2023

Marijuana Cultivation Laws and Admissions for Cannabis Use Disorder in US Substance Abuse Treatment Facilities

nada al-rubaiee
Walden University

Walden University

College of Management and Human Potential

This is to certify that the doctoral study by

Nada Al-Rubaiee

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Kourtney Nieves, Committee Chairperson, Health Sciences Faculty
Dr. Mary Garbowski, Committee Member, Health Sciences Faculty
Dr. Lloyd Ford, University Reviewer, Health Sciences Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2022

Abstract

Marijuana Cultivation Laws and Admissions for Cannabis Use Disorder in US Substance Abuse Treatment Facilities

by

Nada Al-Rubaiee

BSC, University of Leiden, 2003

MSC, University of Utrecht, 2008

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Healthcare Administration

Walden University

November 2022

Abstract

With approximately 4.4 million Americans addicted to cannabis, it is considered a dominant non-medical drug that is common in the US. The purpose of this study was to investigate the possible contribution of the state laws that allow the cultivation of marijuana to Marijuana Medical (MM) program cardholders on cannabis addiction. This study was conducted to address the issue of the increase in demand for cannabis-related admissions that contribute to an upsurge in the unmet treatment needs. The study is founded on the Ecological Models proposed by Urie. The key research question explored the association between state laws that allow cardholders to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019. This quantitative study used data collected from US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019, which helped to determine the relationship between cardholder and caregiver cultivation policies and the percent of CUD admissions. The results indicated that there is a negative relationship between states' allowing of cardholders and caregivers to cultivate cannabis and CUD rates. Results from this study suggest that systemic factors play a strong role in whether or not marijuana laws are associated with CUD rates. Therefore, it is critical to now view the links between cannabis laws and usage disorders in isolate, and, to instead, consider the broader multidimensional nature of these relationships. Findings may be used by legislators to promote positive social change.

Marijuana Cultivation Laws and Admissions for Cannabis Use Disorder in US Substance Abuse Treatment Facilities

by

Nada Al-Rubaiee

BSC, university of Leiden, 2003

MSC, university of Utrecht, 2008

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Healthcare Administration

Walden University

August 2022

Table of Contents

List of Tables

List of Figures

Section 1: Foundation of the Study and Literature Review

Introduction

The topic of the study, Marijuana Cultivation Laws and Admissions for Cannabis Use Disorder (CUD) in US Substance Abuse Treatment Facilities, is found on the need to determine if there is any relation between State laws and the admissions for cannabis use disorder in the US. There is an increase in the number of admissions related to marijuana and substance abuse (Davenport, 2018). The increase in the number of admissions for marijuana and substance abuse comes at a time when the state laws have allowed cardholders to cultivate medical marijuana plants (Ekendahl, Månsson, & Karlsson, 2020). Under the medical marijuana program, different states have enacted laws that provide access to medical marijuana for patients who have serious medical conditions for use in a safe and effective method. The program advocates for use of marijuana in a manner that balances the patient need for access to the latest treatments with the necessary care and safety. Some of the health conditions that are treated using marijuana include Alzheimer, ALS, Cancer, epilepsy, seizures, glaucoma, Posttraumatic stress disorder (PTSD), and severe pain among others (Shishko et al., 2018). However, it is not clear whether the introduction of state laws through the marijuana medical program has a significant effect on substance abuse. As such, there is a need to conduct the study to determine, based on the data and facts, whether the increase in substance and drug abuse is significantly influenced by the decisions by the States to allow cardholders to cultivate medical marijuana plants. The findings from this study can form the basis for the review

of the laws if there is an association between allowing cardholders to cultivate marijuana and the increase in admission and hence reduce the level of addiction among the people.

A significant number of studies that focus on cultivation laws suggest that home cultivation of medical marijuana influences the overall use of the substance in the general population because it results in diversion of marijuana to individuals, thereby increasing the availability of marijuana and subsequent use (Nussbaum et al., 2015, Pacula et al., 2015). There has been little research emphasis on the influence of medical marijuana (MM) caregiver and cardholder cultivation laws on cannabis-related admissions. These linkages could be better substantiated. No known research has focused on determining the extent to which legalizing and not legalizing cardholder and caregiver MM cultivation in a state influences the prevalence of cannabis use disorder admissions in substance abuse facilities. There is a need to conduct a comprehensive empirical based study to determine whether there is an association between the MM programs and an increase in marijuana abuse. In the following section, the problem statement, the purpose of the study, research questions and hypothesis, theoretical foundation of the study, the nature of the study, and the literature search strategy are discussed. In addition, the definition of terms, the study assumptions, scope and delimitations are covered in section. Section 1 of the proposal ends with a summary and conclusion section.

Statement of the Problem

With approximately 4.4 million Americans affected in 2018, cannabis addiction is a dominant non-medical drug consumption disorder common in the U.S (Davenport,

2018; Hasin et al., 2017). The prevalence of marijuana addiction increases the demand for cannabis-related admission and treatment, which in turn impacts healthcare resource utilization in substance abuse treatment facilities (Ditre, Zale & LaRowe, 2019; Ekendahl, Månsson & Karlsson, 2020). In addition to the problem of an increase in healthcare resource utilization, the rise in demand for cannabis-related admissions contributes to an upsurge in the unmet treatment needs – since healthcare funding and resources for substance abuse facilities are not commensurately increasing alongside demand (Kiselica et al.,2018; Hyshka, Anderson, and Wild, 2017).

Purpose of the Study

The purpose of the quantitative cross-sectional study is to explain how the association between the medical marijuana cardholder and caregiver cultivation laws (MM) and the generality of cannabis addiction admissions in U.S. substance abuse treatment facilities. In this study, the researcher seeks to correlate state laws that allow ***cardholders*** to cultivate medical marijuana plants and the percent of state CUD admissions reported. In this case, the dependent variable is the admission in the U.S substance abuse while the independent variable is the adoption of the state laws

Research Question(s) and Hypotheses

RQ 1 – What is the association between state laws that allow ***cardholders*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?
H1: There is a positive and statistically significant association between state laws that allow **cardholders** to cultivate medical marijuana plants and the percent of state CUD

admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019.

H0: There is no statistically significant association between state laws that allow **cardholders** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019.

RQ 2 – What is the association between state laws that *disallow **cardholders*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a statistically significant relationship between state laws that *disallow **cardholders*** to cultivate medical marijuana plants and the percent of state CUD 2015 and 2019?

H0: There is no statistically significant relationship between state laws that *disallow **cardholders*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

RQ 3 – What is the association between state laws that *allow **caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a statistically significant relationship between state laws that *allow **caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions

reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H0: There is no statistically significant relationship between state laws that *allow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

RQ 4 – What is the association between state laws that *disallow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a statistically significant relationship between state laws that *disallow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H0: There is no statistically significant relationship between state laws that *disallow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

RQ 5- What is the association between state laws on medical marijuana cardholders and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a statistically significant relationship between state laws on medical marijuana cardholders and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H0: There is no statistically significant relationship between state laws on medical marijuana cardholders and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

Theoretical Framework

This study's theoretical framework will focus on the Ecological Models proposed by Urie Bronfenbrenner in the 1970s, an activity that was later formalized into a theory in the 1980s (Bronfenbrenner, 1977; Bronfenbrenner, 1986; Bronfenbrenner, 1992). The ecological model focused on population and individual determinants of practices or behaviors. It explains how the various levels of influences determine health-related practices and outcomes. These levels constituted the public policy, the organizational, interpersonal and intrapersonal, and the community (Stockings et al., 2018). Concerning health care practices, public policy can be defined as the local, national, and international laws and guidelines implemented on the CUD. However, the community factors consist of the union from different organizations and institutional networks within a specific boundary. The institutional factors are the social institutions consisting of organizational components and formal, informal guidelines and regulations for operations. Lastly, the interpersonal activities and social groups are connected to both usual and unusual social networks. It also includes support systems such as families, workgroups, and relationship networks. Ideally, the intrapersonal factors consist of individual characteristics that are,

attitudes, behavior, and individual developmental history (Woosnam et al., 2018). Based on the previous Bronfenbrenner research, two considerations make the Ecological Model suitable for this study and help determine how marijuana influences Medical Marijuana cultivation laws on the prevalence of Cannabis Use Disorder (CUD) Admissions into U.S Substance Abuse Treatment Facilities.

The first construct of the Ecological Model pinpoints the key social and environmental dimensions that can help explain health-seeking practices like voluntary and involuntary admissions for CUD into substance abuse facilities. The Construct of 'Public Policy' for instance is of relevance to this study because it relates to the central independent variables of the study – MM cultivation policies. Based on the previous findings, the public policy factor consists of local, state, federal policies, and laws that regulate or support health programs and practices that prevent, control and manage diseases. They also include policies that relate to resource allocation and organizational functioning. However, the public policy construct of the ecological model suggests that the presence of a policy that favors caregiver and cardholder cultivation of Medical Marijuana may influence the prevalence of CUD admissions into substance abuse facilities. Findings from this study may support, refute, or add to this assumption of the Ecological Model.

Secondly, the Ecological Model has been used extensively in research areas that are similar in focus to those of this study such as multiple healthcare administration and systems research including studies that explain upstream determinants of service access, uptake, and resource utilization (Taylor & Haintz, 2018; Ma, Chan, & Loke, 2017; Chiu,

Dushoff, Yu, & He, 2017; Spencer, & Grace, 2016; Manuel et al., 2016). For example, Ma et al. (2019) used the Ecological Model to explore the varying patterns and critical factors associated with involuntary admissions based on the implementation of China's mental health law. Taylor and Haintz (2018) leveraged the theory to examine the impacts of social stressors or constructs of health when providing or accessing healthcare services among refugees in Australia. In the case of the U.S, Manuel et al. (2016) used the Ecological Model to frame their study that determined the threats and promoters of a successful progression from long-term residential substance abuse and treatment. If earlier studies confirm the strength of the Ecological Model in determining factors that influence healthcare service access, uptake, and resource utilization, it may well serve as a good theoretical framework for this study.

The ecological public health model has been used to examine medical marijuana laws, uses, and impact. According to Lang and Rayner (2012), one of the goals of this framework application has been to determine the impact of MML on opioid use and/or overdose mortality. Studies have sought to establish an association between state-level interventions (MML) with statewide opioid use, including prescription opioid use disorder. Many of these studies focus on chronic pain patients and seek to understand the efficacy of offering legal medical marijuana as an opioid alternative. For example, Lake et al. (2019) observed that frequent cannabis use was negatively related to frequent opioid use for individuals with chronic pain. Illustrating that cannabis use may circumvent illicit, unsupervised, and often dangerous, opioid use to manage medical issues such as chronic pain. Indeed, a substantial number of U.S. adults report that they substitute marijuana for

opioids (Ishida et al., 2019), with one national survey reporting a decrease in opioid use by marijuana substitution from 41% of respondents. However, other studies have failed to demonstrate such an association, particularly as it relates to the legality of marijuana, and more specifically among prescription opioid users (Segura et al., 2019).

The application of the ecological public health model to XML has been criticized. Critics argue that the use of an ecological framework to examine substance use disorder/treatment in relation to medical marijuana legality is flawed. Caputi and Humphreys (2018) claim the approach results in what is referred to as the "ecological fallacy" -defining the speculation of the population correlations which defines the parallel individual correlations. Ecological framework studies therefore often misconstrue state-level interventions, such as mm cultivation laws or legal protection for dispensaries, with individual-level effects. Proponents of the ecological approach to the study of MML agree that while the model cannot be accurately applied to individual-level exposure, such as IMU, it can be applied to measurable state-level exposure including state treatment center admissions (Alharbi, 2020). Additionally, problems in measurement, specifically with past-month use, are argued to further influence studies on statewide MML and increased use. Sarvet et al. (2018) argue that many studies showing an association between state MML and higher use in adolescents are flawed. Some suggest that changes in use measurement are influenced by the null effect on the previous month's use, by the transition of casual marijuana users to heavy/daily users (Scholes-Balog et al., 2016).

Similarly, Hunt and Miles (2017) provide their preferences through the study design and results on the impact of legalizing and regulating marijuana. They reviewed three critical factors of causal inference during observational studies and estimated medical influences. Relatively, they focused on the implementations of cannabis addiction and intervention definition and the measurement outcome to understand the impacts of drug use. Their results demonstrate that heterogeneity of study approaches, definitions, and operationalized variables, makes cohesive results elusive. Such findings and topics of debate indicate the need for more specified approaches and a narrowing of focus when it comes to the areas on which medical marijuana legalization has the highest impact.

Nature of the Study

By analyzing the previous studies on marijuana use, the review presented various methodological components on the documentary survey, qualitative analysis, observation research, conducting interviews, and administering questionnaires. These methodologies provide accurate data and information on how cannabis use disorder influences the population. Several justifications exist for this multi-faceted research quantitative research design.

The quantitative cross-sectional research design adopts a systematic approach that will be critical for the current study. Notably, the study will require in-depth insight to help decipher and explain the association between the medical marijuana cardholder and caregiver cultivation laws (MM) and the generality of cannabis addiction admissions in U.S. substance abuse treatment facilities. According to Apuke (2017), the quantitative

cross-section research design takes on a systematic approach that utilizes empirical investigations of observable phenomenon. This approach is thus essential for the study since it will help provide a methodological approach to help understand the correlation between medical marijuana cardholder and cultivation laws in relation to escalations in cases related to medical marijuana use, which will shed light on the contribution of US cannabis addiction admissions and the rising inability of healthcare facilities to deal with associated medical issues in the population. Notably, numerous assumptions are underlying this relationship. For instance, some scholars have suggested that medical marijuana use and the emergence of cardholder and cultivation laws dos do not impede the ability of US medical facilities to deal with health cases arising from associated policies but that most of the individuals having marijuana consumption-related medical issues developed such problems long before the stipulations came into existence (Bloomfield & Fisher, 2019; Zyphur & Pierides, 2019). Such assumptions necessitate the need to prove or disprove underlying opinions, which makes the select research design approach critical.

Various states allow the home growing of medical or recreational marijuana: Washington, D.C, Alaska, Vermont, Arizona, California, Colorado, Maine, Hawaii, Illinois, Massachusetts, Michigan, Missouri, Montana, Nevada, New Mexico, Oklahoma, Rhode Island, and Washington (Alharbi, 2020). In the following states, the medical use of marijuana is approved but home growing is prohibited: West Virginia, Connecticut, Delaware, Florida, Iowa, Louisiana, New Hampshire, Maryland, Minnesota, New Jersey, New Mexico, New York, North Dakota, Ohio, Pennsylvania, Utah and Arkansas (Cook

et al., 2020). In Nebraska, North Carolina, South Carolina, South Dakota, Tennessee, Texas, Virginia, Wisconsin, Alabama, Georgia, Idaho, Wyoming, Kansas, Kentucky, Indiana, and Mississippi, medical use, home cultivation, and recreational use is prohibited (Chiang et al., 2019).

Comprehending the factors related to escalations in the inability of health facilities to cater to the needs of US medical marijuana users and cardholders will require data that is gathered from specific points in time. More importantly, the pool of participants selected for study in such an exercise requires data on demographic variables such as income, education, age, ethnicity, and geographical locations. The quantitative cross-sectional approach allows the researcher to take into account such aspects but is incapable of removing demographic variables-based assumptions (Zyphur & Pierides, 2019. Thus, the co-joined document survey and observation research approaches satisfy the need to quench such assumptions given that they help eliminate assumptions while simultaneously replacing them with actual data on the particular variables (Apuke, 2017). Integrating interviews and questionnaires into the study's data collection approach also fosters credibility through the removal of assumptions. As indicated by Bloomfield and Fisher (2019), these two instruments help researchers compare literature-based data with actual data leading to the acquisition of information that cannot be directly observed and proven. However, such proficiency will require accurate insight into the key study variables.

The independent variables in this study comprise state laws that allow/disallow cardholders to cultivate medical marijuana plants, MM cultivation policies, and variable

is the admission in the U.S substance abuse. Dependent variables to consider in the study include the percentage of individuals using marijuana for medicinal purposes and the percentage of marijuana patients that have been admitted for Cannabis use disorder The dependent variables will as well require careful consideration into covariates such as socio-demographic factors, potential antecedents to the development of medical problems among medical marijuana users and cardholders, self-harm, mortality, unintentional overdose, medical assistance seeking behaviors, and CUD admissions. These independent, dependent, and covariates necessitate the need for quantitative analysis in this study. As indicated by Bloomfield and Fisher (2019), qualitative analysis helps explore the interactions between individual behaviors and systems, which makes it essential for analyzing data obtained using the document survey and observation techniques.

Literature Search Strategy

The literature review section presents the scholarly article and previous literature on how cannabis use disorder has been documented concerning its Influence in the contemporary world. Medical research and proportionalities demonstrate that CUD is a growing area of study; however, no accurate measures or law limits the use of cannabis; since some countries have legalized the drug. Relevant research literature from the last four years will use in this study to explore the impacts of CUD on medical sectors and the global society. The dynamic nature and legalization of medical marijuana from state-to-state form part of the imperative research. The literature study consists of a contemporary understanding of the CUD and provides the current and relevant state of research in

Marijuana use or consumption. In this case, the literature studies will be conducted based on several factors.

The study's theoretical framework will form a foundational basis for the current study as the ecological model will help explain how the various levels of influences associated with medical marijuana consumption determine health-related practices and outcomes. These levels constituted the public policy, the organizational, INTERPERSONAL and intrapersonal, and the community (Stockings et al., 2018). Another factor that will be considered in this study is the legality of medical marijuana in the US as well as the Legal status and guidelines allowing for the cultivation of medical marijuana among cardholders and caregivers. The study will also take into account CUD, prevalence, diagnosis, prognosis, impact on life, demographics, current treatment, and legality as it varies from state to state, and in comparison, to legality in other countries.

To write the literature review, the following online databases and search engines were used: PubMed, Google Scholar, Psych Info, EBSCOhost Online Research Databases, and Journal Seek with a specific preference for articles under four years. The key search terms and combination of search terms that were input to various online databases included the following: *medical marijuana, mm cardholders, CUD admissions, medical marijuana legality, CUD prevalence, medical marijuana cultivation, CUD prognosis, Cannabis use disorder, medical marijuana, cardholder, caregiver, marijuana laws, CUD prognosis, and CUD facilities readiness.* All the key terms used were able to yield studies that were relevant to the problem and research questions. Using these keywords (both individually and in combinations), relevant studies will be generated

from database searches. Only those deemed to be relevant to the current study were included in the literature review.

The following sections outline the theoretical/conceptual framework of the study and how they impact the topic of research. The relevant studies are organized into categories, progressing through the broad topics pertinent to the present study, and identifying the existing literature gaps. Finally, the chapter will have a conclusion will discuss how the gaps were established based on the existing literature.

