2023

Examining the Relationship Between Undergraduate Female Students Marijuana Use and GPAs

Darrel E. Hicks
Walden University

Walden University

College of Psychology and Community Services

This is to certify that the doctoral dissertation by

Darrel Elese Hicks

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. Christopher Jones, Committee Chairperson,
Criminal Justice Faculty

Dr. Mi Young Lee, Committee Member,
Criminal Justice Faculty

Dr. Howard Henderson, University Reviewer,
Criminal Justice Faculty

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

Walden University
2022

Abstract

Examining the Relationship Between Undergraduate Female Students Marijuana Use and GPAs

by

Darrel Elese Hicks

MS, University of Phoenix, 2016

BS, Columbus State University, 2010

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Criminal Justice

Walden University

February 2023

Abstract

Marijuana use has been linked to poor undergraduate student academic performance, yet cannabis continues to be the substance most often used by college students. The purpose of the current research was to add to the limited body of literature about the relationship between female undergraduate marijuana use and lower GPAs. The study explored how marijuana use impacted the GPAs of undergraduate African American females. The research question addressed whether a significant relationship exists between marijuana use and lower GPAs for this population. Complex adaptive systems theory was the lens used to better understand the phenomenon during a time of rapid social and public policy change. Secondary data were gathered from the American College Health Association/National College Health Assessment and tested using statistical regression analysis. Findings demonstrated a relationship between marijuana use and lower GPAs. Data analysis indicated that a significant negative association existed between marijuana use and lower GPAs of undergraduate African American females and females of other races. While a relationship was demonstrated, the correlation does not show causation: the nature of the sample and other drivers outside the scope of the study, such as admissions policies and socio-economic factors. Positive social change implications could include greater awareness on the part of policymakers, admissions and university officials, and other relevant stakeholders of the gaps in GPAs across populations. While social trends suggest that liberalization of marijuana laws may be loosening, stakeholders are recommended to consider responses such as intervention or education programs to close the gaps.

Examining the Relationship Between Undergraduate Female Student Marijuana Use and GPAs

by

Darrel Elese Hicks

MA, University of Phoenix, 2016

BS, Columbus State University, 2005

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Criminal Justice

Walden University

February 2023

Dedication

I dedicate this completed dissertation to the woman who raised me, Viola Wilson Evans, and my two children, De'Adrian and Harmony. Additionally, I dedicate this dissertation to those who have helped throughout not only this dissertation journey but my life journey as a whole: Christopher B. Jones (chair); Dr. Miyoung Lee (2nd chair); La'Vendo A. Warren (I did it, big brother!); Michael Bailey; Dr. Dorinda Dowis; Bridgette Downs; R. King; Mr. Keys; Judge Daniels; Viola Evans; Charles Evans; V. Wilson; Frank Wright; L.S. Dillett; R. Tennyson Jr.; and Lyric Cosby. I hope that completing this dissertation inspires and motivates my children to reach for and achieve all their goals! I hope that completing this dissertation shows that I am grateful for the contributions people have made in my life to ensure that I achieved my goals, even when I lost direction.

Acknowledgments

I want to acknowledge my chair, Dr. Christopher Jones, for being patient and providing me with expert guidance throughout my dissertation journey. I would also like to acknowledge my second committee member, librarian, and URR member, Dr. Miyoung Lee, Mrs. Elsbai Hadeer, and Dr. Howard Henderson, for providing her invaluable knowledge, input, and guidance throughout my dissertation journey. I would also like to acknowledge all the schools that I attended: Winterfield Elementary, Brewer Elementary, Marshall Middle School, Carver High School, Spencer High School, Hallie Turner, Tillinghurst, Johnson C. Smith University, Columbus State University, University of Phoenix, and Walden University. Thanks to each faculty member or staff for providing me with the necessary knowledge and tools to achieve my desired educational goals. I would also like to thank my fraternity, Phi Beta Sigma Fraternity Incorporated, for continuous support throughout all areas of my life. I would also like to thank E. T. Clark, Ulysses Wilson, E & B Davis, M. Green, S.D. Hicks, J. Mae. Wilson, T. Johnson, J. Hall, J. Green, D. Allen, Dr. T. Harvey, D. Gilchrist, Dr. G. Gardner, Mrs. Davis, Mrs. D. Aragon, Principal Drewry, Mr. Yarborough, Dr. K. Williamson, and a variety of staff members and friends at Kennedy Road Middle, Forest Park Middle School, and Ash Street for pushing me to achieve my desired goals and beyond. Additionally, I would like to acknowledge family and friends who were not listed that pushed me to complete my dissertation journey. Thank you all!

