 - $99,999 (2)
- ○ $100,000 - $149,999 (3)
- ○ $150,000 - $199,999 (4)
- ○ $200,000 or more (5)

Page Break

What happens to money when you get it?

- ○ Pay rent (1)
- ○ Pay utilities (2)
- ○ Pay back debt (3)
- ○ Pay medical expenses (4)
- ○ Pay for sex (5)
- ○ Buy food (6)
- ○ Buy clothes (7)
- ○ Buy drugs/alcohol (8)
- ○ Put some away as savings (9)
- ○ Make charitable donation (10)
- ○ Other (please describe) (11)

_____

In the past 6 months, who has helped you manage your money?

- ○ Family (1)
- ○ Friends (2)
- ○ Social worker (3)
- ○ Case manager (4)
- ○ Bank services (5)
- ○ Employment savings program (6)
- ○ Other (please describe) (7)

_____

In the past 6 months, what have you done with the money you received?

- ○ Paid rent (4)
- ○ Paid utilities (5)
- ○ Paid back debt (6)
- ○ Paid medical expenses (7)
- ○ Paid for sex (8)
- ○ Bought food (9)
- ○ Bought clothes (10)
- ○ Bought drugs/alcohol (11)
- ○ Put some away as savings (12)
- ○ Made charitable donation (13)
- ○ Other (please describe) (14)

_____

In the past 6 months, what has impacted your ability to receive money?

- ○ Lost employment (1)
- ○ Lost hours or shifts at work (2)
- ○ Incarcerated (3)
- ○ Moving (4)
- ○ Other (please describe) (5)

_____

- ○ None of the above (7)

X→

What country were you born in?

- ○ United States (1)
- ○ Other country (0)

Skip To: DEM30_1 If What country were you born in? = Other country

How many years have you lived in the United States?

_____

*

What is your current zip code?

_____

X→

Have you ever served in the military (Navy, Army, Marines, Air Force) or National Guard?

- ○ Yes (1)
- ○ No (0)

End of Block: Demographics

Start of Block: Home

The following questions ask about your living arrangements.

X→

During the past 30 days, how many days did you sleep in your home or apartment?

▼ 0 (0) ... 30 (30)

Display This Question:

If During the past 30 days, how many days did you sleep in your home or apartment? != 30

During the past 30 days, which of the following places did you sleep? (select all that apply)

- ☐ In my own home (1)
- ☐ In my parent's home (2)
- ☐ In the home of a friend or family member (3)
- ☐ In a shelter or emergency housing (4)
- ☐ In a motel or hotel (5)
- ☐ In a car, park, or other public place (6)
- ☐ In the home of a sexual partner or significant other (7)
- ☐ Recovery residence (including sober homes or Oxford houses) (8)
- ☐ Transitional housing (including halfway homes or three-quarter houses) (9)
- ☐ Jail or prison (10)
- ☐ Hospital (11)
- ☐ Detox facility (12)
- ☐ Somewhere else (13)

End of Block: Home

Start of Block: Homelessness

Do you currently have your own place to live or sleep?

- ○ Yes (1)
- ○ No (0)

In the past year, how many places have you lived?

▼ 1 (1) ... 20 (20)

Who do you currently live with? (select all that apply)

- ☐ Alone (1)
- ☐ Roommates, friends (2)
- ☐ Roommates, not friends (3)
- ☐ Family (4)
- ☐ Significant other (5)
- ☐ Other (6)

Display This Question:

If Who do you currently live with? (select all that apply) != Alone

How many people do you currently live with?

- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 or more (6)

How much freedom do you feel that you have to do what you want in your home?

- A lot (1)
- Some (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

End of Block: Homelessness

Start of Block: Rehab Substance

This next section will ask you about your experience with substance use treatment.

Which of the following substances are you entering treatment for? Check all that apply.