Literature Review Related to Key Variables and/or Concepts

Description of Studies Related to the Constructs of Interest and Chosen Methodology

The studies related to the constructs of interest deployed diverse methods that made them consistent and relevant to the scope of the study. For instance, Jutras-Aswad et al. (2019) leaned on the qualitative approach while investigating the correlation between the emergence of MMLs and the admission of adult populations for CUD. This approach was critical to the current study in that it provided sufficient details touching the relationship between these two components. Using a sample of 100 medical practitioners dealing with CUD patients, the scholars used interviews to collect data, which was then analyzed to generate new insights into the correlation. In a similar study, De Aquino et al (2019) used the qualitative method to investigate the belief that cultivation laws, and especially the provision for medical marijuana patients and caregivers to grow the plant led to increases in marijuana consumption among non-marijuana patients.

Notably, this approach was particularly useful in the current study in that it provided an in-depth understanding of the perception that cultivation laws have not been

expedient in restricting the use of the substance in society. However, it is important to note that the small sample sizes used in studies that engaged the qualitative paradigm implies that the information generated could not be generalized for reliable conclusions given the scope of the current study. Therefore, it was essential to take into account studies touching on the constructs that leaned on a quantitative approach. For instance, Freisthler et al. (2020) conducted a study using the quantitative methodology while attempting to unearth the relationship between MMLs and increases in CUD admissions among US medical facilities. This particular study encompassed the use of data from medical facilities, which was systematically organized to generate numerical information. Using the same approach, Sarvet et al. (2018) and Smart and Pacula (2019) leaned on the quantitative paradigm to test whether existing cultivation laws had aggravated the use of marijuana by non-patients due to the compromise of caregivers to the substance demands by patients and non-patients. Jointly, the qualitative and quantitative paradigms deployed by the studies used in this study contributed to a more succinct understanding of the issues underlying medical marijuana and the laws that have been put in place.

Research Approaches, Choice of Variables, and Underlying Strengths and Weaknesses

Researchers in the discipline seems to have adopted different ways of approaching problems related to medical marijuana, cultivation, and CUD. For instance, Sarvet et al. (2018) and Segura et al (2019) took on an approach that was based on the influences generated by medical marijuana on the consumption of the substance among friends and family members that are not allowed to use the substance for medicinal

purposes. Notably, the chief strength of this approach stems from the fact that such a research perspective is critical for determining whether current laws seal or leave open loopholes that can be exploited by non-patients to gain access and consume marijuana despite the current legal restrictions. Nonetheless, the approach raises concerns about the ability of the studies to capture the impacts exerted on people in different age groups by the legalized cultivation of the substance by patients and non-patients. This is a major weakness of this particular approach. Further, the comments made by Sarvet et al (2018) that the study was limited in generating findings to help predict the non-patient consumption rates among adolescents evidence the fact that studies that adopted the approach of generating generalized results are unable to help in predicting whether cultivation laws have had similar or different impacts on different genders and age groups.

Additionally, the approaches used by researchers drew their strength from the variables that were selected to guide the scholarly investigations. For instance, Choi and DiNitto (2019) used variables such as paranoia, altered appetite, delusions, and state of mind, sleeping patterns, and mood patterns (Budney, Sofis & Borodovsky, 2019) as variables while investigating whether medical marijuana laws have generated more problems for patients whom they are meant to help treat. Notably, these variables are critical to understanding the nature of impacts that medical marijuana has produced among patients and are also expedient in determining whether the laws are creating more harm than good. Justifying the use of these variables, Lekoubou et al (2020) observed that marijuana has been proven to cause alterations in sleep patterns and as well makes it

almost impossible for individuals to maintain appropriate moods the hallucinations that stem from consistent use notwithstanding. Further, Choi, Dave, and Sabia (2019) noted that in over 67% of cases of CUD admissions, both adolescent and adult patients suffer from paranoia and severe hallucinations. From such a perspective, the variables used by researchers in the discipline while investigating issues related to medical marijuana laws and CUD admissions were both critical and useful in ensuring the generation of reliable conclusions.

Review and Synthesis of Variables

While undertaking scholarly investigations on the medical marijuana laws relative to the CUD problem, researchers used two chief dependent variables. These are the percentage of individuals using marijuana for medicinal purposes and the percentage of marijuana patients that have been admitted for CUD. Notably, the aforementioned two dependent variables generated varying conclusions for the different researchers. For instance, Choi, Dave, and Sabia (2019) indicated that the percentage of individuals consuming the substance based on the current legal provisions has been on the rise, which is reflective of the rising numbers of CUD admissions. From such a perspective, it would be logical to assert that medical marijuana laws have been unable to manage the numbers of people that are increasingly claiming to have medical conditions that require them to be designated as marijuana patients. The implications of such an assertion are of paramount consideration given the rising cases of CUD admissions. According to Jutras-Aswad et al (2019), the ineffectiveness or lack of commitment by hospitals and law enforcers when it comes to scrutinizing patients before giving them the legal go-ahead to

consume marijuana is to blame for CUD admissions escalations. Therefore, it can be argued that as a dependent variable, the percentage of individuals using marijuana for medical purposes has been increasing and setting the stage for more CUD cases.

The percentage of people being admitted for Cannabis use disorder independent variable tells volumes about the effectiveness of marijuana laws, and especially with regards to cultivation. According to Freisthler et al (2020), the fact that marijuana patients are increasingly being admitted for cannabis-related disorders implies serious leakages in the current cultivation laws. On the other hand, Segura et al (2019) indicated that the percentages of this second variable have been heightening owing to the inability or reluctance of law enforcement agencies with regards to strict implementation. From such a perspective, it would be logical to assert that this variable is heavily influenced by both cultivation and distribution laws. Affirming this point of view, De Aquino et al. (2019) posited that in states where cultivation laws are not strictly observed, both caregivers and patients exceed the allowed and pre-determined plants, which leaves sufficient room for illegal distributions and consumption by non-patient friends and families. As such, it is imperative to note that this second independent variable requires researchers to investigate potential approaches that can be used to ensure that caregivers and marijuana patients adhere to the predetermined state stipulations.

Independent Variables, Covariates, and Coding

The year during which US states implemented medical marijuana legislation has been adopted as variable of interest in various studies. As defined by Jutras-Aswad et al (2019), this variable connotes the adoption of medical marijuana stipulations allowing researchers to base their arguments on the resulting influences on CUD admissions. Researchers coded this independent variable for the respective years that US states passed MMLs, zero otherwise. Several covariates were also incorporated in the existing literature. These included possession limits for medical marijuana, cultivation stipulations, and marijuana availability. Defining these covariates Lekoubou et al. (2020) presented them as critical elements for guiding investigations to avoid generating unreliable conclusions based on limited views on cultivation, distribution, and availability of the substance among societies. The coding for these covariates was based on this definition as well as standard deviations and means acquired from acquired data.

Review of Literature Related to Study Variables

Medical Marijuana Laws

Marijuana use has transitioned over the decades from criminalization to legalization and medical use. Nonetheless, the usage of marijuana has always elicited heated debates, and especially, the emergence of Medical Marijuana Law (MMLs), which according to Sarvet et al. (2018) signify the delineation of state-level punishments for usage, possession, and cultivation. It is also important to note that these laws are meant to cover patients after they obtain the requisite doctor certification and approval making them immune from legal prosecution. On the other hand, Wall et al (2019) indicated that

MML gives patients sufficient and solid legal grounds for the designation of caregivers, which play the role of purchasing or growing the product on behalf of their certified clients. Whereas the intentions behind MMLs are legit and focused on helping patients deal with medical issues, scholars and policymakers have been concerned that the signing of MML bills into law will imply that over 40% of American citizens will be permitted to use the drug without legal interferences (Rong et al., 2017). Further, opponents have asserted that despite the medical expediency of MMLs, the underlying social issues stemming from the ability of the drug to pave way for the use of other substances should be considered to ensure a balanced approach to marijuana usage by patients and communities. For instance, it is worth noting that researchers have already established that over 35% of individuals that use marijuana are more open to consuming and abusing other illicit substances like cocaine and alcohol compared to individuals that do not incline Marijuana usage (Cerdá et al., 2018; Kaskie et al., 2017). Notably, such a perspective is critical in understanding the appropriateness or inexpediency of MMLs.

Whereas such arguments should be taken into account in light of MMLs, it is equally imperative to appreciate that research efforts have already proven the efficacy and safety of medical marijuana consumption. For example, Santaella-Tenorio et al (2017) recorded that the drug can be medically used to help patients handle side effects associated with chemotherapy besides being efficacious in cases of AIDS symptoms, epilepsy, multiple sclerosis, and glaucoma. Often, a proponent of MMLs has presented sufficient evidence to affirm the necessity of medical marijuana with most evidence pieces focusing on the proficiency of the drug to relieve chronic pain, help manage

muscle spasms, appetite loss, and nausea. However, the existence of evidence that marijuana usage increases the chances of individuals engaging in criminal activities or turning to additional substances (Wall et al., 2019) has continued to serve as a fortress and strong basis for the arguments of MML opponents. Other concerns depicted in the literature are related to the correlation between medical laws associated with marijuana and trends exhibited by traffic fatalities.

Traffic Fatalities and MMLs

Literature has indicated that the stalemate in the MML debate stems from the association of marijuana usage and traffic fatalities. According to Klieger et al (2017), this perspective has been increasingly turning into a chief point of interest given that Americans aged between 7 and 35 years have been dying out of road accidents that have been associated with marijuana and alcohol usage. Whereas proponents of MML astonishingly avoided discussions arising from this point of view, the opponents have repeatedly produced evidence to back up their claim that MMLs will likely prove a fatal decision. For instance, Cook, Leung, and Smith (2020) observed that between 1990 and 2009, which is a period when thirteen US States enacted MML was marked by significant increases in traffic fatalities that took the lives of over 4,000 adults the child and teenage fatalities notwithstanding. Notably, such data speaks volumes concerning the influences of MML on road safety and traffic mortality.

Conversely, proponents of MML have contradicted the reliability of such findings in determining whether MMLs are appropriate. According to Lee, Abdel-Aty, and Park (2018), although such records may be useful in projecting the implications of sustained

MMLs, they do not provide ample grounds for policymakers to denounce medical marijuana given the close association between marijuana consumption and alcohol tendencies. Notably, such a point of view also suggests that MMMLs have contributed immensely, or may be expected to contribute to increased road fatalities given the already established correlation between marijuana consumption and the inclination to engage other narcotic substances (Fink et al., 2020). However, it would be imperative to note that road fatalities cannot be entirely linked to medical marijuana consumption given the absence of ample literature-based evidence that links marijuana usage directly to traffic fatalities without incorporating the contributions of alcohol or drugs like cocaine.

Studies attempting to link or delink MMLs from traffic fatalities have been on the increase. Given that the MML stalemate stems from the inability of existing studies to disassociate alcohol or other substances from road accidents, scholars have resulted in more focused approaches while attempting to solve the stalemate. For instance, Fink et al (2020) took on an approach that investigated the traffic fatality trends on weekends to determine whether the alcohol impact resulted in more fatalities. In this study, the researchers discovered that traffic fatalities associated with medical marijuana cases increased during the weekends and during night times. Notably, these are the periods when people consume alcohol in increasing amounts. From such a perspective, it would be logical to assert that MMLs do not necessarily point towards increased traffic fatalities since accident increases appear to be directly correlated with alcohol consumption. Nonetheless, Anderson, Rees, and Tekin (2018) negated this perspective arguing that the proven association between marijuana use and consumption of alcoholic drinks implies

that unless most of the traffic fatality cases were linked to patients using marijuana for medical purposes, the traffic mortality rates would assume the same trends as is the case during daytime and week-days.

Medical Marijuana and Driving-related Functions

Opponents of MMLs have argued against the sustenance and adoption of such laws by the US States based on the established correlation between the impairment of driving functions and marijuana usage. Although the proponents have argued that the impairments have never been associated with marijuana in the absence of alcohol consumption (Bartos, Newark, & McCleary, 2018), there seems to be sufficient evidence to imply that the position taken by the opponents is much more convincing. For instance, Lee, Abdel-Aty, and Park (2018) noted that drivers that take marijuana are at greater collision risks when driving because the drug accounts for more than 29% of traffic fatalities in cases where drivers had consumed marijuana. Presenting an argument for unequivocal evidence attaching MMLs to driving functionality impairments and the resulting road accidents, Cook, Leung, and Smith (2020) observed that over 41% of cases of college student accidents where drivers had collided with oncoming traffic had stemmed from heavy marijuana dosages. Despite attempts by proponents of medical marijuana-related laws to contradict arguments suggesting that consumption of the drug even for medicinal purposes contributes heavily towards traffic fatalities, the evidence has been overwhelming.

Despite the convincing nature of such arguments, literature still indicates that proponents of MMLs have contradicted the reliability of such observations in

determining the expediency and suitability of MMLs based on marijuana dosage. Contradicting the assertion that MMLs encourage driving under marijuana influence and thus increasing the possibilities of traffic fatalities, Anderson, Rees, and Tekin (2018) observed that over 51% of patients allocated medical marijuana had spent a decade driving without encountering accidents that have often been associated with the impairing influences of the drug on driving capabilities. Notably, such an argument presents a significant point of view based on the precept that medical marijuana is advocated and issued in dosages that can seldom impair driving functionalities (Salas-Wright & Vaughn, 2017). However, the driving impairment argument that has been used by opponents is worth considering given that over 76% of the American population have been discovered to exhibit alcohol consumption tendencies (Klieger et al., 2017). Such observations strongly compel researchers to carry out additional investigative studies to determine whether marijuana patients have also been involved in road accidents after indulging in alcohol.

Additional findings have also suggested that MMLs are likely to trigger aggravated driving impairments since most of the patient population under the medical marijuana cover are less likely to avoid alcohol. Noting the concern, Fink et al (2020) indicated that when consumed jointly with alcohol, marijuana generates both multiplicative and addictive impacts that adversely affect driving-related functionalities. On the other hand, scholars have suggested that chronic users of the drug are not affected as much by alcohol consumption as is the case with infrequent users (Bartos, Newark, & McCleary, 2018; Salas-Wright & Vaughn, 2017). Whereas this implies that individuals

that have been taking medical marijuana longer are less likely to cause traffic accidents, it also suggests that new marijuana medication users are more prone to traffic mistakes that result in increased mortality rates. MML debates have also been fueled by disagreements concerning its influences on law enforcement.

MMLs and Law Enforcement

The loose wording of MMLs is increasingly becoming a cause of concern for both scholars and law enforcing agents. According to Ward, Lucas, and Murphy (2019), the legal boundaries associated with MMLs are marked by numerous and worrying grey areas that have generated many undesirable impacts on America's law enforcement. On the other hand, it is necessary to note that these impacts have been proven to depend largely on the attitudes of citizens in individuals US States. For instance, Gianotti et al (2017) observed that in Colorado and Florida, cases of police officers opting to grow or supply marijuana secretly to residents have increased by 6.8 and 7.3% respectively since the two states adopted MMLs. Although such a phenomenon can be challenging to explain, literature provides several useful perspectives. For instance, Lipperman-Kreda and Grube (2018) opined that the increasing demand for medical marijuana licenses among residents in these two States has contributed immensely towards the adoption of such attitudes by law enforcers because legal supply dispensaries gave been unable to meet the heightening demand levels. Such an assertion strongly suggests that law enforcers pushed by the attitudes of the locals have been faced with a dilemma, which is marked by the need to adhere to professional standards or capitalize on the growing market and benefit from the large profits.

Further, law enforcers have become rather reluctant to laws regarding marijuana use due to the adoption of MMLs. Affirming this assertion, Nelson (2018) noted that although the laws were not meant to alter the legal stance on non-medical marijuana use, the fact that the laws provide caregivers and dispensaries with the legal avenue of possessing and distributing marijuana has increasingly made it difficult for law enforcers to follow up the quantities of marijuana supplied to outlets. Consequently, law enforcers have been resulting in making deals with legalized marijuana outlets to ensure frequent and ample supplies. Commenting on the resulting impacts of such law enforcers and medical marijuana outlets, Lewis (2019) posited that instead of repeatedly raiding dispensaries in pursuit of illegal substances, police officers have opted to make pacts that encompass allowing medical marijuana outlets to become centers for the supply of other illegal substances. Due to the constraints placed upon law enforcers by grey areas and the influences of resident law enforcers have found it rather comfortable to assume a state of reluctance and adapt to the needs of the population they serve.

MMLs and Illegal Marijuana Consumption

Concerns about the adoption of MMLs across the US States and escalations in illegal marijuana consumption have increased among policymakers and scholars over the past ten years. According to Chang and Jacobson (2017), the number of individuals taking the drug for non-medicinal purposes has been on the rise since States across the country started to adopt MMLs in 2011. Explaining the phenomenon, Tormohlen et al (2019) argued that the trend stems from the fact that non-patients have taken advantage of their friends and family members that have been allocated marijuana for medicinal

purposes to grow the product in their homes. Consequently, family members have been influenced by their folks that consume the drug under medical instructions to consume the drug in increasing amounts. Although the proponents of MMLs continue to argue that such notions are unproven, law enforcement-related agencies have provided ample evidence to support the claim that MMLs have resulted in heightened illegal consumption. For instance, the Drug Enforcement Administration (DEA) reported that its firm stand against MMLs resulted from investigations that revealed that MMLs have escalated illegal consumption by approximately 32.6% since 2015 (Theriault & Schlesinger, 2018). Due to such reports, scholars have undertaken to investigate the reasons behind illegal consumption increases. As indicated by the findings of Choi, Dave, and Sabia (2019), most of the illegal consumption cases emanate from the fact that legal patients have continued to serve as an avenue through which legal patients and dispensary outlets leak marijuana to non-patients, and especially friends and family members. As such, MMLs seems to have been sending an inappropriate message that the drug has become legal leading to escalations in social acceptance.

Researchers have found assertions concerning MMLs and social acceptance true. A study conducted by Olfson, Wall, and Blanco (2018) California confirmed that the laws have caused residents to increase their marijuana consumption for non-medicinal purposes. The researchers discovered that in this particular state, over 67% of residents, which comprise mainly of the youth and adults have interpreted MMLs wrongly to signify that the drug is less harmful than has been reiterated (Theriault & Schlesinger, 2018; Schmidt et al., 2019). Despite these wrong assumptions, the correlation between

marijuana and harmful effects such as short-term memory issues and bursts of anger has continued to prevail across the country's states. However, proponents of MMLs have posited that these perceptions existed long before the laws. Although they lack sufficient evidence to support their claim, several studies have brought to light the fact that the proponents might have a case. For instance, a survey carried out by Lewis (2019) across young adult populations in California revealed that even before the wake of MMLs marijuana was still perceived among 27% of the population as being less harmful compared to hard drugs like cocaine. Nonetheless, this does not negate the fact that MMLs have both cemented and escalated marijuana usage rates since the introduction of MML policies. On the other hand, it is important to note that only a few scholarly investigations concerning MMLs and the prevalence of illegal consumption have focused on adults. According to Sarvet et al (2018), since most of the studies in this area have been focused on young adults and juveniles, it is almost impossible to tell whether the claim that MMLs have led to the increased illegal usage of marijuana can be generalized across populations.