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

Introduction

According to studies, African American female students' grade point averages (GPAs) rank near the bottom at undergraduate institutions in the United States (Swartz et al., 2016). While there is an association with low education, minority groups such as African Americans and Hispanics had the greatest odds of abusing or becoming dependent on marijuana (Swartz et al., 2016). According to Libassi (2018), when compared to white females, African American females were less likely to complete their undergraduate studies (Libassi, 2018). Libassi (2018) further indicated that credentials earned by African Americans are less likely to be beneficial in the labor market than those earned by European Americans.

Marijuana, the psychoactive substance most used by the collegiate community, has been identified as a possible cause of academic discrepancies on college campuses in the United States of America (US). Bolin et al. (2017) indicated that marijuana use had been linked to poor academic achievement, a lack of collegiate success, skipping class, and low graduation rates. The National Institute of Health (2020) indicated that when compared to non-marijuana smokers, those who smoke marijuana experience adverse educational outcomes and various negative cognitive issues. There are also indications that marijuana use is significant among African American female students. As the marijuana usage rate of college students continues to increase (National Institute of Drug Abuse, 2019), understanding its effect on racial discrepancies in academic performance is

essential to adequately address the underperformance of African American females in undergraduate programs.

The increasing use of marijuana in the United States by college students (National Institute of Drug Abuse, 2019) demonstrates a need for studies aiming to explore and explain the effects of marijuana use on GPAs of undergraduate African American females. My proposed research to identify marijuana as a possible cause for academic racial discrepancies on college campuses in the US could benefit collegiate institutions, the student body, and the broader community. I also addressed the apparent absence of literature about what hinders or limits female African American undergraduate students from having higher GPAs and completing their undergraduate studies. Findings from my research may help determine if there is a need for intervention or information programs on college campuses. The findings may also reveal if marijuana use has adversely affected the GPAs of African American undergraduate female students in the US.

This chapter provides in-depth information about the history of marijuana use, current trends associated with marijuana use in the US, the purpose, problem, and research questions and hypotheses. I also discuss the study's design, scope, assumptions, limitations, and delimitations. Finally, I will address potential positive social change implications and provide a summary.

Marijuana History and Laws

Marijuana laws differ from state to state. Marijuana is commonly referred to as cannabis and is known by various street names, including weed, mary jane, ghanga, and dagga. Marijuana is defined as a dried flower bud or leaves obtained from the female

marijuana or hemp plant; the substance has psychoactive properties due to high levels of THC. The substance may be utilized in a variety of manners, including smoking, vaping, or ingesting. The substance is currently illegal at the federal level. In the United States, marijuana is used for medical purposes in certain states, but some states allow marijuana to be used for recreational purposes (National Institute of Health, n.d.).

Medical marijuana refers to marijuana that must be prescribed by a licensed physician and is used to treat certain medical conditions. According to the National Institute of Health (n.d.), conditions commonly treated with marijuana include HIV/AIDS, cancer, fibromyalgia, epilepsy, inflammatory bowel syndrome, and other critical conditions that can drastically affect quality of life. In contrast, as indicated by the National Conference of State Legislators (2021), recreational marijuana, which refers to marijuana use that occurs without a doctor's prescription, is legal in 19 states, Washington D.C., and Guam, at the time of this writing. With usage rates of marijuana by undergraduate students increasing, and with both academic failure and struggles being linked to and associated with marijuana use, there continues to be a need for research that explores the effects of marijuana use on student GPAs.

Current Trends

As marijuana use continues to become more social, current trends related to the topic must be monitored and considered by researchers. According to Chen et al. (2020), marijuana use declined from 1979-1992; however, use increased from 1992-2001 and from 2006-2016. Chen et al. (2020) also indicated that marijuana use is most prevalent among individuals who fall within the age range of 12-25. Additionally, Chen et al.

(2020) indicated that inconsistent results about the impact of marijuana law exist. Such results include the following: (a) no association between marijuana use and marijuana laws, (b) a risk effect that indicated an increase in marijuana use after the implementation of marijuana laws, and (c) a variety of mixed effects (Chen et al., 2020). Chen et al. (2020) also identified a variety of typical side effects associated with the use of marijuana-impaired memory, cognitive issues, and a greater likelihood of using other substances. With trends indicating that marijuana use continues to increase among college-aged students (National Institute of Drug Abuse, 2019), a better understanding of the impacts of marijuana use on the African American population appears not only to be warranted but also to have been neglected.