- [ ] Alcohol (1)
- [ ] Marijuana (Smoked) (2)
- [ ] Marijuana (Edible) (3)
- [ ] Marijuana (Vaped) (29)
- [ ] Synthetic Cannabinoids (K2, Spice, fake weed, etc.) (4)
- [ ] Synthetic Cathinones (bath salts, jewelry cleaner, plant food, etc.) (5)
- [ ] Cocaine (6)
- [ ] Crack (7)
- [ ] Methamphetamine (crystal, meth, ice, crank, etc.) (8)
- [ ] Heroin (smack, dope, dragon, etc.) (9)
- [ ] LSD/Acid (11)
- [ ] MDMA (ecstasy, Molly, party drugs) (12)
- [ ] Mushrooms (13)
- [ ] Ketamine (Special K) (14)
- [ ] DMT (15)
- [ ] PCP (angel dust, elephant tranquilizers) (16)
- [ ] Over-the-counter cough syrup (DXM: Alka Seltzer Plus, Coricidin, Delsym, Theraflu) (17)

☐ Over-the-counter stimulants (diet pills, cold pills, Sudafed) (18)

☐ Prescription stimulants (Ritalin, Vyvanse, Adderall) (19)

☐ Opioids/prescription pain medication (codeine, oxycodone, morphine, methadone, fentanyl, Vicodin, etc.) (20)

☐ Vasodilators/ED drugs (Viagra, Levitra, Cialis) (21)

☐ Prescription sedatives, tranquilizers, benzodiazepines (Xanax, Klonopin, Valium, Ambien, etc.) (22)

☐ Buprenorphine (23)

☐ Gabapentinoids (Neurontin, Lyrica, Tarlige, Avifen) (24)

☐ Kratom (25)

☐ Poppers (amyl nitrite) (26)

☐ Other (27)

☐ Refuse to answer (28)

Skip To: End of Block If Which of the following substances are you entering treatment for? Check all that apply. != Other

What other substance(s) are you in treatment for?

_____

End of Block: Rehab Substance

Start of Block: Inpatient/Outpatient

Is your current treatment inpatient or outpatient?

- ○ Inpatient (1)
- ○ Outpatient (2)

End of Block: Inpatient/Outpatient

Start of Block: Legal Requirement for Rehab

Are you legally required to attend rehab for substance abuse?

- ○ Yes (1)
- ○ No (0)

End of Block: Legal Requirement for Rehab

Start of Block: Formal Treatment Type

Start of Block: Treatment Commitment and Engagement

APPENDIX D

DAILY SURVEY MEASURES

Trigger: Timed for every morning at 7am
Snooze: To disappear if not completed by 1pm

GENERAL DAILY QUESTIONS
Tell us about what you did **since your last survey at (TIME AND DAY)**,

Variable Label	Item	Response Codes
CAS_MOOD1 Stem	Stem Please describe how you currently feel today.	
CAS_MOOD1A	Happy	1=Not at all happy 2 3 4 5 6 7 8 9 10=Very happy
CAS_MOOD1B	Angry	1=Not at all angry 2 3 4 5 6 7 8 9 10=Very angry

CAS_MOOD1C	Sad	1=Not at all sad 2 3 4 5 6 7 8 9 10=Very sad
CAS_MOOD1D	Content	1=Not at all content 2 3 4 5 6 7 8 9 10-=Very content
CAS_MOOD1E	Worried	1=Not at all worried 2 3 4 5 6 7 8 9 10=Very worried
CAS_MOOD1F	Relaxed	1=Not at all relaxed 2 3 4 5 6 7 8 9 10=Very relaxed