MMLs and Price Reductions

Investigative studies have also associated increased illegal usage of the drug to price reductions. For instance, LeeHannah (2019) revealed that the adoption of MMLs by the US States combined with the influences exerted by legalization has led to significant drops in high-quality marijuana prices. Such an assertion strongly suggests that consumption escalations of the drug are not only related to wrong perceptions created by MMLs but are also linked to the fact that marijuana has become more affordable.

Notably, this point of view has seldom been contested by MML proponents. Further, their inability to confront the perspective seems to have emanated from the availability of research-based facts. For instance, Cobb et al (2019) noted that over 42% of youths that could not afford high-quality marijuana are currently able to acquire and use the drug without having to spend as much as was the case before legalization and the emergence of MMLs. Such an observation strongly suggests that the contributions of MMLs towards price reductions have brought about the increased non-medical use of the drug among the youth. However, the price reductions stemming from the emergence and adoption of MML laws have not only affected the youth but adults as well. According to the observations made by Eriksson et al (2019), over 58% of adults in states like Colorado and California have increased their usage of the drug for leisure purposes owing to the availability of the drug at much lower prices at legally designated outlets. Thus, it would be logical to assert that MMLs by triggering friendlier prices have led to a situation whereby non-patients can acquire marijuana at relatively lower prices, a predicament that has escalated non-patient marijuana consumption across US populations. Notably, evidence suggesting that medical marijuana laws have aggravated consumption among non-patients is prodigiously undeniable.

The state of MML in the U.S

The contemporary research explains that medical marijuana is legal in thirty-five within the U.S. Chapman et al. (2016) published a taxonomy of regulatory regimes across the U.S. regarding medical marijuana policies. The results demonstrate a significant state-level variation in medical marijuana policies and implementations. A high degree of

variability in MML from state to state has been shown by numerous studies (Bestrashniy & Winters, 2015) federal laws on the medical use of marijuana and cannabinoids are a times conflicted. The laws have led to confusion among caregivers, medical centers, and parents (Mead et al., 2017). Studies aimed at understanding the highest benefit of medical marijuana distribution within a given state point to the need for state-wide research and the educating of physicians (Alexander et al., 2017). Indicating that the highest degree of success in medical marijuana distribution is that which is supported by empirical evidence access to reliable information.

Similar findings from a 2017 study showed confusion and frustration in patients seeking mm can be driven by poor guidance from healthcare professionals and the conflicting policies imposed by the state and federal government. The authors, Ryan and Sharts-Hopko (2017) argue that as more patients with divergent conditions seek the medication, it becomes increasingly important for healthcare providers to understand patient experiences as well as the therapeutic potential and adverse effect risk of mm.

Such heterogeneity in legality presents unique challenges to the empirical study of card holding and caregiving marijuana cultivators. Beyond the challenges in the heterogeneity of existing laws, there is the fact that medical marijuana legalization is a social experiment, one that is iterative, and unfinished (Caulkins et al., 2015). For this literature review, cardholders and caregivers are defined in the following way, as designated by the Medical Cannabis Act.

Marijuana Cultivation Laws in States

The cultivation of marijuana for medicinal purposes has elicited significant concerns since the emergence of MML-related policies. Whereas MML proponents have continued to fight for cultivation to be legalized for patients, opponents have argued that such a direction would result in widespread use and heightened abuse. As indicated by Johnson (2019), these disagreements have led to 'Hodge-Podge' regulations that contradict one another. On the other hand, the legalization of generalized cultivation has already been deemed inappropriate given that marijuana is still viewed as an illegal federal substance (Chumbler, 2017; Winniman, 2018). Remarkably, the government has allowed each state to determine parameters to be used in controlling cultivation to ensure that authorities in each state can account for and monitor cultivation and distribution.

Marijuana Cultivation by States

Alaska. Although individuals are not allowed to consume the substance while in public, Alaska is one of the states in which legalization was embraced. However, when it comes to growing the substance, Alaska allows individuals that are above 21 years old to grow not more than six plants (Alharbi, 2020). On the other hand, it is critical to note that Alaska cultivation policies only allow cultivating individuals to mature a maximum of three plants at a time. According to Johnson (2019), these laws are confusing since individuals and families are still allowed to grow a maximum of 12 plants the number of people within each premise notwithstanding. Notably, the explicit nature of these cultivation policies and the corresponding punitive measures in case of non-compliance have caused most Alaska residents to stay away from cultivation.

Arkansas. Unlike Alaska where a limit to the number of plants that individuals and people living within the same premises can cultivate, Arkansas has not designated such limits. As noted by Balla and Abrams (2020), the absence of cultivation policies in this state stems from the fact that registration is required before caregivers can distribute or cultivate the plant. Conversely, this is expected to change due to the mounting pressure for the state to legalize the substance as has been witnessed in other locations.

Arizona. This state allows both patients and caregivers to engage in marijuana cultivation. Nonetheless, before growing, patients and caregivers must be qualified through registration. One of the most significant aspects of the cultivation policies in this state is that the spaces in which marijuana is grown must be both locked and enclosed (Richardson, 2019). Similar to Alaska, Arizona limits cultivation to 6 or 12 plants depending on the nature of the premises (Owley, 2017). However, the policies in this state are not strictly enforced.

California. Unlike most other US states, California has more specific cultivation laws. For instance, policies dictate that around 100 square feet be set aside for cultivation in cases where cultivation is meant to cater to medicinal purposes (Alharbi, 2020). Astoundingly, California has not set any limits for medicinal-related cultivation although limits have been set at six plants when growing is designed for recreation (Johnson, 2019). Such loose laws would explain why the state has often been associated with the highest numbers of marijuana consumption.

Colorado. Some of the cultivation regulations in Colorado are similar to those in Alaska. For instance, this state allows individuals that are above 21 years to cultivate not

more than 6 plants without maturing more than three at the same time (Richardson, 2019). However, Colorado has set specifics for caregiver cultivation, which is unlike most other states. For instance, caregivers are allowed a maximum of 5 patients if they are to grow a maximum of 36 plants (Chumbler, 2017). Such specifics can be understood given that the state legalized the substance.

Connecticut. This state has established certain requirements that must be satisfied before caregivers can engage in cultivation. Nonetheless, it is important to note that caregivers are not allowed to cultivate without having obtained certification from the state's authorities (Balla & Abrams, 2020). Unlike other states that make room for patients to take on marijuana cultivation, Connecticut strictly prohibits individual patients from growing the substance.

Delaware. Unlike most states that have already allowed either caregivers and patients or both to engage in cultivation, Delaware does not have such allowances. According to Chumbler (2017), both of these parties are disallowed and patients can only source the substance from designated and certified dispensaries. This strongly implies that this state has been keen on the alleged demerits of allowing marijuana cultivation.

Hawaii. Hawaii cultivation stipulations are purely based on registration. As indicated by Johnson (2019), patients that qualify for medical usage of the substance must obtain a '329 card', which is also a necessity for caregivers before they can take on cultivation and the number of plants should not exceed ten. Also, both parties must register the specific areas where cultivation will take place. Notably, these legal requisites have been put in place to avoid widespread illegal consumption.

Are Caregivers Allowed to Cultivate Marijuana?

Caregivers are only allowed to engage in marijuana cultivation in some states. However, in such states, they have to comply with pre-determined regulations. Generally, in the states where such provisions have been made, the underlying principle is that medical marijuana patients are not supposed to obtain the substance from any other sources apart from their designated caregivers (Winniman, 2018). According to Johnson, Hodgkin, and Harris (2017), states in the US that allow for caregiver marijuana growing should have a maximum of five registered patients, which gives them the go-ahead to grow not more than twelve plants for each of their clients. It is also important to note that the legal provisions for caregivers in some states also take into account that some of the caregivers may be candidates for medical marijuana. As such, there are cases where some states like Michigan allow caregivers that also need to use the substance for medical purposes to grow a maximum of 72 plants provided they have registered at least five patients under their jurisdiction (Anderson, Rees & Tekin, 2018). Conversely, it is as well necessary to note that when such large marijuana plant numbers come into view, caregivers are expected to observe additional protocols.

Caregivers growing marijuana plants in large numbers are only allowed to do so under conditions that have been determined by certain legal stipulations. Literature has indicated that in states like Michigan, caregivers only have the green light to grow a particular number of plants within enclosed spaces. Also, Carnevale et al. (2017) noted that facilities in which these parties can grow 72 marijuana plants for personal use and distribution to their allocated clients must be put under lockdown, be enclosed, and

occupy spaces that are separated specifically for the purpose. However, some researchers have suggested that although the spaces should be locked, it is not essential that cultivation takes place in spaces that are separated, and nor will it prove expedient if the allocated spaces are enclosed (Borodovsky & Budney, 2017). Whereas such a perspective can be understood given that studies have established that marijuana performs best in open and well-aerated spaces than in enclosed environments, it is critical to understand that states advocate and seek to enforce enclosed rather than open spaces to discourage non-patients from sneaking in and helping themselves with the substance (Johnson, 2019). Thus, the issue of caregivers being allowed to grow the substance brings along other critical issues like access.

Access to Marijuana Cultivation Spaces

Proponents and opponents of medical marijuana have consented that access to facilities where growing takes place needs to be treated as a subject of weighty concern. According to Anderson, Rees, and Tekin (2018), in states where cultivation of the substance for medical purposes has been legally permitted for caregivers, it is of paramount importance that access is restricted only to the caregivers to ensure that non-patients and other individuals that would distribute or consume without legal consent do not gain access to marijuana. Notably, such is the case even for states that have allowed patients to engage in marijuana cultivation. Requirements governing the access parameter are almost the same in all states where cultivation takes place for medicinal purposes. For instance, all these states advocate that caregivers and patients keep keys to cultivation spaces in discreet places to keep away individuals that are not allowed by law to consume

the substance (PDAPS, 2020). Recent developments in the access issue have seen states like Alaska, Colorado, and California comes up with policies that require entry into marijuana growing facilities to be sealed with technological devices and passwords where possible (Mead, 2017; Chiang, Du & Summers, 2019). Such developments have stemmed from the discovery that family members and friends of both caregivers and legal marijuana patients have been gaining access to growing spaces leading to increased consumption of the substance in families and society.

Do State Laws Allow/Disallow Cardholders to Cultivate Marijuana Plants

Literature has indicated that although cardholders (Green Card Holders) can apply for permits to grow marijuana due to medical reasons, care should be exercised to ensure compliance with all legal requisites. Explaining the need to tread carefully for this particular US citizen faction, Winniman (2018) argued that cardholders can be at risk of being deported if the authorities' sense or have evidence concerning medical marijuana consumption and cultivation issues given that cardholders are immigrants and their status is treated as a federal issue. This implies that although the states of cardholders are unlikely to convict them for medical marijuana usage, the US federal government can easily take on such measures against cardholders that attempt to cultivate the plant even in cases where state laws make room for such provisions (Kamin, 2018). Additionally, cardholders are strongly advised to obtain the substance from their designated caregivers instead of growth owing to the moral turpitude component governing immigration law (PDAPS, 2020). According to Kruger, Kruger, and Collins (2020), this particular immigrant law parameter being a fuzzy term implies that court decisions are unlikely to

favor cardholders that cultivate marijuana. More importantly, records of marijuana cultivation that are kept by cardholders are likely to be used against them in case they travel outside and need to be admitted after their travels.

Percent of State Cannabis Use Disorder (CUD) Admissions Reported in The US Treatment Episode Data Set for Admissions (TEDS - A) Between 2015 and 2019

Although the percentage of Cannabis Use Disorder (CUD) admissions in the US have been on the decline, statistics acquired by relevant authorities between 2015 and 2019 reveal disturbing truths. For instance, records on Treatment Episode Data Set for Admissions (TEDS - A) in relation to CUD indicated that between 2015 and 2017, the rates of admissions for individuals who consistently use the substance were recorded at 43% (Gillespie et al., 2018). Such findings strongly suggest that marijuana consumption, even for medical purposes can easily cause individuals to develop addiction disorders that have severe clinical consequences. Commenting on the increased admissions during this period, Small (2018) opined that the escalations resulted from the inability of state authorities to enforce legalization for adults while restricting usage by teenagers. Notably, Kruger et al (2020) affirmed this point of view noting that CUD admissions during the 201 to 2017 period increased by almost 27% among adolescents in most US states although significant declines among the teenage population were yet to be recorded between 2018 and 2019. As such, it would be logical to argue that if medical marijuana and legalization policies were to be implemented correctly, the percentage of CUD admissions would be headed for a downward trend (Ciccone, 2017). Notably, it is also

imperative to consider the CUD admission percentile sex differences reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019.

Although CUD admissions were found to be rampant and worrying between 2015 and 2019, current statistics strongly suggest a reduced prevalence of such admissions. In a recent study, Pinto et al (2019) noted that the admission rates for both teenagers and adults have declined drastically over the past two years. However, it is important to note that the declines have not been uniform across all states. For instance, states like California still exhibit worrying trends due to the minimal changes in the percentages of CUD admissions for both adults and adolescents. On the other hand, states like Kansas, Hawaii, Colorado, and Delaware have continued to portray significant declines, which Wu et al. (2017) observe to be the greatest the states have experienced since they adopted medical marijuana policies. Astoundingly, the declines in most states have been associated with the enactment and strict stance taken by relevant authorities to ensure that laws concerning legalization and medical marijuana are observed. More importantly, Han et al. (2019) affirmed that the current significant CUD admission declines serve as solid proof that implementation of laws related to medical marijuana can be undertaken in such a manner as to guarantee limitations on access to cultivation facilities, distribution, and misuse by non-patients.

The most striking feature as it relates to CUD admission prevalence is that the admissions have declined drastically for adolescents although records still indicate that adult admissions may not be as predictable in the future. Affirming the notable admission declines among teenagers, Pinto et al. (2019) noted that the declines that currently stand

at around 18% stem from the fact that legalization laws for adults and the development of stricter cultivation laws across states in the US are the chief reason since it has become increasingly difficult for adolescents to obtain the substance. Such prevalence findings are contrary to common allegations that legalization and the emergence of medical marijuana policies and practices have escalated marijuana consumption among young people (Chiang, Du & Summers, 2019). Explaining the disparities in scholarly opinion, Kruger et al. (2020) posited that previous studies are likely to have generated results that vary from the current indicators of CUD admissions because at the time when studies suggesting that medical marijuana and legalization contribute to increases in CUD admissions because states within the country had not mastered the implementation of related laws. Given such an opinion, it would be logical to conclude that as the states across the US continue to learn better methods of implementing medical marijuana laws with regards to caregiver and patient cultivation, CUD admission declines can be expected to decline more uniformly.

CUD Admissions and Sex Disparities

Astoundingly, consistent marijuana usage, even for legally covered patients exhibited sex-based disparities between 2015 and 2019. for instance, a study carried out by Zhu and Wu (2017) to examine sex differences, as well as the clinical features associated with CUD among the adult population, revealed that although both sexes were prone to hospitalization, the female populace hospitalized for CUD was larger compared to that of their male counterparts. Additionally, the scholars discovered that whereas mental disorders accounted for 41% of the female population, their male counterparts

mental disorder proportions stood at 36%. Attempting to explain the phenomenon, Halladay et al (2019) posited that men are more likely to have developed higher tolerance capabilities compared to women who are likely to exhibit comparatively lower levels. Nonetheless, it is not the explanations that are more significant in this study. The most critical aspect that can be used to relate medical marijuana to CUD (Kim et al., 2019). This aspect draws from the observation that despite the sex disparities, it can be proven that even the medical consumption of the substance under study is likely to result in heightened cases of CUD diagnosis, and especially in relation to mental disorder hospitalizations.

The Primary Substance Use at Admission

The primary substance use governing CUD admission for marijuana is determined at the federal level and is expected to be adhered to by each of the states in the country. According to the codebook generated in 2017 by the US Treatment Episode Data Set for Admissions, admission for marijuana CUD is set at a percentage of 12.5% and corresponding 250,786 uses/frequency. (Samhda, 2017). Nonetheless, some scholars have expressed their concerns that the frequency and percentage rates that have been set do not capture the need to separate teenagers from adults or the pressing need to cater for sex-related differences while generating treatment modalities (Chiang, Du & Summers, 2019). Such an assertion can be qualified by the fact that CUD admissions have not produced matching percentages for teenagers and adults (Gillespie et al., 2018). Additionally, given that researchers have already established that mental disorders, which comprise the greatest admission percentiles but at varying levels among the male and

female genders, it would have been better for the current admission percentiles and frequencies to reflect such dynamics.

Medical Cannabis Act and Cardholders

As the legalization of cannabis increases within the states, the federal and local governments have presented myriad responses to the federal law which makes it illegal. The main activity is to possess federally banned substances such as cannabis and the legalization of firearms. The cardholder has a varying registry, cultivation cards, cannabis, and other plants. Through the card cannabis cultivation products were produced. If cannabis and cannabis products are possessed, the same product was produced and cultivated numerous times. Relatively, the cardholders qualify patient's practitioner specifies a greater quantity is reasonably necessary to meet the qualifying patient's medical needs every 14 days, the amount specified in the written certification.

Caregiver or Practitioner

They are tasked with monitoring the patients. Here, the clinical officer and the patient develop a treatment or consulting rapport of friendship. During this course, the doctor has completed assessing the patient based on the medical history and current medical condition. The critical examination will assist the practitioners to improve care to the patients. Moreover, the practitioner has consulted the patient about his/her medical condition. Therefore, the medical officer or professional is allowed to care for and treatment to the patient correspondingly.

Specific legal cannabis laws (LCL) can have unique results on how marijuana is used and economized. Borodovsky and Budney (2017) found that laws permitting home

cultivation do contribute to a higher likelihood of at-home growing and the production of edibles, while dispensary permissions increase the likelihood of edible purchases. Research conducted by Carliner et al. (2017) reviewed marijuana consumption and its association with attitudes, and legal matters in the U.S. The review showed that since the early 2000s, the relationship between adolescents and marijuana has changed in America and the outside world. However, adults have exhibited marijuana addiction consequences and increase rapidly in modern society. Multiple global research asserts that MMLs have posted some effects on cannabis use among teens or children under adolescent transition. Meanwhile, Chihuri and Li (2019) examined the state of MML and opioid overdose mortality, finding that marijuana legalization might lead to a reduction in opioid prescriptions, but the overall report on its influence on opioid overdose mortality is conclusive.

MM dispensaries were found to have no association with either violent or property crime rates. A study conducted by Kepple and Freisthler (2012) found that MML is associated with higher use, attitudes/perception, treatment admissions, and CUD. Studies examining the impact of MML on cannabis use and treatment admissions have been conflicting and have evolved in recent years. For example, a study from 2012 indicated that states that implemented medical marijuana laws are exposed to higher rates of consumption (Cerda et al., 2012). Meanwhile, a 2017 study found that MML was not connected to the rapidly increasing adolescent marijuana consumption, though higher possession limits were. Thus, demographic differences and legal specifics may be the root of conflicts in the literature.