Hasin et al.'s (2019) cross-sectional study that examined data from 2002-2003 and 2012-2013 yielded detailed information about current trends associated with marijuana use, indicating, for one, that more accessible access to marijuana might have adverse consequences such as increased usage rates leading to increased cannabis use disorder diagnosis. According to Hasin et al., medical marijuana legalization caused usage rates of adults to increase, and recreational marijuana legalization is presumed to have a more significant effect on adults than medical marijuana legalization. Hasin et al. also examined the prevalence of marijuana use in males and females and found that while increased drug use occurred in both genders, greater frequency of use was identified in women. Hasin et al. also indicated that all age groups and all races experienced significant increases when examining the prevalence of marijuana use. Additionally, Hasin et al. indicated that women experienced significant increases in diagnoses of

cannabis use disorder from 1991-1992 to 2001-2002, and both sexes saw increases from 2001-2002 to 2012-2013. Hasin et al. also stated that individuals aged 18-29 experienced the most significant increases in marijuana use, and that age group was one of the three groups that saw significant increases in cannabis use disorder diagnoses. Current trends indicate that greater availability will lead to higher usage rates and diagnosis rates of cannabis use disorder in those who fall within the typical age range of college students.

College students continue to be the predominant users of marijuana. According to Sherburne (2018), marijuana usage rates among college students are historically high, the highest in three decades. Current trends indicate that college students aged 19-22 have shown a steady increase in marijuana utilization over the past five years (National Institute of Drug Abuse, 2019). As indicated by the National Institute of Drug Abuse (2019), past year usage data indicated that college and noncollege students experienced a 5-year 7% increase, a historic high for both. Additionally, from 2014-2019 college students' marijuana usage rates saw a significant 5-year 9% increase from 34% to 43% (National Institute of Drug Abuse, 2019b). However, daily cannabis use rates differed between college and noncollege students. In 2019, 15% of noncollege students' daily usage rate was 6% greater than the number of college students who used marijuana daily (National Institute of Drug Abuse, 2019b). With data indicating increases in the use of marijuana by college and noncollege students identifying the root causes for the increased use of cannabis remains important.

Marijuana policy continues to influence community members' usage behaviors and marijuana usage rates. According to Oregon State University (2020), usage rates in

legalized states exceeded national marijuana usage rates. Marijuana continues to be one of the most used substances by undergraduate students. With trends indicating an increase in marijuana use by undergraduate college females, understanding if a relationship or association exists between lower GPAs and use can help identify negative and positive social implications.

Background

Racial discrepancies related to female African American undergraduate GPAs remain a social concern. The impacts of marijuana use on the GPAs of African American undergraduate females must be explored further. College student marijuana use reached its peak in 2019, with 43% of the national student body acknowledging marijuana use (National Center for Drug Abuse Statistics, 2019). Additionally, marijuana use has been associated with low GPAs, skipping classes, dropping out, and poor educational outcomes (National Center for Education Statistics, 2019). With marijuana use being linked to poor educational outcomes and college student usage rates at an all-time high, understanding the effects of marijuana policy remains essential. Particularly as the substance becomes legalized widely and nationally, the importance of research like this will dramatically increase if, for example, marijuana is removed as a Schedule I drug in the Controlled Substance Act. According to the National Center for Education Statistics (2020), African American females' undergraduate graduation rates are significantly lower than those of other races except Latinx. African American females have the second-lowest completion rates at all institution types: private, private nonprofit, and private for-profit.

Information about the effects and impacts of marijuana use on undergraduate GPAs and the achievement and success of the African American female college student, though limited, remains vital in society. Studies by Arria et al. (2015), Cadigan et al. (2018), Finn (2012), and Marwaha and Patel (2020) have identified the effects of marijuana legalization on cognitive abilities or skills, graduation rates, cannabis use disorder diagnosis, and academic achievement. Additionally, limited studies have provided data about how marijuana use affects undergraduate GPAs and completion rates of African American female students, such as Adumene (2018), Cowan et al. (2017), and Ensminger and Green (2006), which focus primarily on the use rather than the effects on academic achievement and success. My research may be significant because it adds needed knowledge to the limited body of works on the impacts on female African American undergraduate college students' GPAs of marijuana use. My research may also help other researchers identify and respond to the unanticipated consequences of policy changes that may further impact the development and success of African American undergraduate females.