CAS_MOOD1G	Stressed	1=Not at all stressed 2 3 4 5 6 7 8 9 10=Very stressed
CAS_DEM1	How was your day yesterday overall?	1= Very Bad 2= Bad 3= Neutral 4= Good 5= Very Good
CAS_DEM2	How was your night last night?	1= Very Bad 2= Bad 3= Neutral 4= Good 5= Very Good
CAS_TREAT1 (archived to edit), TREAT1.1 used in replacement)	Did you attend any of the following yesterday? Select all that apply.	1= AA/NA 2=Therapy outside of treatment facility 3=Formal Treatment 4=Telehealth Meeting 5= Phone call with care provider or sponsor 6=None of the above
CAS_TREAT1.1	Did you attend any of the following yesterday? Select all that apply.	1= AA/NA 2=Therapy outside of treatment facility 3=Formal Treatment 4=Take medications to address substance use 5= None of the above
If TREAT1.1 =4		
CAS_TREATMEDS	What medication did you take as part of the treatment for your substance use?	1=Naltrexone (aka Vivitrol, Revia) 2=Acamprosate (aka Campral) 3=Disulfiram (Aka Antabuse) 4=Methadone (aka Methadose) 5=Buprenorphone (aka Suboxone, Subutex, Belbuca, Beltrans)
CAS_TEMPT1	Since your last survey, were you tempted to drink alcohol?	1=Yes 0=No
CAS_TEMPTLOC1 *Show if* CAS_TEMPT1 *=1*	Where were you tempted to drink?	*Location List*

CAS_TEMPTSOC1 *Show if* CAS_TEMPT1 *=1*	Were any of these people with you?	*Friends List*
CAS_ALC1	Did you drink any alcohol?	1=Yes 0=No
CAS_ALC3 Show is CAS_ALC1=1	If yes, how many drinks did you consume yesterday? Remember, a "drink" is 12oz of beer, 1.5oz of liquor (a shot), or 5oz of wine.	____ drinks
CAS_ALC4 Show is CAS_ALC1=1	How "drunk" did you get?	1= not at all drunk 2= a little drunk 3= somewhat drunk 4= very drunk 5=extremely drunk
CAS_ALC2 Show if ALC1 =0	How confident were you that you would be able to stay sober from alcohol yesterday?	1 = "not at all confident", 10 = "very confident"
CAS_TEMPT2	Since your last survey, were you tempted to use drugs?	1=Yes 0=No
CAS_TEMTLOC2 *Show if TEMPT1 =1*	Where were you tempted to use drugs?	*Location List* Other (text)
CAS_TEMPTSOC2 *Show if TEMPT1 =1*	Were any of these people with you?	*Friends List*

CAS_HDU1	Since your last survey, did you use any of the following substances? (check all that apply)	1=I did not use any drugs 2=Marijuana (smoked, edible or vaped) 3=Synthetic cannabinoids (K2, Spice, fake weed, etc.) 4= Synthetic cathinones (bath salts, jewelry cleaner, plant food, etc.) 5=Cocaine/crack 6=Methamphetamines (crystal, meth, ice, crank, etc.) 7=Heroin (smack, dope, dragon, etc.) 8=Hallucinogens (LSD/Acid, MDMA, ecstasy/molly, party drugs, mushrooms, ketamine, DMT, PCP, dust etc.) 9=Over-the-counter cough syrup (DXM: Alka Seltzer Plus, Coricidin, Delsym, Theraflu) 10=Over-the-counter stimulants (diet pills, cold pills, Sudafed) 11=Opioids/prescription pain medication (codeine, oxycodone, morphine, methadone, fentanyl, Vicodin, etc.) 12=Prescription stimulants (Ritalin, Vyvanse, Adderall) 13=Vasodilators/ED Drugs (Viagra, Levitra, Cialis) 14=Prescription sedatives, tranquilizers, benzodiazepine (Xanax, Klonopin, Valium, Ambien, etc.) 15=Buprenorphine (Belbuca, Probuphine, Butrans, Buprenex, Suboxone, bupe) 16=Gabapentinoids (Neurontin, Tarlige, Avifen, Lyrica) 17=Kratom 18=Poppers (Amyl nitrite) 19=Other -88 = Refuse to answer
CAS_HDU2 Show if CAS_HDU1=1	How confident were you that you would be able to stay clean and sober from drugs yesterday?	1 = “not at all confident”, 10 = “very confident”