Once again calling for a need for empirical specificity. Research has focused on the association of MML with higher use/treatment among both adolescents and adults, as well as the impact of MML implementation on perception and attitudes toward cannabis use. The emerging research and findings on RCLs suggest that there is a lower impact on the growth of adolescent use of cannabis. The increase is recorded in colleges where student use rises steadily and is associated with various unknown effects. Regardless of rates of marijuana use, there is a consensus that for those who struggle with substance abuse, the idea of legalizing marijuana has increased the rate of cannabis use disorder (Goldsmith et al., 2017). To understand the differences between normative marijuana use and CUD it is important to first have an understanding of the phenomenology of CUD independent of legal parameters.

According to SAMHSA, marijuana dependence is only second to alcohol dependence in the U.S. In the early 2010s, when marijuana legalization began gaining traction, out of 6.9 million illicit drug users with dependence or abuse, 4.2 million (61.4%) had marijuana dependence or abuse (Alharbi, 2020). One of the central components that drives problematic cannabis use is craving, which is now considered a primary behavioral symptom of CUD in the DSM5. This is crucial to understand as it is entirely independent of marijuana legalization. Indeed, physiological measures of craving support the validity of how adolescents crave cannabis. According to Wolfling, Flor, and Grusser (2008), consuming cannabis leads to visual cues, skin conductance, and late visual cues and was greater in marijuana consumers. Medical research or strategies have formulated the basics of increasing attentional bias on cannabis dependents when

compared to consistent cues with those recorded in tobacco and alcohol (Metrik et al., 2016). Based on their analytical study, Metrik et al. (2016) outline that the users rated cannabis cues as pleasant on the rating scale. Moreover, similar marijuana-associated cues response has been reported in the adolescent population (Field et al., 2006). Preliminary research estimated that there is a significant increase in cannabis use among the youths and this consists of 15 people daily. They are presented to experience increasing skin conductance and heart rate. The marijuana craving questionnaire was administered and found that after the auditory exposure, both visual and tactile cannabis cues were estimated (Fogel, 2015).

Beyond craving, there are several factors that the DSM5 uses to categorize CUD and the associated risk factors. The DSM5 is thus used to make a diagnosis of CUD and presented to use large amounts over a period, and it is more than the intended use or reason When used repeatedly, it can stop or lowers the intended purpose. Extra time is spent to help recover from marijuana impacts.

CUD Diagnosis Based on DSM5

- Individual cravings are connected to thoughts and images, dreams, and smell due to obsession.
- Consistence consumption regardless of the associated health care risks and threats.
- Consumption of cannabis is critical to human life. It affects jobs, education, and responsibilities.
- Marijuana use can expose one to criminal activities and other social problems

- Marijuana helps during withdrawal services

Risk factors connected to extensive consumption are also outlined below.

- It is connected to family history and personal chemical dependence.
- The present history of Conduct Disorder or Antisocial Personality Disorder within the family.
- The exposure to a low or poor socio-economic state-levels.
- The recorded history of extensive tobacco smoking.
- Abusive family with regards to living conditions.
- Massive and unpredictable family circumstances and conditions.
- Recorded smoking of marijuana within the family.
- Relatively low or poor performance in school among the users.
- Easy access to cannabis rapidly increases consumption rates.
- Developing a consistent and drug-tolerant culture

The DSM5 does not give specific treatment options for CUD. But some common approaches include both individual group therapy as outlined by Albert Ellis therapy (REBT). The theory helps the disorder to understand the dysfunctional patterns associated with its functions and replace them with adaptive reasoning. 12 step programs have also shown some success, particularly for those with comorbid addictions or disorders. There is research designed to inform regulatory policy and evaluate the impact of the legislation on cannabis use, a problem described being progressing rapidly (Pardo, 2014). However, both definitive findings and resources are needed to enhance the activity. In the meantime, policymakers should use the scientific literature on marijuana

use to foster common-sense approaches to cannabis policy that focuses on preventing massive addiction within the society (Budney et al., 2017).

States which have legalized marijuana use are affected considerably when compared to the non-states. The higher risks are reported before the legalization activity. As the implementation and legalization continue, that is for both reaction and medical functionality, it has raised some public concerns among the population. Generally, the negative impacts of cannabis include human intoxication and hallucinations. On the other end, children have been exposed to the disorder thus affecting their lives and parental relationship. Opioid use will be impacted and increase in health issues associated with marijuana use such as psychosis, pulmonary diseases, dependence, and addiction. As the world experiences a change in the global territory or landscape, no deep research is essential and helps understand public health and the effects of marijuana legalization (Caulkins et al., 2015).

Law Enforcement

Law enforcement is a procedure conducted by the states or federal government in the United States. Analysis conducted outside Colorado indicates that less impact is recorded compared to the neighboring borders. In the case of Nebraska and Kansas, the respondents perceived a larger impact on enforcement; nevertheless, the differences were discouraged due to individual control and perception of marijuana (Ward, Lucas, & Murphy, 2019).

Among Adolescents

In 2015, one multistage and random-sampling study conducted by Hasin et al. (2015) found that the use of marijuana prevalent in states which implemented cannabis policies. The study did not however find significant differences between the risk of cannabis consumption before passing MML since the risks passed influenced the laws passed. The authors, therefore, concluded that marijuana laws are not connected to adolescent use. However, adult youth use is growing rapidly in states that passed CUD laws and regulations. Although the national survey data provides no significant increase in an emergency on the adolescent consumption of Marijuana (Sarvet et al., 2018). As marijuana legality becomes challenging in the United States, it is presented that psychosocial education help adults and adolescents understand the consequences of cannabis in respective societies (Estoup et al., 2016).

Other studies support the link between MML and marijuana consumption in the global world. Adolescent use frequencies and neutral attitudes are also shown to increase in states with MML, according to one study. Use was more likely within both the past month and the past year ((OR = 1.45 and 1.49; *p*s < .001, $\beta = 0.12$, $p < .001$). Neutral attitude also encompassed a lower presentation of parental discouragement regarding marijuana use ($\beta = -0.06$, $p < .001$, $\beta = -0.04$ and -0.02, *p*s < .001) (Martins et al., 2016).

Research conducted by Wen, Hockenberry, and Druss (2019) presented the similarities in perceptions of marijuana availability, risk, and acceptance, and state implementation of medical marijuana policies and guidelines. Further, they presented the

guidelines of medical marijuana laws between 2004 and 2012; during the time, an increase of 4.72% was reported leading to (95% CI 0.15, 9.28) in the probability rating. Based on the data, young adults experienced low health risks due to marijuana use or consumption. Consequently, implementing marijuana policies was associated with a 0.37% point leading to a decrease of (95% CI - 0.72, - 0.03) in the probability. Concerning the mathematical report, the adolescents recorded parental admission of marijuana use (Wen, Hockenberry, & Druss, 2019).

Such associations between MML and treatment admissions have resulted in further policy recommendations to prevent and reduce illicit use/misuse. The above authors argue that the findings suggest that states with MML should take special precautions to address adolescent marijuana use. Young adult MM cardholders were found to be exposed to the risks of frequent marijuana use, according to one study. Turker et al. (2019) applied various latent growth theory to estimate the number of children who own MM card showing a gradual increase in marijuana use; that is 20-30 days of consumption in the previous month; this is done from 13-19 years during the comparative analysis of who lacked MM card between the youths and adults.

However, in contrast, a meta-analysis of studies conducted among people with an age of less than 25 failed to present the quantitatively assessed consequences of cannabis policy change. It also lacks the validation mechanism that presents the differences between association and liberalization of marijuana policy and adolescent use. Melchior et al.(2019) in their research variability pronounce that cannabis policy does not present

significant changes in youths' use. However, this is possible for recreational purposes, a process that requires monitoring.

Among Adults

Richmond et al. (2015) found the frequency of exposure and risks associated with the use of marijuana. Based on their report, the threats are higher among card-holding patients than those with limited access to medical marijuana. The cardholder patients showed an increased frequency of marijuana use and were screened moderately compared to low risk. Consequently, Richmond et al. (2015) through their findings can help nurses understand specific risks, long-term use the legality of the limited challenge among marijuana users.

MMLs are demonstrated to have a rapidly increasing substance use treatment among pregnant women. Research conducted by Alharbi (2020) pinpoints that the rate of marijuana treatment has increased by 4.69 [95%; a confidence interval (CI) = 1.32, 8.06] among pregnant mothers in MML and its relativity to non-MML states. Admissions increase, which was largest in states that grant protection for marijuana care centers; It was also accompanied by alcohol treatment admission increases.

In his research on marijuana laws, Chu (2014) examined the effects of the illegal use of marijuana. He explored that laws have heightened arrests on marijuana use among adult males, estimated to be approximately 15-20%. The aforementioned results are therefore validated by data reports on the treatment options available to those admitted to the rehabilitation facilities. Marijuana treatments on adult males have increased by 10-20% after the enforcement of the consumption guidelines.

Further, Chu examined the impacts of medical laws on marijuana and its illegal use. These laws increase cases of marijuana arrest among adults; constituting 15-20 percent. The impacts are thus validated through data findings to the treatment admission to the rehabilitation center. Consequently, marijuana treatments among male adults have reached 10-20 percent after the implementation of marijuana guidelines (Chu, 2014). Older adults who have attained the retirement age are overlooked in MML studies regardless of their age groups and their likelihood of becoming mm recipients. One study conducted by Nicholas & Maclean(2019) demonstrates the repercussions of MML on the health of older adults and labor supply. Further, their findings highlighted the functions of health policy implementations and how it supports work among older adults. Finally, the importance of their inclusion during the assessment of state medical marijuana laws was also recorded.

Definition of Terms

- Cannabis Use Disorder (CUD): this term is used to capture possibilities of people being impacted negatively by their consistent use of the substance without necessarily suffering from or exhibiting addiction symptoms (Budney, Sofis & Borodovsky, 2019).
- Cardholder: this term has been used in the study to signify two aspects that are related to marijuana laws. The first definition encompasses the identification that is provided to patients that can consume marijuana at pre-determined dosages due to their medical conditions (Smart & Pacula, 2019). The second definition

involves the consideration that some individuals have moved to the US and have obtained legal citizenship by having a ‘green card’.

- Caregiver: this term is used in the current study to connote qualified and registered medical personnel that is allowed by state law to cultivate or supply marijuana patients with the substance from designated and registered dispensaries (Budney, Sofis & Borodovsky, 2019).
- Cultivation laws: these are legal stipulations that have been established by states to govern the planting of marijuana (Smart & Pacula, 2019).

Assumptions

The most significant aspect of this study that seems to be believed among scholars is the assumption that MMLs have increased the consumption of the substance among non-patients. Notably, this assumption is critical to the meaningfulness of this study given that the study intends to determine whether MMLs have had negative or positive influences at both the societal level and for marijuana designated patients, which is underpinned by the prevalence of CUD admissions (Budney, Sofis & Borodovsky, 2019). Whereas this assumption exists, it is important to consider the fact that researchers have generated different arguments. Given that most of the researchers have confirmed that CUD admissions have increased after US states adopted MMLs while others have presented an opposing perspective, this assumption implies that further research in the area is necessary to produce more reliable information.

The aforementioned assumption is necessary for the context of the study because the study must generate information that can help determine whether MMLs have exerted

more detrimental than beneficial effects with regards to CUD admission. Bearing in mind that CUD admissions are often related to mental disorders that surface in the form of hallucinations, mood instabilities, and paranoia (Budney, Sofis & Borodovsky, 2019), this assumption will determine whether the current study reinforces the need for MMLs or will result in a recommendation for policy change

Scope and Delimitations

This study focuses on the impact of the MM programs and their possible effect on the increase in the number of admissions related to marijuana and substance abuse. A substantial number of studies have explored the behavioral, social, and economic drivers of substance and marijuana abuse in the United States, but the limited focus has been directed towards the enactment of the state laws that allow cardholders to cultivate marijuana for medical services. The study will use data on the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019. The choice for the TEDs is based on the fact that it covers admissions from different states, whether they have MM programs or laws allowing the cultivation of marijuana or not. As such, the population of the study will be US states, which have MM programs only as the focus of the study is their effect on substance abuse.

Limitations

For this study, the researcher will use data from US Treatment Episode Data Set for Admissions (TEDS), which is archival data for subsequent analysis, and subsequently provide an answer to the research question. However, the use of archival data has its

limitation in that the data may be biased (Barnes et al., 2018). Also, people make mistakes when entering data in the archives, which could compound the biasness in the research and lead to the wrong conclusion (Barnes et al., 2018).

Significance

This study is conducted to identify the association between the MM programs and the increase in the number of admissions related to marijuana and drug abuse. As such, from the study, the researcher will be able to determine, based on data and facts, whether the state laws that allow the cultivation of marijuana harms the admission of people due to abuse. As such, the findings will form the basis for the corrective action, if the researcher finds significant association. Also, the findings will provide a basis for the improvement in the current policies, to ensure that the cultivation of marijuana under the MM program in different states are not wrongly used to promote marijuana and substance abuse. The necessity of these findings stems from the fact that MM programs have been associated with social changes that influence healthcare administrators.

Whereas most scholars have been concerned about increases in CUD admissions, it is equally important to recognize that MM programs have as well exerted significant influences on how healthcare administrators execute their duties. According to Anderson et al (2018), as states continue to adopt legalization and medical use of marijuana, the issue of diverted medical marijuana is increasingly gaining prevalence. This implies that for adults that have been issued cards to guarantee the issuance of medical marijuana, some of the supplies are being made available for minors. For instance, Cook et al (2020) reported that in Colorado over 75% of young people involved in marijuana consumption

have received supplies from cardholders that diverted supplies on-demand at agreed costs. Consequently, CUD admissions are no longer increasing for adults but healthcare administrators are increasingly being pushed to the edge being coerced to deal with under admissions without existing stipulations to deal with such cases.

Summary and Conclusions

This review of literature investigated Marijuana Cultivation Laws and Admissions for Cannabis Use Disorder in US Substance Abuse Treatment Facilities based on the need to determine if there is any relation between State laws and the admissions for cannabis use disorder in the US. The overarching study was guided by a quantitative cross-sectional study to explain how the association between the medical marijuana cardholder and caregiver cultivation laws (MM) and the generality of cannabis addiction admissions in U.S. substance abuse treatment facilities. This approach necessitated the use of the ecological model framework that explains how the various levels of influences determine health-related practices and outcomes. These levels constituted the public policy, the organizational, interpersonal and intrapersonal, and the community.

A review of the literature indicated that the percentage of individuals admitted for CUD was closely related to cultivation and the prevalence of MM laws adoption. Notably, the increasing use of medical marijuana has impacted how healthcare administrators carry out their duties. Whereas they are supposed to provide medical marijuana to licensed cardholders, diversion to unlicensed young adults and children has increased the workload for practitioners. MM laws have also contributed to escalations in CUD admissions despite their alleged efficacy in guaranteeing the safety of medical

marijuana consumption. Whereas prevalent notions have associated MML's with traffic fatalities, literature has indicated that fatalities only escalate during weekends. Additionally, America's law enforcement has as well experienced difficulties with laws concerned with medical marijuana. For instance, the wrong attitudes adopted by law enforcers have contributed immensely towards the adoption of such attitudes by law enforcers because legal supply dispensaries gave been unable to meet the heightening demand levels thus the notable increases in illegal MML consumption. This is because price reductions have also made the drug easily available to non-cardholders.

The state of MML's in the US is characterized by heterogeneity in legality, which as indicated in literature presents unique challenges to the empirical study of card holding and caregiving marijuana cultivators. Chiefly this is because although there is a notable discrepancy in marijuana cultivation by states across the country, heightening demand has led to utter disregard of the governing laws. This explains the significant increases in CUD admissions despite the existence of legal stipulations. Notably, men are more prone to such admissions compared to women. Generally, the review of literature has indicated that states that have legalized marijuana use are affected considerably when compared to the non-states

Section 2 – Methodology

Introduction

The study aims at examining the relationship between Marijuana Cultivation Laws and Admissions for Cannabis Use Disorder (CUD) in US Substance Abuse Treatment Facilities. Specifically, it will compare the rate of cannabis use disorder between states will laws allowing cultivation of medical marijuana by cardholders and caregivers against states where cultivation is prohibited. It is thought that medical marijuana laws impact the use of cannabis and CUD admissions among the youth and general population. It is paramount to examine how medical Marijuana laws and distribution impact its use and the resulting CUD admissions.

The main section covered include research design and methods, population and sampling procedures, sources of data and information, instrumentation and operationalization of study constructs, threats to validity and reliability, data analysis plan, and ethical; considerations. The research will rely on secondary data relevant to the study that will be sourced from PDADS and SAMHDA website. The quantitative cross-sectional research design is deemed relevant in collecting and analyzing secondary data to answer the research question and test research hypotheses. A quantitative research method is suitable for relationship analysis such as the association between the prevalence of CUD admissions and state medical marijuana policies. The target population will be comprised of patients with substance use disorders in states with regulations that allow medical marijuana cultivation and states prohibiting the cultivation of medical marijuana. The SPSS program version 26 will be used to analyze statistical

data to generate descriptive and inferential statistics for answering research questions and testing research hypotheses. All ethical requirements for research will be accorded due to consideration as all procedures of acquiring secondary data will be overseen to ensure they are within the guidelines of an approved IRB.

Research Design and Rationale

The study adopts a quantitative research method as opposed to the qualitative method because it is suitable for relationship analysis such as the association between the prevalence of CUD admissions and state medical marijuana policies. This method is known to generate objective and scientific results rather than subjective ones for the case of qualitative approaches (Rahi, 2017). It has a structured and systematic approach for researching to enhance the validity and reliable study results. It is hence combined with an appropriate research design.

Research design provides an overall roadmap for integrating the various components of the research logically and coherently. The chosen research design ensures that all evidence gathered to address the problem of study as unambiguously as possible. There are multiple research designs including cohort design, cross-sectional design, ethnographic design, causal and experimental design, exploratory design, and action research design among others (Dannels, 2018). The choice of design depends on the research problem, the nature of the study (whether qualitative or quantitative, whether cross-sectional and longitudinal study, etc), the type of research data required for the study. The cross-sectional research design is defined by three distinctive features; these are lack of time dimension, depend on current differences as opposed to change due to

intervention, and selection of groups is based on current differences rather than randomization. It is the most relevant design for measuring differences between or among a variety of subjects, people, or phenomena rather than change. Similar to this is a longitudinal design but this collects and analyzes data over a while, let's say weeks or months to assess the effect of treatment on the outcome.