Problem Statement

Undergraduate African American female college students are currently ranked near the bottom when gauging academic success based on GPAs of undergraduate studies at 4-year institutions. Various explanations or causes may exist that may have or can adversely affect or impact GPAs of African American females in undergraduate studies. Since data about marijuana use and the relationship, causation, and barriers related to the performance and completion of undergraduate studies by African American females is

limited, there is a need to explore further and examine how marijuana use may have affected the GPAs of undergraduate African American women. With marijuana use being linked to poor academic performance, dropping out, and poor attendance, understanding the effects of marijuana use on the success of the student body, especially African American females, is a must.

Purpose of the Study

This quantitative research study aimed to examine the effects of marijuana use on undergraduate GPAs of African American females. The study provided new data about how marijuana use and GPAs may be related. The data yielded helped determine if marijuana use negatively affected female college student undergraduate GPAs, if there is a need for marijuana intervention programs at the college level on the college campus, or if legalization has caused improvements, perhaps due to extenuating social or economic factors.

Research Question and Hypotheses

Research question: To what extent has marijuana use influenced female African American college-level GPAs?

$H_0$1 – Marijuana use has not had a significant effect on female African American GPAs.

*Ha*1 – Marijuana use has had a significant effect on female African American GPAs.

Research question: To what extent has marijuana use influenced female White college-level GPAs?

$H_0$1 – Marijuana use has not had a significant effect on female White GPAs.

*Ha*1 – Marijuana use has had a significant effect on female White GPAs.

Research question: To what extent has marijuana use influenced female Hispanic/Latino college-level GPAs?

$H_0$1 – Marijuana use has not had a significant effect on female Hispanic/Latino GPAs.

*Ha*1 – Marijuana use has had a significant effect on female Hispanic/Latino GPAs.

Research question: To what extent has marijuana use influenced female Asian college-level GPAs?

$H_0$1 – Marijuana use has not had a significant effect on female Asian GPAs.

*Ha*1 – Marijuana use has had a significant effect on female Asian GPAs.

Research question: To what extent has marijuana use influenced female Native American Indian, Alaskan Native, or Native Hawaiian college-level GPAs?

$H_0$1 – Marijuana use has not had a significant effect on female Native American Indian, Alaskan Native, or Native Hawaiian Asian GPAs.

*Ha*1 – Marijuana use has had a significant effect on female Native American Indian, Alaskan Native, or Native Hawaiian GPAs.

Research question: To what extent has marijuana use influenced female Biracial or Multiracial college-level GPAs?

$H_0$1 – Marijuana use has not had a significant effect on female Biracial or Multiracial GPAs.

*Ha*1 – Marijuana use has had a significant effect on female Biracial or Multiracial GPAs.

Research question: To what extent has marijuana use influenced female Other college-level GPAs?

$H_0$1 – Marijuana use has not had a significant effect on female Other GPAs.

*Ha*1 – Marijuana use has had a significant effect on female Other GPAs.

Theoretical Framework

A complex adaptive systems theory approach was used to guide the research. According to Chan (2001), the complex adaptive systems movement was established during the 1980s at Santa Fe Institute in New Mexico (Chan, 2001). Chan also indicated that complex adaptive systems refer to a process that emphasizes systems and utilizes computer simulation as a tool to conduct extensive research. Chan also identified that combined applied, theoretical, and experimental methods are used to analyze complex adaptive systems. According to the Human Systems Dynamics Institute (2021), the representation of a complex adaptive system during research informs understanding while identifying a system's dominant patterns (Human Systems Dynamics Institute, 2021). Complex adaptive systems allow researchers to examine how patterns emerge between interacting agents that influence future interactions (Human Systems Dynamics Institute, 2021). When adopted for research data, complex adaptive systems techniques can be used to collect and develop new data about issues or problems with limited information and no answer or help inform policy decisions at the national, state, or local level. Complex adaptive systems are important to examine processes that can study and better understand

developing phenomena. With marijuana use effects being examined by many states and legalization occurring across the US, utilization of a complex adaptive systems theorist approach to explore the impact of marijuana use on GPAs of African American females rendered data that may inform if marijuana use negatively affects GPAs of the study population.