CAS_HDU3 Show if CAS_HDU1does NOT=1	If selected any of the above: How "high" did you get?	1= not at all high 2= a little high 3= somewhat high 4= very high 5= extremely high
CAS_SEX1	Did you have sex (vaginal or anal) yesterday?	1=Yes 0=No
CAS_SEX2 Show if CAS_SEX1 =1	Did you use a condom?	1=Yes 0=No
CAS_SEX3 Show if CAS_SEX1 =1	How would you describe your sex partner from yesterday?	1=Steady partner 2=Casual partner 3=New partner 4=Partner that you exchanged money or drugs for sex
CAS_SOC1	Since your last survey, did you see anyone from your friend group?	1=Yes 0=No
CAS_SOC2 Show if CAS_TEMPTSOC1=1	Who did you see? (check all that apply)	*Friends List* Other (text)
CAS_SOC3 Show if CAS_TEMPTSOC1=1	While you were with the people listed above, did any of them: (check all that apply)	A= Consume alcohol B= Use drugs C= Engage in unprotected sexual activity D= Pick up a partner for sex E= Encourage you to drink F= Encourage you to use drugs G= Encourage you to engage in unprotected sexual activity H= Support you I= Get into a verbal disagreement with you J= Get into a physical fight with you K= Make you feel safe L= None of the Above
CR002	Have you been tested for the coronavirus? If so, what was the result?	1= I have been tested and I tested positive (I had coronavirus) 2= I have been tested and I tested negative (I did not have coronavirus) 3=I have been tested and I do not know the result 4=I have not been tested
CAS_COV1 Show is CR002 = 2	How stressed are you about getting COVID-19?	1=Not at all stressed 2=Slightly stressed 3=Moderately stressed 4=Very stressed 5=Extremely stressed

CAS_COV2 Show is CR002 = 2	I feel that the chances are good that I may get COVID-19	1=Strongly Disagree 2=Disagree 3=Neither agree nor disagree 4=Agree 5=Strongly Agree
CAS_COV1B Show is CR002 = 3	How stressed are you about getting COVID-19?	1=Not at all stressed 2=Slightly stressed 3=Moderately stressed 4=Very stressed 5=Extremely stressed
CAS_COV2B Show is CR002 = 3	I feel that the chances are good that I may get COVID-19	1=Strongly Disagree 2=Disagree 3=Neither agree nor disagree 4=Agree 5=Strongly Agree
CAS_COV1c Show is CR002 = 4	How stressed are you about getting COVID-19?	1=Not at all stressed 2=Slightly stressed 3=Moderately stressed 4=Very stressed 5=Extremely stressed
CAS_COV2c Show is CR002 = 4	I feel that the chances are good that I may get COVID-19	1=Strongly Disagree 2=Disagree 3=Neither agree nor disagree 4=Agree 5=Strongly Agree
CR005	Whether or not you have had a coronavirus test, has a doctor or another healthcare professional diagnosed you as having or probably having the coronavirus?	1=Yes 0=No 2=Unsure

CR015	In the last 24 hours, have you done the following: (select all that apply)	A=Gone out to a bar, club, or other place where people gather B=Gone to the grocery store or pharmacy C=Gone to a friend, neighbor, or relative's residence (that is not your own) D=Had visitors such as friends, neighbors or relatives at your residence E=Attended a gathering with more than 10 people, such as a reunion, wedding, funeral, birthday party, concert, or religious service F=Sought care from a hospital or health care facility G=Been placed in isolation or quarantine H=Remained in your residence at all times, except for essential activities or exercise I=Shared items like towels or utensils with other people J=Had close contact (within 6 feet) with people who live with you K=Had close contact (within 6 feet) with people who do not live with you L=Gone outside to walk, hike, or exercise
CR0016	Which of the following have you done in the last 24 hours to keep yourself safe from coronavirus? Only consider actions that you took or decisions that you made personally. (select all that apply)	A=Washed your hands with soap or used hand sanitizer several times per day B=Canceled or postponed air travel for work C=Canceled or postponed air travel for pleasure D=Canceled or postponed work or school activities E=Canceled or postponed personal or social activities F=Visited a doctor G=Canceled a doctor's appointment H=Stockpiled food or water I=Avoided contact with people who could be high-risk J=Avoided public spaces, gatherings, or crowds K=Prayed L=Avoided eating at restaurants M=Stockpiled hand sanitizer or disinfectant wipes N=Worked or studied at home O=Worn a mask or other face covering P=Stockpiled medication