The proposed study seeks to assess the relationship between medical marijuana policies on CUD admissions. The study will be based on a quantitative comparative cross-sectional research design consistent with assessing the association between state medical marijuana cultivation policies and the prevalence of CUD admissions into substance abuse treatment facilities. Unlike the experimental design that seeks to assess case effects due to intervention, cross-sectional is appropriate in determining the association between the variables of interest without manipulation and randomization of participants (Asiamah, Mends-Brew, & Boison, 2019). The proposed study collects data from January 2015 to February 2019 from TEDS-A for cross-sectional analysis by comparing states with medical marijuana cultivation policies and states with laws prohibiting marijuana cultivation. Besides, unlike longitudinal design where the same samples are assessed repeatedly over a period to aid in tracking changes and connect them to variables responsible for changes that occur, there is the tracking of data from the same sample over time in this study, rather than data on different CUD admissions are analyzed. In this study, changes in CUD admission for different people over the 2015-2019 period are analyzed by comparing states with medical marijuana policies against

states prohibiting medical marijuana. Since the data is drawn from secondary sources, the design has no significant resource and time constraints.

The independent statistical test is proposed to determine the relationship between cardholder and caregiver cultivation policies and the percent of CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019. *The* approach of this study will be to examine the percentage of CUD admissions reported in states that allow cardholder and caregiver cultivation of marijuana versus states that do not allow card hold and caregiver cultivation of marijuana, and then determine if there are differences in the percentages reported and if observed differences are significant. The independent categorical variables are the (1) type of caregiver cultivation policy and (2) type of cardholder cultivation policy. However, the dependent variable is the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019. The results of this study may inform the administrators of provisions in state Medical Marijuana laws that stand as facilitators or barriers to effective and efficient healthcare administration of substance abuse facilities.

Population

The target population will be comprised of patients with substance use disorders in states with regulations that allow medical marijuana cultivation and states prohibiting the cultivation of medical marijuana. It is approximated that close to 4.4 million Americans experience substance use disorders annually (Budney et al., 2019). State laws and CUD percentages will be acquired via secondary data materials for fifty states. The

comparative nature of this study is that independent variables will be the grouping variables, where group A will comprise states with laws that allow caregivers or cardholders to cultivate medical marijuana and group B will consist of states with legislation that disallows caregiver/cardholder to cultivate medical marijuana. The CUD percentages for each state will be acquired, also via secondary data materials, as the dependent variable. As several state laws changed at various times, a cut of the year 2015 will be used. The status of laws this year will be used to group states. CUD percentages will be gathered from this year until 2019. The total number of people considered for the study is approximately 1.5 million adults derived from hospitalization data between 2015 and 2019. The population is further characterized by comorbid patterns of hospitalization and CUD diagnosis with 3.5% male and 1.8% female CUD hospitalization cases.

Sampling and Sampling Procedures

Sampling is the process of selecting a subset of the population for use as study respondents. The process is fundamental in any research because it is not always possible to enlist the entire population in the study. It is important to ensure that the selected sample represents the population so that results from the sample are generalized to the study population (Dawson, 2019). A relatively large sample is preferable in quantitative research. The research data and information is sourced from online secondary sources. In this study, two independent categorical variables will be considered: (1) Type of caregiver cultivation policy. The categories for this variable are (a) state laws that *allow* ***caregivers*** to cultivate medical marijuana plants; (b) state laws that *disallow* ***caregivers*** to cultivate medical marijuana plants. (2). Type of cardholder cultivation policy. The

categories for this variable are (a) state laws that *allow* ***the cardholder*** to cultivate medical marijuana plants; (b) state laws that *disallow* ***cardholders*** to cultivate medical marijuana plants. One dependent variable will be analyzed in this study: percent of the state, CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019. The study will utilize secondary data and information on the variables of interest for analysis.

Secondary data for the above variables will be sourced from two online publicly accessible databases located on two websites: the first source was the website of Prescription Drug Abuse Policy System (PDAPS) http://pdaps.org/, while the second source the website https://www.datafiles.samhsa.gov/ for the substance abuse and mental health data archive (SAMHDA). The PDAPS was funded by the National Institute on Drug Abuse and is charged with tracking key state laws connected to prescription drug abuse. The agency achieved this by collating data on state laws and regulations on the production, quality, transportation, sale, and consumption of marijuana for medical reasons. This dataset cover states with detailed programs for medical marijuana but does not include state laws that allow the medical use of "low THC" products in a given situation. It gathers a longitudinal dataset displaying therapeutic marijuana caregivers effective January 1, 2015, through February 1, 2019. The dataset on cardholder cultivation laws has a detailed medical marijuana law for patients such as the illnesses and symptoms qualifying the use of marijuana on patients and where it can be used, and whether it can be used on non-residents, and the number of units that can be possessed by the patient.

The substance abuse and mental health service administration collect and stores the SAMHDA data containing a panel of datasets on admission and discharges for substance abuse treatments that include marijuana. The national data system - Treatment Episode Data Set – stores the yearly admissions in treatment facilities for patients with substance abuse conditions. State laws mandate that programs for treating substance abuse report to the state all publicly funded admissions. Whereas some state only collects and report publicly funded admissions, other states collect and report privately funded substance abuse admissions in facilities receiving public funding. The states then report data from their administrative system to SAMHSA with TEDS-A being the resultant data. Therefore, not all admissions for substance abuse treatment are captured in TEDS-A, but instead, a portion of admission constituting the public burden for substance abuse treatment are captured. It captures data on admissions of persons aged over 12 years including data on demographics variables such as race/ethnicity, gender, age, employment status, etc. data on substance abuse characteristics such as type of substance used, frequency of use, the route of use, age at first abuse, prior admissions, etc. The TEDS-A record represents admissions rather than individuals as a person could be admitted more than once for the treatment. It is vital to acknowledge that selected sources are reliable sources of data for use in scientific study. For consistency, only these two online websites will be included in the study as all other websites with related data are excluded from the sample.

Power analysis is applied to find an optimal sample size for the study by combining statistical analysis and knowledge of the subject area. As noted by Faul et al

(2007), using GPower 3.1 demonstrates that a power level of only 0.4 can be achieved with a sample of 50 for each state, split into two groups (max of 25 in each group if, hypothetically they were evenly split). While typically, a threshold for power would be determined (typically 0.8 in psychological research) and then used to determine the required sample size, the nature of this study is such that the sample size is fixed (by number of States). Four data points will be used for each state with each corresponding to the study variables of interest. As such it is not possible to increase the sample size to the required number to reach a power of 0.8. At 0.4 power, an alpha threshold of 0.05 was set, as is the standard for inferential statistics in the field of psychology. Given the limitations of sample size, a small to moderate effect size was chosen (cohen's d = 0.3). A G-power analysis yield a sample size of 80, which is considered adequate for data saturation in a quantitative study (Zyphur & Pierides, 2019).

Instrumentation and Operationalization of Constructs

As this study uses a secondary data analysis approach, hence no data collection instruments are applied in the study. Rather, the study gathers data and information on states that allow medical marijuana cultivation by cardholders and caregivers. This is followed by gathering data in states prohibiting the cultivation of medical marijuana by caregivers and cardholders. The dependent variable is the State's CUD admission rate as reported in the TEDS-A for 2015-2019. The dependent variable, percentage of CUD admissions by state, will be acquired from the TEDS-A, as a ratio of CUD admissions between 2015 and 2019 to all admissions from that same period, by state. This percentage will be used as the dependent variable for all planned analyses. For independent, as

mentions earlier, the grouping will be done using the PDAPS. The variables are grouped into two types of categorical variables (1) type of caregiver cultivation policy measured by 1 = allowed and 0 = disallowed and (2) type of cardholder cultivation policy denoted by 1 = allowed to cultivate and (2) disallowed to cultivate medical marijuana as per the state laws and regulation.

Data Analysis Plan

Data from the secondary sources on the Medical Marijuana policies and percentage of CUD admissions will be checked to ensure completeness, arranged, sieved, and tabulated before analysis. As noted by Hagan (2014), these steps are relevant in ensuring the collected data is complete and admissible for analysis using the selected statistical tests. The initial stage will involve a description of data for presentation using graphs, charts, and tables. It is important to systematically examine each data in line with study questions and hypotheses. This is followed by inferential analysis to test the research hypothesis and answer research questions. All analysis will be performed in the SPSS statistics 26 software package. Although the T-test would have helped in analysis, the ANOVA approach is selected for this study. This is because whereas t-tests provide reliable results, chances of making a Type 1 error are high hence the need for ANOVA, which controls the occurrence of such errors and produces statistically relevant and significant results (Hagan, 2014). Data grouping will be double-checked against the PDAPS for validation of correct grouping for each state by caregiver and cardholder laws. All percentages of CUD admissions reported by the TEDS-A will be calculated as

CUD admissions/total admissions and double entered. Accordingly, the analysis for each research question and hypothesis is provided as follows:

Research Questions and Hypothesis

RQ 1 – What is the association between state laws that allow ***cardholders*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a positive and statistically significant association between state laws that allow **cardholders** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019.

H0: There is no statistically significant association between state laws that allow **cardholders** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019.

RQ 2 – What is the association between state laws that *disallow* ***cardholders*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a statistically significant relationship between state laws that *disallow* ***cardholders*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H0: There is no statistically significant relationship between state laws that *disallow* ***cardholders*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

RQ 3 – What is the association between state laws that *allow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a statistically significant relationship between state laws that *allow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H0: There is no statistically significant relationship between state laws that *allow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

RQ 4 – What is the association between state laws that *disallow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a statistically significant relationship between state laws that *disallow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H0: There is no statistically significant relationship between state laws that *disallow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

RQ 5- What is the association between state laws on medical marijuana cardholders and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a statistically significant relationship between state laws on medical marijuana cardholders and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H0: There is no statistically significant relationship between state laws on medical marijuana cardholders and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

Descriptive statistics for the number of states that allow/disallow cardholders and caregivers will be provided and presented in the form of tables and graphs. Research questions 1 and 2 will be tested using a two-tailed independent sample t-test. The grouping will be based on the cross-sectional design of the study, with states prohibiting the cultivation of medical marijuana for cardholders making up one group and those permitting it to make up the other group. Ideally, this test is performed to determine any significant differences between the two independent groups. In this case, the test is relevant in assessing differences in CUD admissions between states with the law allowing cultivation of medical marijuana and states with laws disallowing the cultivation of

therapeutic marijuana. The statistical significance is set at 5%, as the most common for social sciences. Therefore, the p-value of less than 0.05 of the relationship would imply significant differences between these two groups of states. The analysis is done separately for cardholder and caregiver medical marijuana cultivation policies. The test is relevant when the independent variables are categorical and a continuous dependent variable.

In this case, the percentage of CUD admissions in each state between 2015 and 2019 is a continuous dependent variable in each group before any inferential statistics against categorical independent variables. Besides, the two groups must be independent of each other, states with laws prohibiting the cultivation of medical marijuana and states with laws supporting the cultivation of medical marijuana. Besides, the independent t-tests have other assumptions that must be met to perform the tests, including testing for normal distribution of data (using kurtosis and skewness values between -2 and 2), appropriate sample size (see above limitations described from power analysis, and homogeneity of variance (using Levene's test for homogeneity of variance). The t statistics that correspond to an alpha ≥ 0.05 will be deemed significant and the null hypothesis for research questions 1 and 2 will be rejected. The same tests will be applied for questions 3 and 4, for caregivers to determine differences in scores between the two groups of states. The interpretation of independent t-tests will be based on a significance level of 5% where p values less than 0.05 mean that differences in scores between independent groups are statistically significant, hence the null hypothesis s rejected. Therefore, medication marijuana cultivation promotes CUD admission in the states.

However, if the p values exceed 0.05 then the null hypothesis is accepted indicating there is no significant difference in the rate of admissions between the two independent groups. These results imply that laws and regulations on medical marijuana cultivation by caregivers do not affect CUD admissions.

To investigate the interaction effect of state legality for cardholder and caregiver cultivation of medical marijuana on CUD admission rates by state (cardholder permitted to cultivate marijuana versus cardholder prohibited from cultivating medical marijuana) as well as a caregiver (caregiver permitted vs. caregiver prohibited), the univariate analysis will be performed with CUD admission rates by state as the dependent variable. As noted by Ary, Jacobs, Irvine, and Walker (2018), a Univariate test is the simplest form of analyzing data because it involves only one variable. In contrast to the regression that seeks to establish the relationships and causes, the univariate analysis aims at describing by finding patterns in the data. The outcome metric of interest for this analysis will be the interaction term between the two significant variables. A significant interaction term resulting from the Univariate analysis would indicate an interaction effect of cardholder and caregiver medical marijuana legality by the state on the CUD admission percentage for each state.

Threats to Validity

The validity of data is the degree to which they can capture the required information and data for the research. The types of validity include construct validity, internal validity, and external validity. It is important in ensuring that scores and conclusions drawn from collected data correctly represent the study phenomenon.

However, reliability is the generation of consistent results from repeated tests or studies. The validity of this research will be ensured through expert input in the research to ensure that only relevant information for addressing the research problem is collected. In line with Borg and Gall (1989), expert judgment was used to enhance the instrument's content validity. For instance, the key threats to validity are connected to the merging of three data files of caregiver by state, cardholder by state, and rates of marijuana admissions.

Regarding external validity, the current analysis plan is limited to only the impact of caregiver/cardholder medical marijuana cultivation legality on CUD admission rates. Extraneous factors that could represent confounding variables are not considered as they are beyond the scope of the current study (Mohajan, 2017). The high CUD admissions can be attributed to internal factors such which were never controlled like such as parenthood which are not controlled in this study. As a consequence, the outcome of the study may not be purely a result of the medical marijuana legality across states but also other factors that reduce the validity of the study.

Ethical Procedures

Certain ethical requirements must be complied with in conducting any research. The researcher must avoid doing any physical or psychological harm to the study subjects. However, the study relies on secondary sources of data and information and hence no participants were recruited as respondents in this study. All procedures to acquire secondary data will be overseen and within the guidelines of an approved IRB (Head, 2020). Nonetheless, the researcher will seek approval from IRB and other relevant research ethics bodies before commencing the actual study. However, for all information

in the public domain, there is no need to keep the information confidential. The study will use data from online websites that were available for public use. Information on rates and types of admissions will not include any personal health information, thus there is no risk to individual confidentiality. As such, the information from online sources and pieces of literature reviewed will be properly acknowledged and referenced following APA style. Nonetheless, for purposes of confidentiality, all data will be kept on password-protected hardware (laboratory computers) in locked offices. Hardcopies of data will be kept in locked filing cabinets.

Summary

The chapter has provided detailed information on research designs and methodology to be adopted in carrying out the proposed research. The goal of the study is to assess the association between state medical marijuana cultivation policies and the prevalence of CUD admissions into substance abuse treatment facilities. The study proposes to use a qualitative cross-sectional research design to assess the effects of medical marijuana legality on CUD admissions To achieve the research goal and test the hypotheses and answer the research questions, secondary data will be acquired, and descriptive/inferential statistical analysis will be performed using SPSS version 26 for answering research questions and testing research hypothesis. All ethical requirements for research will be accorded due to consideration as all procedures of acquiring secondary data will be overseen to ensure they are within the guidelines of an approved IRB. The independent-sample t-tests are relevant approaches for assessing the relationship between independent variables and dependent variables. The preceding

section provides a detailed analysis and presentation and discussion of results on a quantitative cross-sectional research study.

Section 3: Presentation of the Results and Findings

Introduction

The purpose of this study was to examine the relationship between Marijuana Cultivation Laws and Admissions for Cannabis Use Disorder (CUD) in US Substance Abuse Treatment Facilities by comparing the rate of admission for cannabis use disorder between states where laws allow the cultivation of medical marijuana by cardholders and caregivers against states where cultivation is prohibited. The descriptive statistics and demographic characteristics of the data sets were presented. The assumptions of the independent t-test were assessed. An independent t-test and a nonparametric Mann-Whitney test were implemented to assess the research questions. The following research questions guided this study:

Research Questions

Research Questions and Hypothesis

RQ 1 – What is the association between state laws that allow ***cardholders*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a positive and statistically significant association between state laws that allow **cardholders** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019

H0: There is no statistically significant association between state laws that allow **cardholders** to cultivate medical marijuana plants and the percent of state CUD admissions

reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019.

RQ 2 – What is the association between state laws that *disallow* ***cardholders*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a statistically significant relationship between state laws that *disallow* ***cardholders*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H0: There is no statistically significant relationship between state laws that *disallow* ***cardholders*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

RQ 3 – What is the association between state laws that *allow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a statistically significant relationship between state laws that *allow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H0: There is no statistically significant relationship between state laws that *allow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions

reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

RQ 4 – What is the association between state laws that *disallow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a statistically significant relationship between state laws that *disallow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H0: There is no statistically significant relationship between state laws that *disallow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

RQ 5- What is the association between state laws on medical marijuana cardholders and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a statistically significant relationship between state laws on medical marijuana cardholders and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H0: There is no statistically significant relationship between state laws on medical marijuana cardholders and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

Data Collection of Secondary Data Set

The research utilized secondary data sourced from PDADS (https://pdaps.org/datasets/) and SAMHDA (https://www.datafiles.samhsa.gov) websites. The initial SAMHDA data set consisted of 9414284 observations and measurements for the years 2015-2019. After filtering the observation for the time period 2015 and 2019, the resulting data set included 5,489,408 observations measured by the information on admission demographics (for example, age, sex, race/ethnicity, employment status) and substance use characteristics (for example, substances used, age at first use, route of use, frequency of use, number of prior admissions). The majority of the participants were Males, White, under 40 years old, and unemployed (Table 1).

Table 1

Sociodemographic Characteristics of Participant

		N	%
Gender			
	Male	3563004	65%
	Female	1923578	35%
	Missing values	2826	0%
Race			
	White	3608182	66%
	African American	1010249	18%
	Other	583685	11%
	Missing values	129770	2%
	American Indian	120876	2%
	Asian	36646	1%
Age			
	30-39	1571491	29%
	20-29	1548869	28%
	40-49	985540	18%
	50+	959556	18%
	12-19	423952	8%

Education			
	Grade 12	2360233	43%
	Grades 9 to 11	1153475	21%
	1-3 years of college	955391	17%
	Missing values	370733	7%
	Less than Grade 8	331681	6%
	BA/BS	317895	6%
Employment			
	Unemployed	1955879	36%
	Not in labor force	1919673	35%
	Full-time	882093	16%
	Part-time	388468	7%
	Missing values	343295	6%

The initial PDAPS data set consisted of the states separated by information on whether caregivers were allowed to cultivate marijuana and whether the law explicitly allowed cardholders to cultivate medical marijuana plants (Table 2). However, in the SAMHDA dataset, there was missing information on the disorder diagnosis for California, Minnesota, Nevada, Oregon, and Washington, therefore, they were removed from the further analysis. As a result, by 2019, 12 states in the dataset allowed cardholders and caregivers to cultivate marijuana, and 12 states did not allow it.