Approaching the study from a complex adaptive systems theory perspective was beneficial in assessing the impacts of marijuana use on African American undergraduate female students. In complex adaptive systems, data is generated that helps address developing phenomena, topics, or questions with limited to no data by examining interacting agents to identify specific patterns or shared attitudes (Human Systems Dynamics Institute, 2021). As indicated by Corns et al. (2021), complex adaptive systems are defined by Kevin Dooley (1997) as a group of semi-autonomous agents that interact in interdependent ways to produce system-wide patterns, such as that those patterns then influence the behavior of the agents (Dooley, 1997, as cited in Corns et al., 2021). Examples of complex adaptive systems include hospitals, healthcare systems, and businesses (Corns et al., 2021). According to Chan (2001), complex adaptive systems evolve and adapt to changing environments. Complex adaptive systems allow researchers to develop information that may be useful when determining relationships or causes for unaddressed issues or ones with limited or no information. The process allows researchers to classify data that may help identify the impacts of specific interactions and relationships between defined agents, which could be beneficial during the policy-making process.

Complex adaptive systems have specific attributes that aid in the quest for better understanding. According to Chan (2021), attributes of complex adaptive systems include distributed control, which refers to system behaviors not being controlled by specific mechanisms, and connectivity, which implies that a choice or decision by one agent within a system will influence the whole system but not in a uniform manner (Chan, 2021). Additionally, Chan identified co-evaluation, which refers to patterns changing over time and the changing of elements within a system based on the inter-action and inter-connectivity between system agents and elements within a system. Another attribute of complex adaptive systems identified by Chan (2021) is the sensitive dependence on initial conditions, which identifies systems as sensitive because no linear correlation exists between changes in characteristics or rules. Additional attributes identified by Chan include emergent order, which refers to the possibility of emergent behaviors presenting themselves in an unexplained or unpredictable phenomenon, far from equilibrium, which refers to the development of new data because of a system's ability to explore various possibilities while not remaining at equilibrium, and state of paradox which identifies a need for both order and chaos to gain a better understanding.

In addition to attributes, advantages of complex adaptive systems also exist. Complex adaptive systems have noted advantages. The Health Foundation (2010) identified complex adaptive systems as dynamic processes that challenge cause and effect assumptions (The Health Foundation, 2010). The Health Foundation also identified complex adaptive systems as systems in which relationships of different agents are shaped and simultaneously affected. According to the Health Foundation, the advantages

of Complex adaptive systems include the following: 1) focuses on relationships, 2) challenges assumptions, 3) suggests new possibilities for change, and 4) provides a framework for categorizing and analyzing knowledge and agents. By labeling undergraduate African American females who consume marijuana as agents within a complex adaptive system, valuable data was generated to address unanswered questions about the impact of marijuana use on female African American undergraduate students. Generating data from a complex adaptive theorist perspective to explore further the impacts of marijuana use on GPAs of female African American undergraduates may also help address evident gaps in the literature related to the impacts of marijuana use on GPAs. This data may also be used to identify, develop, or address policy issues, problems, and concerns related to marijuana law that affects or may affect African American female undergraduate college students.

Utilizing a complex adaptive systems approach can be beneficial during research, especially when examining topics with limited data or developing phenomena. The attributes of complex adaptive systems, which help ensure that identifying data is developed, allow researchers to address issues with an open mind, aid researchers and policymakers when examining developing issues and concerns, and when researching policy issues or topics with limited data. According to Conboy et al. (2019), complex adaptive systems rigorously and appropriately direct and inform future research and research methods because a complex systems research approach examines and considers how collective behaviors develop because of relationships between agents within a system (Conboy et al., 2019). Additionally, Conboy et al. (2019) identified complex

systems as being adaptive, self-organizing, and constantly evolving. A practical approach to take when conducting studies to evaluate the limited and unknown, a complex adaptive theorist approach can be used to thoroughly investigate, inspect, and analyze a phenomenon that may help develop policy conducive to society and society's members identifying problems or solutions.

Nature of the Study

A complex adaptive systems theory approach guided this quantitative correlational research study. A quantitative correlational research approach allowed me to examine further the relationship between marijuana use and female African American undergraduate students' success or failure during undergraduate studies. Because of the nature of quantitative and correlational studies, data was compared to identify a relationship between marijuana use and undergraduate GPAs of African American females; additionally, other races were examined.