CAS_COV4	Are you planning to practice social distancing (purposely staying away from others) today in response to COVID-19?	1=Yes 0=No
CAS_SUPPORT1	Did you seek out any support from any of the below sources?	A= An individual B= A phone app C= A website D= Other
CAS_SUPPORT2 *Show if CAS_SUPPORT1=A*	Who did you reach out to for support?	*Friends list Other (text)
CAS_SUPPORT3 *Show if CAS_SUPPORT1=A*	How did you contact them? Select all that apply	A= Phone call B= Texting C= Email D= Through a social media app (such as Facebook or Instagram) E= In person
CAS_SUPPORT4 *Show if CAS_SUPPORT1=B*	Which app did you use to find support?	Text
CAS_SUPPORT5 *Show if CAS_SUPPORT1=C*	Which website did you use to find support?	Text
CAS_SUPPORT6 *Show if CAS_SUPPORT1 =D*	What was the other source of support you found?	Text
CAS_OPT1	How optimistic do you feel about tomorrow?	1= Very Bad 2= Bad 3= Neutral 4= Good 5= Very Good

APPENDIX E

MARIJUANA AND TREATMENT QUALITATIVE SCRIPT

Marijuana Use and Treatment Questions

During this part of the interview, we are interested in learning how people entering treatment for alcohol or other substances use and perceive marijuana in relation to their treatment goals. We will ask you about your marijuana use and the marijuana use of people you know and how that may affect treatment.

1. How would you describe your treatment goals?
    a. Have they changed since you first entered treatment?
    b. If yes, how have they changed?
2. How does the marijuana use of other people in your life or around you affect your use of alcohol or other substances?
3. What did you think about marijuana before you entered treatment?
    a. PROBE: Has this changed since you entered treatment?
    b. PROBE: Why do you think you feel that way
4. Do you know anyone that has used marijuana during their treatment? **IF NO SKIP TO BOLD 5**
    a. How do you think marijuana affects their treatment goals?
5. **Have you ever used marijuana? IF NOT SKIP TO BOLD ITALIC**
6. Can you tell me about the first time you used marijuana?
    a. How old were you?
    b. Were you alone or with other people?
    c. What did you think about marijuana after you tried it the first time?
7. Have you used marijuana since you entered treatment? **IF NO, SKIP TO BOLD ITALIC**
    a. Do you think it has been a positive or negative experience?
8. How do you typically use marijuana?
    a. Smoking, edibles, vaping etc
9. Do you ever use any marijuana products like Delta 8, Delta 10, or THC-O?
    a. What is that like in comparison to typical marijuana?
10. Do you use marijuana for a specific purpose?
    a. Sleep, pain, mental health
11. How does marijuana affect your use of alcohol or any other substance other than marijuana?
    a. PROBES: Does using marijuana help you avoid other substance use?
    b. PROBES: When you use marijuana do you have any cravings for other substances?
12. Do you use marijuana with others, like sharing joints or blunts?
    a. **If yes,** what is that usually like? Do you prefer to use marijuana with others?
    b. **If no**, do you prefer to use marijuana alone? Is there a reason why?

13. How would you describe marijuana use in relation to your treatment goals?
    a. PROBE: Has using marijuana been a positive for your treatment? A negative? Mixed?
14. Where do you usually get your marijuana from?
    a. PROBE: Do you have a marijuana card? Do you usually get it from people other than a retail store? What is that like?
15. ***Is there anything else you'd like to say about marijuana or using marijuana during treatment before we end the interview?***
16. Do you think people that are in treatment can use marijuana safely?
    a. PROBE: Why do you think they can or cannot use marijuana safely?