Table 2

Prescription Drug Abuse Policy System (PDAPS) information

Jurisdiction	Does the law explicitly allow cardholders to cultivate medical marijuana plants?	Are caregivers allowed to cultivate marijuana?
Massachusetts	Yes (105 Mass. Code Regs. Sec. 725.015)	Yes (Mass. Gen. Laws ch. 94C, Sec. 1-2; Code Regs. 725.035)
Vermont	Yes (17-2 Vt. Code R. Sec. 3:3)	Yes (17-2 Vt. Code R. Sec. 3:1)

Alaska	Yes (Alaska Stat. Sec. 17.37.040)	Yes (Alaska Stat. Sec. 17.37.070,)
Arizona	Yes (Ariz. Rev. Stat. Sec. 36-2801)	
California	Yes (Cal. Health & Safety Code Sec. 11362.77)	Yes (Cal. Health & Safety Code Sec. 11362.77)
Colorado	Yes (Colo. Const. Art. XVIII, Section 14)	Yes (Colo. Const. Art. 18 Sec. 14, Colo. Rev. Stat. 25-1.5-106)
Hawaii	Yes (Haw. Rev. Stat. Sec. 329-121 Haw. Code R. 11-160-2)	Yes (Haw. Code R. Sec. 11-160-27, Haw. Rev. Stat. 329-121)
Maine	Yes (Me. Rev. Stat. tit. 22, Sec. 2423-A)	Yes (Me. Rev. Stat. tit. 22, Sec. 2423-A)
Michigan	Yes (Mich. Comp. Laws Sec. 333.26424)	Yes (Mich. Comp. Laws Sec. 333.26423; Mich. Comp. Laws 333.26424)
Montana	Yes (Mont. Code Sec. 50-46-319)	Yes (Mont. Code Sec. 50-46-301, Mont. Code 50-46-302, Mont. Code 50-46-303)
New Mexico	Yes (N.M. Code R. Sec. 7.34.4.8)	Yes (N.M. Code R. Sec. 7.34.4.8)
Nevada	Yes (Nev. Rev. Stat. Sec. 453A.200)	
Oregon	Yes (Or. Rev. Stat. Sec. 475B.428)	
Rhode Island	Yes (R.I. Gen. Laws Sec. 21-28.6-4)	Yes (R.I. Gen. Laws Sec. 21-28.6-4)
Washington	Yes (Wash. Rev. Code Sec. 69.51A.040)	Yes (Wash. Rev. Code Sec. 69.51A.010,)
Nevada		Yes (Nev. Rev. Stat. 453A.200)
Arizona		Yes (Ariz. Rev. Stat. 36-2801, Ariz. Admin. Code R9-17-202)
Oregon		No
Arkansas	No	No
Connecticut	No	No
Delaware	No	No
District of Columbia	No	No
Florida	No	No
Illinois	No	No
Maryland	No	No
Minnesota	No	No

New Hampshire	No	No
New Jersey	No	No
New York	No	No
Ohio	No	No
Pennsylvania	No	No

Following the data analysis plan, the indicator variables cardholders and caregivers as independent variables were created. The resulting records were identical for the states where cardholders and caregivers were allowed to cultivate medical marijuana plants. According to J. Patel (2022), Cannabis abuse and dependence were combined in the DSM-5 into a single entity capturing the behavioral disorder that can occur with chronic cannabis use and named Cannabis Use Disorder. The corresponding values were collected from SAMHDA data set column DSMCRIT: DSM diagnosis. After that, they were grouped by each state and divided by the total number of records. The resulting dependent variable CUD Rate was created.

Results

RQ 1 – What is the association between state laws that allow ***cardholders*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a positive and statistically significant association between state laws that allow **cardholders** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019.

H0: There is no statistically significant association between state laws that allow **cardholders** to cultivate medical marijuana plants and the percent of state CUD admissions

reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015-2019.

The dependent variable CUD Rate had an average value of 0.04 and a standard deviation of 0.04 rate units (Table 3). Kurtosis and skewness values were between -2 and 2. However, the variable was not normally distributed (Shapiro-Wilk test, SW (24) = 0.84, $p < .001$, Figure 1).

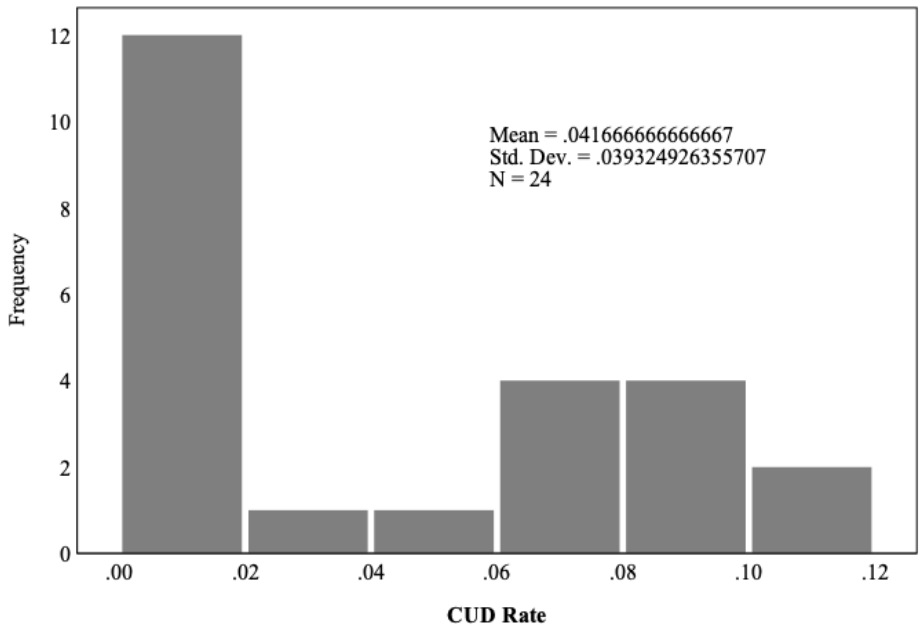
Table 3

CUD rate

	0 disallowed	1 allowed	Total
N	12	12	24
Mean	0.06	0.02	0.04
Median	0.06	0.01	0.02
Std. Deviation	0.04	0.03	0.04
Kurtosis	-1.53	0.08	-1.56
Skewness	-0.34	1.34	0.41
Minimum	0.00	0.00	0.00
Maximum	0.11	0.09	0.11

Figure 1

Histogram of CUD Rate values



As a result, initially planned t-tests were accompanied by a non-parametric Mann-Whitney U test. The homogeneity of variance was assessed using Levene's Test. The results indicated that the variance was approximately equal across the groups F (1, 22) = 1.25, p = .27 (Table 4).

Table 4

Levene's Test of Equality of Error Variances

CUD Rate	Levene Statistic	df1	df2	p
Based on Mean	1.254	1	22	.27
Based on Median	1.767	1	22	.19
Based on Median and with adjusted df	1.767	1	19.952	.19

Based on trimmed mean	1.422	1	22	.24

Note Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
Dependent variable: CUD Rate
Design: Intercept + cardholders

Previously, the independent variables cardholders and caregivers were found to be identical for the states where cardholders and caregivers were allowed to cultivate medical marijuana plants. Therefore, the analysis was performed only for cardholders. The CUD Rate for the states that disallowed to cultivate medical marijuana plants (M = 0.06, SD = 0.04) was higher than for the states that allowed to cultivate medical marijuana plants (M = 0.02, SD = 0.03) (Figure 2). The results of the independent samples T-test indicated that the difference was statistically significant, t (22) = 2.48, p = .02 (Table 5). The difference in means was greater than 1 standard deviation: Cohen's d = 1.01 (95% CI [0.15, 1.85]), indicating that the effect size was large.

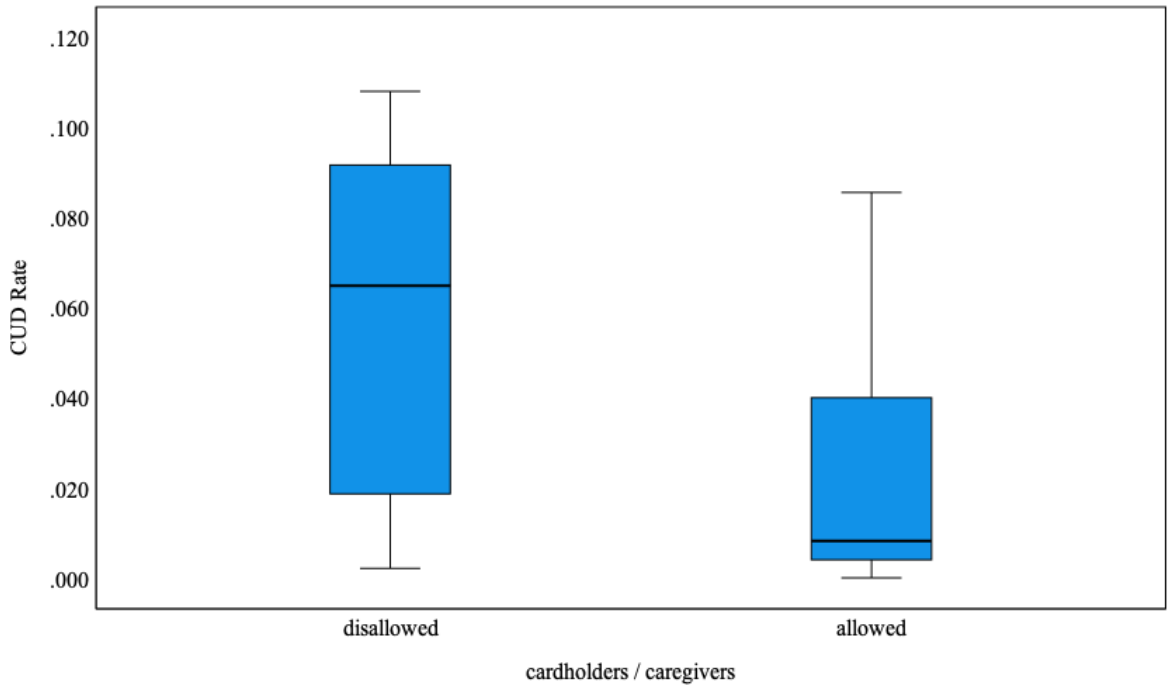
Table 5

Independent Samples Test

	t	df	p (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Equal variances assumed	2.488	22	0.02	0.04	0.01	0.01	0.07
Equal variances not assumed	2.488	20.814	0.02	0.04	0.01	0.01	0.07

Figure 2

Boxplots of CUD Rate across the groups



The results of a nonparametric Mann-Whitney Test confirmed the statistical significance of the difference. The CUD Rate for the states that disallowed to cultivate medical marijuana plants (*Mdn* = 0.06) was higher than for the states that allowed to cultivate medical marijuana plants (*Mdn* = 0.01). A Mann-Whitney test indicated that this difference was statistically

significant, U ($N_{\_disallowed}$ = 12, $N_{\_disallowed}$ = 12) = 34, z = -2.19, p = .028 (Table 6).

Table 6

Mann-Whitney Test

	n	Mean Rank	Sum of Ranks
0 disallowed	12	15.67	188.00
1 allowed	12	9.33	112.00
Total	24		

The results of the independent samples T-test showed that the difference in CUD Rate between the state laws that allow cardholders to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019 was statistically significant, t (22) = 2.48, p = .02 (Table 5). Additionally, a nonparametric Mann-Whitney test confirmed that this difference was statistically significant, U ($N_{\_disallowed}$ = 12, $N_{\_disallowed}$ = 12) = 34, z = -2.19, p = .028 (Table 6). The null hypothesis 1 was rejected, and it was concluded that the states that allowed cardholders to cultivate medical marijuana plants had lower CUD Rate than those that allowed it.

RQ 2 – What is the association between state laws that *disallow* ***cardholders*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019? H1: There is a statistically significant relationship between state laws that *disallow* ***cardholders*** to cultivate medical marijuana plants and the percent of state CUD

admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H0: There is no statistically significant relationship between state laws that *disallow* ***cardholders*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

The results of the independent samples T-test showed that the difference in CUD Rate between the state laws that allow cardholders to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019 was statistically significant, t (22) = 2.48, p = .02 (Table 5). Additionally, a nonparametric Mann-Whitney test confirmed that this difference was statistically significant, U ($N_{\_disallowed}$ = 12, $N_{\_disallowed}$ = 12) = 34, z = -2.19, p = .028 (Table 6). The null hypothesis 2 was rejected, and it was concluded that the states that disallowed cardholders to cultivate medical marijuana plants had higher CUD Rate than those that allowed it.

RQ 3 – What is the association between state laws that *allow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a statistically significant relationship between state laws that *allow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H0: There is no statistically significant relationship between state laws that *allow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) 2015 and 2019?

The results of the independent samples T-test showed that the difference in CUD Rate between the state laws that allow caregivers to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019 was statistically significant, t (22) = 2.48, p = .02 (Table 5). Additionally, a nonparametric Mann-Whitney test confirmed that this difference was statistically significant, U ($N_{\_disallowed}$ = 12, $N_{\_disallowed}$ = 12) = 34, z = -2.19, p = .028 (Table 6). The null hypothesis 3 was rejected, and it was concluded that the states that allowed caregivers to cultivate medical marijuana plants had lower CUD Rate than those that allowed it.

RQ 4 – What is the association between state laws that *disallow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a statistically significant relationship between state laws that *disallow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H0: There is no statistically significant relationship between state laws that *disallow* ***caregivers*** to cultivate medical marijuana plants and the percent of state CUD admissions

reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

The results of the independent samples t-test showed that the difference in CUD Rate between the state laws that allow caregivers to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019was statistically significant, t (22) = 2.48, p = .02 (Table 5). Additionally, a nonparametric Mann-Whitney test confirmed that this difference was statistically significant, U ($N_{\_disallowed}$ = 12, $N_{\_disallowed}$ = 12) = 34, z = -2.19, p = .028 (Table 6). The null hypothesis 4 was rejected, and it was concluded that the states that disallowed caregivers to cultivate medical marijuana plants had higher CUD Rate than those that allowed it.

RQ 5- What is the association between state laws on medical marijuana cardholders and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H1: There is a statistically significant relationship between state laws on medical marijuana cardholders and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?

H0: There is no statistically significant relationship between state laws on medical marijuana cardholders and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019

Due to the complete match of the independent variables Cardholders and Caregivers for the states where cardholders and caregivers were allowed or disallowed to cultivate medical marijuana plants, the univariate analysis with the interaction term was not performed.

Summary

The purpose of this study was to examine the relationship between Marijuana Cultivation Laws and Admissions for Cannabis Use Disorder (CUD) in US Substance Abuse Treatment Facilities by comparing the rate of cannabis use disorder between states where laws allow the cultivation of medical marijuana by cardholders and caregivers against states where cultivation is prohibited. An independent t-test and a nonparametric Mann-Whitney test were implemented to assess the research questions. It was found that the difference in CUD admission rate between the states that allowed or disallowed to cultivate medical marijuana plants was statistically significant. t (22) = 2.48, p = .02. The CUD Rate for the states that disallowed to cultivate medical marijuana plants (M = 0.06, SD = 0.04) was higher than for the states that allowed to cultivate medical marijuana plants (M = 0.02, SD = 0.03) both for cardholders and caregivers. Additionally, a nonparametric Mann-Whitney test confirmed that this difference was statistically significant, U ($N_{\_disallowed}$ = 12, $N_{\_disallowed}$ = 12) = 34, z = -2.19, p = .028. The null hypotheses 1, 2, 3, and 4 were rejected. The univariate analysis with the interaction term was not performed, and consequently, the research question 5 was not assessed due to the complete match of the independent variables Cardholders and Caregivers for the states where cardholders and caregivers were allowed or disallowed to cultivate medical

marijuana plants. Section 4 discusses the conclusions of the study and presents recommendations for future research.

Section 4 – Application to Professional Practice and Implications for Social Change

Introduction

With approximately 4.4 million Americans affected in 2018, cannabis addiction is a dominant non-medical drug consumption disorder common in the U.S (Davenport, 2018; Hasin et al., 2017). The prevalence of marijuana addiction increases the demand for cannabis-related admission and treatment, which in turn impacts healthcare resource utilization in substance abuse treatment facilities (Ditre, Zale & LaRowe, 2019; Ekendahl, Månsson & Karlsson, 2020). In addition to the problem of an increase in healthcare resource utilization, the rise in demand for cannabis-related admissions contributes to an upsurge in the unmet treatment needs – since healthcare funding and resources for substance abuse facilities are not commensurately increasing alongside demand (Kiselica et al.,2018; Hyshka, Anderson, and Wild, 2017).

Therefore, the purpose of the quantitative cross-sectional study was to explain how the association between the medical marijuana cardholder and caregiver cultivation laws (MM) and the generality of cannabis addiction admissions in U.S. substance abuse treatment facilities. In this study, the researcher seeks to correlate state laws that allow ***cardholders*** to cultivate medical marijuana plants and the percent of state CUD admissions reported. In this case, the dependent variable is the admission in the U.S substance abuse while the independent variable is the adoption of the state laws.

By analyzing the previous studies on marijuana use, the review presented various methodological components on the documentary survey, qualitative analysis, observation

research, conducting interviews, and administering questionnaires. These methodologies provide accurate data and information on how cannabis use disorder influences the population. Several justifications exist for this multi-faceted research quantitative research design. The quantitative cross-sectional research design adopted a systematic approach that was critical for the current study. Notably, the study required in-depth insight to help decipher and explain the association between the medical marijuana cardholder and caregiver cultivation laws (MM) and the generality of cannabis addiction admissions in U.S. substance abuse treatment facilities.

The research utilized secondary data sourced from PDADS and SAMHDA websites. The initial SAMHDA data set consisted of 9414284 observations and measurements for the years 2015-2019. After filtering the observation for the time period 2015 and 2019, the resulting data set included 5,489,408 observations measured by the information on admission demographics (for example, age, sex, race/ethnicity, employment status) and substance use characteristics (for example, substances used, age at first use, route of use, frequency of use, number of prior admissions). The results of the independent samples T-test showed that the difference in CUD Rate between the state laws that allow cardholders to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019 was statistically significant.

Additionally, the results of the independent samples T-test showed that the difference in CUD Rate between the state laws that allow cardholders to cultivate

medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019 was statistically significant. Third, the results of the independent samples T-test showed that the difference in CUD Rate between the state laws that allow caregivers to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019 was statistically significant. Finally, the results of the independent samples T-test showed that the difference in CUD Rate between the state laws that allow caregivers to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019 was statistically significant.

The remainder of this chapter contains a critical discussion of the findings and their implications. An interpretation of the findings based on their alignment with previous research and theory is presented first. Consideration is then given to the limitations of this study and the extent to which they affected the results. Recommendations are then made for research, practice, and policy where relevant. Finally, the implications of these findings for social change are considered. This chapter concludes with a summary and outline of key points.

Interpretation of the Findings

This section contains an interpretation of the findings based on their alignment with previous literature and theory. This section is organized based on each of the five research questions. A brief overview of the questions is presented first, and then an interpretation of the results is offered based on their impact on social change.

The first research question what, "What is the association between state laws that allow *cardholders* to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?" It was hypothesized that there is a positive and statistically significant association between state laws that allow cardholders to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019. The results of the independent samples T-test showed that the difference in CUD Rate between the state laws that allow cardholders to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019 was statistically significant. Therefore, the null hypothesis 1 was rejected, and it was concluded that the states that allowed cardholders to cultivate medical marijuana plants had lower CUD Rate than those that disallowed it.

Results related to this research question help to reconcile debates that have existed in previous research. setting the stage for more CUD cases. The percentage of people being admitted for Cannabis use disorder independent variable tells volumes about the

effectiveness of marijuana laws, and especially with regards to cultivation. According to Freisthler et al (2020), the fact that marijuana patients are increasingly being admitted for cannabis-related disorders implies serious leakages in the current cultivation laws. On the other hand, Segura et al (2019) indicated that the percentages of this second variable have been heightening owing to the inability or reluctance of law enforcement agencies with regards to strict implementation. From such a perspective, it would be logical to assert that this variable is heavily influenced by both cultivation and distribution laws.

The second research question was, "What is the association between state laws that *disallow cardholders* to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?" It was hypothesized that there is a statistically significant relationship between state laws that *disallow cardholders* to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?" The results of the independent samples T-test showed that the difference in CUD Rate between the state laws that allow cardholders to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019 was statistically significant. Therefore, the null hypothesis 2 was rejected, and it was concluded that the states that disallowed cardholders to cultivate medical marijuana plants had higher CUD Rate than those that allowed it.

As with research question one, findings related to this question help to expand on previous literature associated with this issue. For example, literature has indicated that although cardholders (Green Card Holders) can apply for permits to grow marijuana due to medical reasons, care should be exercised to ensure compliance with all legal requisites. Explaining the need to tread carefully for this particular US citizen faction, Winniman (2018) argued that cardholders can be at risk of being deported if the authorities' sense or have evidence concerning medical marijuana consumption and cultivation issues given that cardholders are immigrants and their status is treated as a federal issue. This implies that although the states of cardholders are unlikely to convict them for medical marijuana usage, the US federal government can easily take on such measures against cardholders that attempt to cultivate the plant even in cases where state laws make room for such provisions (Kamin, 2018).

The third research question was, "What is the association between state laws that allow caregivers to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?" It was hypothesized that there is a statistically significant relationship between state laws that allow caregivers to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019. The results of the independent samples T-test showed that the difference in CUD Rate between the state laws that allow caregivers to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS -

A) between 2015 and 2019 was statistically significant. Therefore, the null hypothesis 3 was rejected, and it was concluded that the states that allowed caregivers to cultivate medical marijuana plants had lower CUD Rate than those that disallowed it.

Findings related to this question support previous studies. For instance, records on Treatment Episode Data Set for Admissions (TEDS - A) in relation to CUD indicated that between 2015 and 2017, the rates of admissions for individuals who consistently use the substance were recorded at 43% (Gillespie et al., 2018). Such findings strongly suggest that marijuana consumption, even for medical purposes can easily cause individuals to develop addiction disorders that have severe clinical consequences. Commenting on the increased admissions during this period, Small (2018) opined that the escalations resulted from the inability of state authorities to enforce legalization for adults while restricting usage by teenagers. As such, it would be logical to argue that if medical marijuana and legalization policies were to be implemented correctly, the percentage of CUD admissions would be headed for a downward trend (Ciccone, 2017). The most striking feature as it relates to CUD admission prevalence is that the admissions have declined drastically for adolescents although records still indicate that adult admissions may not be as predictable in the future

The fourth research question was, “What is the association between state laws that *disallow caregivers* to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?” It was hypothesized that there is a statistically significant

relationship between state laws that *disallow caregivers* to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019. The results of the independent samples T-test showed that the difference in CUD Rate between the state laws that allow caregivers to cultivate medical marijuana plants and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019was statistically significant. Therefore, the null hypothesis 4 was rejected, and it was concluded that the states that disallowed caregivers to cultivate medical marijuana plants had higher CUD Rate than those that allowed it.

This finding also helps to address gaps in the literature associated with the relationship between marijuana laws and substance use disorders. For example, these findings affirm the notable admission declines among teenagers, Pinto et al. (2019) noted that the declines that currently stand at around 18% stem from the fact that legalization laws for adults and the development of stricter cultivation laws across states in the US are the chief reason since it has become increasingly difficult for adolescents to obtain the substance. Such prevalence findings are contrary to common allegations that legalization and the emergence of medical marijuana policies and practices have escalated marijuana consumption among young people (Chiang, Du & Summers, 2019). Given such an opinion, it would be logical to conclude that as the states across the US continue to learn better methods of implementing medical marijuana laws with regards to caregiver and patient cultivation, CUD admission declines can be expected to decline more uniformly.

The fifth research question was, “What is the association between state laws on medical marijuana cardholders and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019?” It was hypothesized that there is a statistically significant relationship between state laws on medical marijuana cardholders and the percent of state CUD admissions reported in the US Treatment Episode Data Set for Admissions (TEDS - A) between 2015 and 2019. Due to the complete match of the independent variables Cardholders and Caregivers for the states where cardholders and caregivers were allowed or disallowed to cultivate medical marijuana plants, the univariate analysis with the interaction term was not performed. Recent developments have stemmed from the discovery that family members and friends of both caregivers and legal marijuana patients have been gaining access to growing spaces leading to increased consumption of the substance in families and society. Cardholders are strongly advised to obtain the substance from their designated caregivers instead of growth owing to the moral turpitude component governing immigration law (PDAPS, 2020).

Findings from this study may be interpreted based on the theoretical framework guiding the research. This study's theoretical framework will focus on the Ecological Models proposed by Urie Bronfenbrenner in the 1970s, an activity that was later formalized into a theory in the 1980s (Bronfenbrenner, 1977; Bronfenbrenner, 1986; Bronfenbrenner, 1992). The ecological model focused on population and individual determinants of practices or behaviors. It explains how the various levels of influences determine health-related practices and outcomes. These levels constituted the public

policy, the organizational, interpersonal and intrapersonal, and the community (Stockings et al., 2018). Concerning health care practices, public policy can be defined as the local, national, and international laws and guidelines implemented on the CUD. Results from this study suggest that systemic factors play a strong role in whether or not marijuana laws are associated with CUD rates. Findings from this study extend the previous research in which the Ecological Model has been used extensively in research areas that are similar in focus to those of this study such as multiple healthcare administration and systems research including studies that explain upstream determinants of service access, uptake, and resource utilization (Taylor & Haintz, 2018; Ma, Chan, & Loke, 2017; Chiu, Dushoff, Yu, & He, 2017; Spencer, & Grace, 2016; Manuel et al., 2016). For example, Ma et al. (2019) used the Ecological Model to explore the varying patterns and critical factors associated with involuntary admissions based on the implementation of China's mental health law. Taylor and Haintz (2018) leveraged the theory to examine the impacts of social stressors or constructs of health when providing or accessing healthcare services among refugees in Australia. In the case of the U.S, Manuel et al. (2016) used the Ecological Model to frame their study that determined the threats and promoters of a successful progression from long-term residential substance abuse and treatment. Therefore, it is critical to now view the links between cannabis laws and usage disorders in isolate, and to, instead, consider the broader multidimensional nature of these relationships. The following section contains a discussion of limitations that were present and which may have impacted the findings of this study.

Limitations of the Study

While this study is believed to offer several contributions to social change, there were some limitations that were present and which warrant consideration. For this study, the researcher used data from US Treatment Episode Data Set for Admissions (TEDS), which is archival data for subsequent analysis, and subsequently provide an answer to the research question. However, the use of archival data has its limitation in that the data may be biased (Barnes et al., 2018). Also, some mistakes may have been made when entering data in the archives, which could compound the biasness in the research and lead to the wrong conclusion (Barnes et al., 2018). Thus, further research is needed in order to mitigate these issues. The following section contains a more detailed discussion of recommendations that can be made based on these limitations, as well as based on the implications of the results of this investigation.

Recommendations

Several recommendations can be made for future research, practice, and policy, based on limitations mentioned above and the implications of these findings. First, it is recommended that the aforementioned limitations be addressed, as doing so will enhance the generalizability of the evidence associated with marijuana laws and CUD rates. Additionally, future research is still needed in order to understand how and why legislation is linked to CUD rates in various states. No known research has focused on determining the extent to which legalizing and not legalizing cardholder and caregiver

MM cultivation in a state influences the prevalence of cannabis use disorder admissions in substance abuse facilities.

There is a need to conduct a comprehensive empirical based study to determine whether there is an association between the MM programs and an increase in marijuana abuse. The ineffectiveness or lack of commitment by hospitals and law enforcers when it comes to scrutinizing patients before giving them the legal go-ahead to consume marijuana is to blame for CUD admissions escalations. Therefore, it can be argued that as a dependent variable, the percentage of individuals using marijuana for medical purposes has been increasing and setting the stage for more CUD cases. There is a need to study this issue further.

Additionally, there is a need for more specified approaches and a narrowing of focus when it comes to the areas on which medical marijuana legalization has the highest impact. Additionally, despite the evidence generated from this study, there remains a There is a need to conduct a comprehensive empirical based study to determine whether there is an association between the MM programs and an increase in marijuana abuse. Associated between MML and treatment admissions have resulted in further policy recommendations to prevent and reduce illicit use/misuse. The following section contains a discussion of implications that can be drawn for practice and social change based on the findings of this study.

Implications for Professional Practice and Social Change

This study was conducted to identify the association between the MM programs and the increase in the number of admissions related to marijuana and drug abuse. As such, from the study, the researcher was able to determine, based on data and facts, whether the state laws that allow the cultivation of marijuana harms the admission of people due to abuse. As such, the findings help to form the basis for the corrective action, based on several significant associations. Also, the findings provide a basis for the improvement in the current policies, to ensure that the cultivation of marijuana under the MM program in different states are not wrongly used to promote marijuana and substance abuse. The necessity of these findings stems from the fact that MM programs have been associated with social changes that influence healthcare administrators.

Whereas most scholars have been concerned about increases in CUD admissions, it is equally important to recognize that MM programs have as well exerted significant influences on how healthcare administrators execute their duties. According to Anderson et al (2018), as states continue to adopt legalization and medical use of marijuana, the issue of diverted medical marijuana is increasingly gaining prevalence. This implies that for adults that have been issued cards to guarantee the issuance of medical marijuana, some of the supplies are being made available for minors. For instance, Cook et al (2020) reported that in Colorado over 75% of young people involved in marijuana consumption have received supplies from cardholders that diverted supplies on-demand at agreed costs. Consequently, CUD admissions are no longer increasing for adults but healthcare

administrators are increasingly being pushed to the edge being coerced to deal with under admissions without existing stipulations to deal with such cases. Findings from this study have implications for healthcare administrators by potentially alleviating their burden associated with managing CUD admissions. The development of stipulations based on these findings may help in regards to providing professional boundaries in regards to the roles of healthcare administrators and help provide clarity as to their expectations when working with cases involving CUD admissions. Also, the findings provide a basis for the improvement in the current policies, to ensure that the cultivation of marijuana under the MM program in different states are not wrongly used to promote marijuana and substance abuse

Conclusion

The purpose of this chapter was to provide an interpretation related to findings associated with relationship between Marijuana Cultivation Laws and Admissions for Cannabis Use Disorder (CUD) in US Substance Abuse Treatment Facilities by comparing the rate of cannabis use disorder between states where laws allow the cultivation of medical marijuana by cardholders and caregivers against states where cultivation is prohibited. An independent t-test and a nonparametric Mann-Whitney test were implemented to assess the research questions. It was found that the difference in CUD admission rate between the states that allowed or disallowed to cultivate medical marijuana plants was statistically significant.

The CUD Rate for the states that disallowed to cultivate medical marijuana plants was higher than for the states that allowed to cultivate medical marijuana plants both for cardholders and caregivers. Additionally, a nonparametric Mann-Whitney test confirmed that this difference was statistically significant. Therefore, the null hypotheses 1, 2, 3, and 4 were rejected. The univariate analysis with the interaction term was not performed, and consequently, the research question 5 was not assessed due to the complete match of the independent variables Cardholders and Caregivers for the states where cardholders and caregivers were allowed or disallowed to cultivate medical marijuana plants.

This chapter contained a critical discussion of the findings and their implications. An interpretation of the findings based on their alignment with previous research and theory was presented first. Results demonstrated that these findings generally show that medical marijuana disallowance is not associated with an increase in CUD rates, and these findings help to extend previous research related to this subject. These findings are explained efficaciously by ecological systems theory. Consideration was then given to the limitations of this study and the extent to which they affected the results. These limitations included the use of secondary data and potential errors made in entering results. Recommendations were then made for research, practice, and policy where relevant. Research directions involve the correction of limitations made in this study, as well as to consider the mediating and moderating variables that potentially influence the relationship between marijuana laws and substance use disorders.

Finally, the implications of these findings for social change are considered. The findings of this study significantly help to form the basis for the corrective action, based

on several significant associations. Also, the findings provide a basis for the improvement in the current policies, to ensure that the cultivation of marijuana under the MM program in different states are not wrongly used to promote marijuana and substance abuse. This concludes Section 4 and the dissertation.

References

Alharbi, Y. N. (2020). Current legal status of medical marijuana and cannabidiol in the United States. *Epilepsy & Behavior*, *112*, 107452.

Anderson, D. M., Rees, D. I., & Tekin, E. (2018). Medical marijuana laws and workplace fatalities in the United States. *International Journal of Drug Policy*, *60*, 33-39.

Anderson, D. M., Rees, D. I., & Tekin, E. (2018). Medical marijuana laws and workplace fatalities in the United States. *International Journal of Drug Policy*, *60*, 33-39.

Apuke, O. D. (2017). Quantitative research methods: A synopsis approach. *Kuwait Chapter of Arabian Journal of Business and Management Review*, *33*(5471), 1-8.

Ary, D., Jacobs, L. C., Irvine, C. K. S., & Walker, D. (2018). *Introduction to research in education*. Cengage Learning.

Asiamah, N., Mends-Brew, E., & Boison, B. K. T. (2019). A spotlight on cross-sectional research: Addressing the issues of confounding and adjustment. *International Journal of Healthcare Management*, 1-14.

Balla, A., & Abrams, D. I. (2020). Questioning the New Drug Enforcement Administration Proposed Rule to Facilitate the Cultivation of Cannabis for Research Purposes. *Cannabis and Cannabinoid Research*, *5*(3), 188-190.

Bartos, B. J., Newark, C., & McCleary, R. (2018). Marijuana medicalization and motor vehicle fatalities: a synthetic control group approach. *Journal of Experimental Criminology*, 1-18.

Bloomfield, J., & Fisher, M. J. (2019). Quantitative research design. *Journal of the Australasian Rehabilitation Nurses Association*, *22*(2), 27-30.

Bonn-Miller, M. O., Boden, M. T., Bucossi, M. M., & Babson, K. A. (2014). Self-reported cannabis use characteristics, patterns, and helpfulness among medical cannabis users. *The American Journal of Drug and Alcohol Abuse*, *40*(1), 23-30.

Borodovsky, J. T., & Budney, A. J. (2017). Legal cannabis laws, home cultivation, and use of edible cannabis products: A growing relationship?. *International Journal of Drug Policy*, *50*, 102-110.

Borodovsky, J. T., & Budney, A. J. (2017). Legal cannabis laws, home cultivation, and use of edible cannabis products: A growing relationship?. *International Journal of Drug Policy*, *50*, 102-110.

Bradford, A. C., & Bradford, W. D. (2017). Medical marijuana laws may be associated with a decline in the number of prescriptions for Medicaid enrollees. *Health Affairs*, *36*(5), 945-951.

Budney, A. J., Sofis, M. J., & Borodovsky, J. T. (2019). An update on cannabis use disorder with a comment on the impact of policy related to therapeutic and recreational cannabis use. *European Archives Of Psychiatry And Clinical Neuroscience*, *269*(1), 73-86.

Carliner, H., Brown, Q. L., Sarvet, A. L., & Hasin, D. S. (2017). Cannabis use, attitudes, and legal status in the US: a review. *Preventive Medicine*, *104*, 13-23.

Carnevale, J. T., Kagan, R., Murphy, P. J., & Esrick, J. (2017). A practical framework for regulating for-profit recreational marijuana in US states lessons from Colorado and Washington. *International Journal of Drug Policy*, *42*, 71-85.

Caulkins, J. P., Kilmer, B., Kleiman, M., MacCoun, R. J., Midgette, G., Oglesby, P., ... & Reuter, P. H. (2015). *Considering marijuana legalization: Insights for Vermont and other jurisdictions*. Rand Corporation.

Cerdá, M., Sarvet, A. L., Wall, M., Feng, T., Keyes, K. M., Galea, S., & Hasin, D. S. (2018). Medical marijuana laws and adolescent use of marijuana and other substances: Alcohol, cigarettes, prescription drugs, and other illicit drugs. *Drug and Alcohol Dependence*, *183*, 62-68.

Cerdá, M., Wall, M., Keyes, K. M., Galea, S., & Hasin, D. (2012). Medical marijuana laws in 50 States: Investigating the relationship between state legalization of medical marijuana and marijuana use, abuse, and dependence. *Drug and Alcohol Dependence*, *120*(1-3), 22-27.

Chang, T. Y., & Jacobson, M. (2017). Going to pot? The impact of dispensary closures on crime. *Journal of Urban Economics*, *100*, 120-136.

Chiang, W. C., Du, J., & Summers, D. (2019). Providing Services to the Marijuana Industry. *The CPA Journal*, *89*(11), 6-10.

Chihuri, S., & Li, G. (2019). State marijuana laws and opioid overdose mortality. *Injury Epidemiology*, *6*(1), 38.

Choi, A., Dave, D., & Sabia, J. J. (2019). Smoke gets in your eyes: medical marijuana laws and tobacco cigarette use. *American Journal of Health Economics*, *5*(3), 303-333.

Choi, A., Dave, D., & Sabia, J. J. (2019). Smoke gets in your eyes: medical marijuana laws and tobacco cigarette use. *American Journal of Health Economics*, *5*(3), 303-333.

Choi, N. G., & DiNitto, D. M. (2019). Older marijuana users in substance abuse treatment: Treatment settings for marijuana-only versus polysubstance use admissions. *Journal of Substance Abuse Treatment*, *105*, 28-36.

Chu, Y. W. L. (2014). The effects of medical marijuana laws on illegal marijuana use. *Journal of Health Economics*, *38*, 43-61.

Chumbler, M. H. (2017). Land Use Regulation of Marijuana Cultivation: What Authority Is Left to Local Government. *The Urban Lawyer*, *49*(3).

Ciccone, C. D. (2017). Medical marijuana: Just the beginning of a long, strange trip?. *Physical therapy*, *97*(2), 239-248.

Cobb, S., Bazargan, M., Smith, J., Del Pino, H. E., Dorrah, K., & Assari, S. (2019). Marijuana use among African American older adults in economically challenged areas of South Los Angeles. *Brain Sciences*, *9*(7), 166.

Cook, A. C., Leung, G., & Smith, R. A. (2020). Marijuana decriminalization, medical marijuana laws, and fatal traffic crash in US cities, 2010–2017. *American Journal Of Public Health*, *110*(3), 363-369.

Dannels, S. A. (2018). Research design. *The reviewer's guide to quantitative methods in the social sciences* (pp. 402-416). Routledge.

Davenport, S. (2018). Falling rates of marijuana dependence among heavy users. *Drug and Alcohol Dependence*, *191*, 52-55.

Dawson, C. (2019). *Introduction to Research Methods 5th Edition: A Practical Guide for Anyone Undertaking a Research Project*. Robinson.

De Aquino, J. P., Sofuoglu, M., Stefanovics, E., & Rosenheck, R. (2019). Adverse Consequences of Co-Occurring Opioid Use Disorder and Cannabis Use Disorder Compared to Opioid Use Disorder Only. *The American Journal Of Drug And Alcohol Abuse*, *45*(5), 527-537.

Ditre, J. W., Zale, E. L., & LaRowe, L. R. (2019). A reciprocal model of pain and substance use: transdiagnostic considerations, clinical implications, and future directions. *Annual Review of Clinical Psychology*, *15*, 503-528.

Ekendahl, M., Månsson, J., & Karlsson, P. (2020). Risk and responsibilization: Resistance and compliance in Swedish treatment for youth cannabis use. *Drugs: Education, Prevention, and Policy*, *27*(1), 60-68.

Eriksson, A., Saunders, B., Lansdell, G., & Bunn, R. (2019). 'Short fuse and no filter': Acquired brain injury–How a medical disability transforms into a social and criminal justice concern. *International Journal Of Law, Crime And Justice*, *57*, 126-136.

Estoup, A. C., Moise-Campbell, C., Varma, M., & Stewart, D. G. (2016). The impact of marijuana legalization on adolescent use, consequences, and perceived risk. *Substance Use & Misuse*, *51*(14), 1881-1887.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical

sciences. *Behavior Research Methods*, 39(2), 175–191. https://doi.org/10.3758/BF03193146

Field, M., Eastwood, B., Bradley, B. P., & Mogg, K. (2006). Selective processing of cannabis cues in regular cannabis users. *Drug and Alcohol Dependence*, *85*(1), 75-82.

Fink, D. S., Stohl, M., Sarvet, A. L., Cerda, M., Keyes, K. M., & Hasin, D. S. (2020). Medical marijuana laws and driving under the influence of marijuana and alcohol. *Addiction*.

Fischer, B., Russell, C., Sabioni, P., Van Den Brink, W., Le Foll, B., Hall, W., ... & Room, R. (2017). Lower-risk cannabis use guidelines: a comprehensive update of evidence and recommendations. *American Journal of Public Health*, *107*(8), e1-e12.

Fogel, J. S. (2015). Effects of repeated cue exposure on cannabis craving.

Freisthler, B., Sumetsky, N., Kranich, C., Chadwick, C., & Mair, C. (2020). Opioid Misuse and the Availability of Medical Marijuana Through Dispensaries. *Journal of Studies on Alcohol and Drugs*, *81*(4), 489-496.

Gianotti, A. G. S., Harrower, J., Baird, G., & Sepaniak, S. (2017). The quasi-legal challenge: Assessing and governing the environmental impacts of cannabis cultivation in the North Coastal Basin of California. *Land Use Policy*, *61*, 126-134.

Gillespie, N. A., Aggen, S. H., Neale, M. C., Knudsen, G. P., Krueger, R. F., South, S. C., ... & Reichborn-Kjennerud, T. (2018). Associations between personality

disorders and cannabis use and cannabis use disorder: a population-based twin study. *Addiction, 113*(8), 1488-1498.

Halladay, J. E., Boyle, M. H., Munn, C., Jack, S. M., & Georgiades, K. (2019). Sex differences in the association between cannabis use and suicidal ideation and attempts, depression, and psychological distress among Canadians. *The Canadian Journal of Psychiatry*, *64*(5), 345-350.

Han, B., Compton, W. M., Blanco, C., & Jones, C. M. (2019). Time since first cannabis use and 12-month prevalence of cannabis use disorder among youth and emerging adults in the United States. *Addiction*, *114*(4), 698-707.

Hasin, D. S., Wall, M., Keyes, K. M., Cerdá, M., Schulenberg, J., O'Malley, P. M., ... & Feng, T. (2015). Medical marijuana laws and adolescent marijuana use in the USA from 1991 to 2014: results from annual, repeated cross-sectional surveys. *The Lancet Psychiatry*, *2*(7), 601-608.

Head, G. (2020). Ethics in educational research: Review boards, ethical issues, and researcher development. *European Educational Research Journal*, *19*(1), 72-83.

Johnson, J., Hodgkin, D., & Harris, S. K. (2017). The design of medical marijuana laws and adolescent use and heavy use of marijuana: Analysis of 45 states from 1991 to 2011. *Drug and alcohol dependence*, *170*, 1-8.

Johnson, N. (2019). American Weed: A History of Cannabis Cultivation in the United States. *EchoGéo*, (48).

Johnson, N. (2019). Where There's Smoke: The Environmental Science, Public Policy, and Politics of Marijuana. Edited by Char Miller.

Jutras-Aswad, D., Le Foll, B., Bruneau, J., Wild, T. C., Wood, E., & Fischer, B. (2019). Thinking beyond legalization: the case for expanding evidence-based options for cannabis use disorder treatment in Canada. *The Canadian Journal of Psychiatry*, *64*(2), 82-87.

Kamin, S. (2018). The legalization of marijuana and the interplay of federal and state laws. In *Controversies in American Federalism and Public Policy* (pp. 114-131). Routledge.

Kaskie, B., Ayyagari, P., Milavetz, G., Shane, D., & Arora, K. (2017). The increasing use of cannabis among older Americans: a public health crisis or viable policy alternative?. *The Gerontologist*, *57*(6), 1166-1172.

Kepple, N. J., & Freisthler, B. (2012). Exploring the ecological association between crime and medical marijuana dispensaries. *Journal of Studies on Alcohol and Drugs*, *73*(4), 523-530.

Kim, S., Kimber, M., Boyle, M. H., & Georgiades, K. (2019). Sex differences in the association between cyberbullying victimization and mental health, substance use, and suicidal ideation in adolescents. *The Canadian Journal of Psychiatry*, *64*(2), 126-135.

Klieger, S. B., Gutman, A., Allen, L., Pacula, R. L., Ibrahim, J. K., & Burris, S. (2017). Mapping medical marijuana: State laws regulating patients, product safety, supply chains, and dispensaries, 2017. *Addiction*, *112*(12), 2206-2216.

Kruger, D. J., Kruger, J. S., & Collins, R. L. (2020). Frequent cannabis users demonstrate low knowledge of cannabinoid content and dosages. *Drugs: Education, Prevention, and Policy*, 1-7.

Lake, S., Walsh, Z., Kerr, T., Cooper, Z. D., Buxton, J., Wood, E., ... & Milloy, M. J. (2019). Frequency of cannabis and illicit opioid use among people who use drugs and report chronic pain: A longitudinal analysis. *Plos Medicine*, *16*(11), e1002967.

Lang, T., & Rayner, G. (2012). Ecological public health: the 21st century's big idea? An essay by Tim Lang and Geof Rayner. *Bmj*, *345*.

Lee, J., Abdel-Aty, A., & Park, J. (2018). Investigation of associations between marijuana law changes and marijuana-involved fatal traffic crashes A state-level analysis. *Journal of Transport & Health*, *10*, 194-202.

LeeHannah, A. (2019). *Developing a Mixed-Methods Research Agenda on Medical Marijuana Policy*. SAGE Publications Ltd.

Lekoubou, A., Fox, J., Bishu, K. G., & Ovbiagele, B. (2020). Trends in documented cannabis use disorder among hospitalized adult epilepsy patients in the United States. *Epilepsy Research*, 106341.

Lewis, C. (2019). Confronting Cannabis: Legalization on Native Nation Lands and the Impacts of Differential Federal Enforcement. *American Indian Quarterly*, *43*(4), 408-438.

Lipperman-Kreda, S., & Grube, J. W. (2018). Impacts of marijuana commercialization on adolescents' marijuana beliefs, use, and co-use with other substances. *Journal of Adolescent Health*, *63*(1), 5-6.

Martins, S. S., Mauro, C. M., Santaella-Tenorio, J., Kim, J. H., Cerda, M., Keyes, K. M., ... & Wall, M. (2016). State-level medical marijuana laws, marijuana use, and perceived availability of marijuana among the general US population. *Drug and Alcohol Dependence*, *169*, 26-32.

Mead, A. (2017). The legal status of cannabis (marijuana) and cannabidiol (CBD) under US law. *Epilepsy & Behavior*, *70*, 288-291.

Melchior, M., Nakamura, A., Bolze, C., Hausfater, F., El Khoury, F., Mary-Krause, M., & Da Silva, M. A. (2019). Does the liberalization of cannabis policy influence levels of use in adolescents and young adults? A systematic review and meta-analysis. *BMJ Open*, *9*(7), e025880.

Metrik, J., Aston, E. R., Kahler, C. W., Rohsenow, D. J., McGeary, J. E., Knopik, V. S., & MacKillop, J. (2016). Cue-elicited increases in incentive salience for marijuana: Craving, demand, and attentional bias. *Drug and Alcohol Dependence*, *167*, 82-88.

Mohajan, H. K. (2017). Two criteria for good measurements in research: Validity and reliability. *Annals of Spiru Haret University. Economic Series*, *17*(4), 59-82.

Nelson, E. U. (2018). Police crackdowns, structural violence, and impact on the well-being of street cannabis users in a Nigerian city. *International Journal of Drug Policy*, *54*, 114-122.

Nicholas, L. H., & Maclean, J. C. (2019). The effect of medical marijuana laws on the health and labor supply of older adults: Evidence from the Health and Retirement Study. *Journal of Policy Analysis and Management*, *38*(2), 455-480.

Olfson, M., Wall, M. M., & Blanco, C. (2018). Medical Marijuana and the Opioid Epidemic: Response to Theriault and Schlesinger. *American Journal of Psychiatry*, *175*(3), 284-285.

Owley, J. (2017). Unforeseen land uses the effect of marijuana legalization on land conservation programs. *UCDL Rev.*, *51*, 1673.

Patel J, Marwaha R. Cannabis Use Disorder. [Updated 2022 Feb 7]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK538131/

Pardo, B. (2014). Cannabis policy reforms in the Americas: a comparative analysis of Colorado, Washington, and Uruguay. *International Journal of Drug Policy*, *25*(4), 727-735.

PDAPS. (2020). *PDAPS - Medical Marijuana Caregiver Rules*. Pdaps.org. Retrieved 23 November 2020, from http://pdaps.org/datasets/rules-of-caregivers-medical-marijuana-1501610940.

Pinto, J. V., Medeiros, L. S., da Rosa, G. S., de Oliveira, C. E. S., de Souza Crippa, J. A., Passos, I. C., & Kauer-Sant'Anna, M. (2019). The prevalence and clinical correlates of cannabis use and cannabis use disorder among patients with bipolar disorder: A systematic review with meta-analysis and meta-regression. *Neuroscience & Biobehavioral Reviews*, *101*, 78-84.

Rahi, S. (2017). Research design and methods: A systematic review of research paradigms, sampling issues, and instruments development. *International Journal of Economics & Management Sciences*, *6*(2), 1-5.

Richardson, D. W. (2019). A Geospatial Analysis of Illicit Marijuana Cultivation Sites Across Colorado National Forests Using a Traditional Risk Terrain Modeling Methodology. *Journal of Intelligence & Analysis*, *24*(2), 121.

Richmond, M. K., Pampel, F. C., Rivera, L. S., Broderick, K. B., Reimann, B., & Fischer, L. (2015). Frequency and risk of marijuana use among substance-using health care patients in Colorado with and without access to state legalized medical marijuana. *Journal of Psychoactive Drugs*, *47*(1), 1-9.

Rong, C., Lee, Y., Carmona, N. E., Cha, D. S., Ragguett, R. M., Rosenblat, J. D., ... & McIntyre, R. S. (2017). Cannabidiol in medical marijuana: research vistas and potential opportunities. *Pharmacological Research*, *121*, 213-218.

Salas-Wright, C. P., & Vaughn, M. G. (2017). Marijuana use among young people in an era of policy change: what does recent evidence tell us?. *The American Journal Of Drug And Alcohol Abuse*, *43*(3), 231-233.

Samhda. (2017). Treatment Episode Data Set Admissions (TEDS-A) 2017 Codebook. *Center For Behavioral Health Statistics And Quality Substance Abuse And Mental Health Services Administration*, 1-88. Retrieved 23 November 2020, from http://samhda.s3-us-gov-west-1.amazonaws.com/s3fs-public/field-uploads-protected/studies/TEDS-A-2017/TEDS-A-2017-datasets/TEDS-A-2017-DS0001/TEDS-A-2017-DS0001-info/TEDS-A-2017-DS0001-info-codebook.pdf.

Santaella-Tenorio, J., Mauro, C. M., Wall, M. M., Kim, J. H., Cerdá, M., Keyes, K. M., ... & Martins, S. S. (2017). US traffic fatalities, 1985–2014, and their relationship to medical marijuana laws. *American Journal Of Public Health*, *107*(2), 336-342.

Sarvet, A. L., Wall, M. M., Fink, D. S., Greene, E., Le, A., Boustead, A. E., ... & Hasin, D. S. (2018). Medical marijuana laws and adolescent marijuana use in the United States: a systematic review and meta-analysis. *Addiction*, *113*(6), 1003-1016.

Sarvet, A. L., Wall, M. M., Fink, D. S., Greene, E., Le, A., Boustead, A. E., ... & Hasin, D. S. (2018). Medical marijuana laws and adolescent marijuana use in the United States: a systematic review and meta-analysis. *Addiction*, *113*(6), 1003-1016.

Sarvet, A. L., Wall, M. M., Fink, D. S., Greene, E., Le, A., Boustead, A. E., ... & Hasin, D. S. (2018). Medical marijuana laws and adolescent marijuana use in the United States: a systematic review and meta-analysis. *Addiction*, *113*(6), 1003-1016.

Schmidt, L. A., Jacobs, L. M., Vlahov, D., & Spetz, J. (2019). Impacts of Medical Marijuana Laws on Young Americans Across the Developmental Spectrum. *Maternal And Child Health Journal*, *23*(4), 486-495.

Scholes-Balog, K. E., Hemphill, S. A., Evans-Whipp, T. J., Toumbourou, J. W., & Patton, G. C. (2016). Developmental trajectories of adolescent cannabis use and their relationship to young adult social and behavioral adjustment: A longitudinal study of Australian youth. *Addictive Behaviors*, *53*, 11-18.

Segura, L. E., Mauro, C. M., Levy, N. S., Khauli, N., Philbin, M. M., Mauro, P. M., & Martins, S. S. (2019). Association of US medical marijuana laws with nonmedical

prescription opioid use and prescription opioid use disorder. *JAMA Network Open*, *2*(7), e197216-e197216.

Segura, L. E., Mauro, C. M., Levy, N. S., Khauli, N., Philbin, M. M., Mauro, P. M., & Martins, S. S. (2019). Association of US medical marijuana laws with nonmedical prescription opioid use and prescription opioid use disorder. *JAMA Network Open*, *2*(7), e197216-e197216.

Shaughnessy, J. J., Zechmeister, E. B., & Zechmeister, J. S. (2000). *Research methods in psychology*. McGraw-Hill.

Small, E. (2018). 57. Marijuana–unsustainable, unecological, and unnecessary cultivation in energy-hog greenhouses. *Biodiversity*, *19*(3-4), 255-271.

Smart, R., & Pacula, R. L. (2019). Early evidence of the impact of cannabis legalization on cannabis use, cannabis use disorder, and the use of other substances: findings from state policy evaluations. *The American Journal Of Drug And Alcohol Abuse*, *45*(6), 644-663.

Stockings, E., Bartlem, K., Hall, A., Hodder, R., Gilligan, C., Wiggers, J., ... & Wolfenden, L. (2018). whole-of-community interventions to reduce population-level harms arising from alcohol and other drug use: a systematic review and meta-analysis. *Addiction*, *113*(11), 1984-2018.

Theriault, B. M., & Schlesinger, J. J. (2018). Potential impact of medical marijuana on nonmedical opioid use. *American Journal of Psychiatry*, *175*(3), 284-284.

Tormohlen, K. N., Brooks-Russell, A., Ma, M., Schneider, K. E., Levinson, A. H., & Johnson, R. M. (2019). Modes of marijuana consumption among Colorado high

school students before and after the initiation of retail marijuana sales for adults. *Journal of Studies On Alcohol And Drugs*, *80*(1), 46.

Tucker, J. S., Rodriguez, A., Pedersen, E. R., Seelam, R., Shih, R. A., & D'Amico, E. J. (2019). Greater risk for frequent marijuana use and problems among young adult marijuana users with a medical marijuana card. *Drug And Alcohol Dependence*, *194*, 178-183.

Wall, M. M., Liu, J., Hasin, D. S., Blanco, C., & Olfson, M. (2019). Use of marijuana exclusively for medical purposes. *Drug And Alcohol Dependence*, *195*, 13-15.

Ward, K. C., Lucas, P. A., & Murphy, A. (2019). The impact of marijuana legalization on law enforcement in states surrounding Colorado. *Police Quarterly*, *22*(2), 217-242.

Ward, K. C., Lucas, P. A., & Murphy, A. (2019). The impact of marijuana legalization on law enforcement in states surrounding Colorado. *Police Quarterly*, *22*(2), 217-242.

Wen, H., Hockenberry, J. M., & Druss, B. G. (2019). The effect of medical marijuana laws on marijuana-related attitude and perception among US adolescents and young adults. *Prevention Science*, *20*(2), 215-223.

Winniman, J. T. (2018). Marijuana/Constitutional Law-State Ballot Reforms 2016: The Ramifications on Probable Cause in Massachusetts with Legal Marijuana Cultivation in the Home. *W. New Eng. L. Rev.*, *40*, 363.

Wölfling, K., Flor, H., & Grüsser, S. M. (2008). Psychophysiological responses to drug-associated stimuli in chronic heavy cannabis use. *European Journal of Neuroscience*, *27*(4), 976-983.

Woosnam, K. M., Draper, J., Jiang, J. K., Aleshinloye, K. D., & Erul, E. (2018). Applying self-perception theory to explain residents' attitudes about tourism development through travel histories. *Tourism Management*, *64*, 357-368

Wu, L. T., Zhu, H., Mannelli, P., & Swartz, M. S. (2017). Prevalence and correlates of treatment utilization among adults with cannabis use disorder in the United States. *Drug and Alcohol Dependence*, *177*, 153-162.

Zhu, H., & Wu, L. T. (2017). Sex differences in cannabis use disorder diagnosis involved hospitalizations in the United States. *Journal of Addiction Medicine*, *11*(5), 357.

Zyphur, M. J., & Pierides, D. C. (2019). Statistics and probability have always been value-laden: An historical ontology of quantitative research methods. *Journal of Business Ethics*, 1-18.