To assess if marijuana use hindered or negatively affected the GPAs of African American females, secondary data from the ACHA National College Health Assessment Survey was explored. Variables for the study were the following. How often the student has used marijuana served as the independent variable, undergraduate GPAs of African American females served as the dependent variable during the testing phase of the study, and control variables utilized during my research were sex, institution type, and race. The study attempted to reveal if marijuana use has had a significant adverse effect on undergraduate African American female GPAs, and if there is a need for marijuana

intervention programs on college campuses where recreational marijuana legislation statuses exist.

A quantitative correlational research design allowed for a thorough evaluation of quantitative data to identify the effects of marijuana use on undergraduate female students. A simple linear regression test, which falls under the scope of inferential analysis methods, was used to examine further the relationships between marijuana use and an important factor used to measure undergraduate collegiate success-GPAs. This method allowed various secondary data to be tested and compared to yield the most significant data. Pre-existing data was used to examine the relationship between the GPAs of undergraduate female students and marijuana use. Data was gathered and tested from the American College Health Association/National College Health Association. Statistical regression analysis testing was performed on collected data utilizing SPSS.

Scope and Delimitations

My research aimed to identify if marijuana use adversely impacted the GPAs of female African American undergraduate students. African American females (dependent variable) at the colleges in the United States that participate in the annual American College Health Association - National College Health Assessment were examined in the study. Data from the American College Health Association - National College Health Assessment was selected because the survey instrument used to collect data asked detailed questions about marijuana use and identified GPA data about smokers and nonsmokers of marijuana. Other survey instruments from other studies were excluded because of insufficient relevant data for the study. In addition to other races, the male

population was left out of the study to ensure that data was representative of only the female undergraduate population. Archived data about GPA and marijuana usage rates of undergraduate female students were examined. Graduation data was from 2012 -2019. My research was a quantitative correlation study, allowing quantitative data to be collected, compared, and tested to yield significant data. A linear regression test was used to run a statistical analysis on the data.

Some data was not included in the study for specific reasons. My research did not have data on males as there is abundant literature about the effect and impacts of recreational marijuana legalization and use on males. My research does include data about females of other races. Undergraduate African American females were selected because they perform far worse than all other females of other races other than Latinx. Latinx-related data was included, but the study focused on African American females. All colleges within each state that participate in the yearly American College Health Association-National College Health Association survey were examined; some colleges did not have an adequate amount of female African American students enrolled, and some colleges did not have the needed data to be included in the analysis.

Limitations

Limitations have been identified for the study. Sample limitations existed in the study. State-level data sets were not available. Additionally, all colleges in the United States do not participate in the ACHA National College Health Assessment study. The generalization of the study must also be considered. Since not all U.S. colleges participate in the assessment, my research results may not be representative of the U.S. female

African American undergraduate student population. The college population must also be considered. The populations at each institution differed, which is another generalization issue. Access to data was limited during the study. There is also a lack of data about marijuana use and its effects on GPAs at the collegiate level.

Significance

My research is significant because, since the 2020 election, 19 states, Washington D.C., and Guam, have legalized marijuana for recreational use, and more states are considering legalizing marijuana for recreational purposes. With college students being the predominant users of the substance and since the utilization of the substance has been linked to adverse academic consequences, there is a need to understand better how and if marijuana use impacts, is related to, or affects GPAs of African American females and females of other races. The study is also significant because it attempts to identify a relationship between marijuana use and lower GPAs of undergraduate African American female students. My research filled a gap in the literature that has failed to address GPA discrepancies of African American females on U.S. college campuses. Since marijuana remains one of the most widely used substances by college students in the US, and since there is a lack of data about how undergraduate African American female students have been impacted by marijuana use, my research may help determine policy direction while also identifying weaknesses that may have contributed to African American women underachieving in undergraduate institutions.

Summary

African American female undergraduate GPAs rank near the very bottom in the United States. Additionally, African American female students have been identified as one of the least likely groups to complete their undergraduate studies. There is a need for further research about the effects of marijuana use, especially with college students' marijuana usage rates increasing (National Institute of Drug Abuse, 2019) and legalization for medical and recreational purposes occurring in various states in the US. According to Chen et al. (2020), marijuana use is most prevalent in individuals who fall within the age range of traditional undergraduate students (Chen et al., 2020). With marijuana being the most widely used substance by college students and with marijuana use being linked to adverse academic consequences, my research and related future studies may prove valuable to students, colleges, and the community. My research provides information about the relationship between marijuana use and lower GPAs and identifies if marijuana use contributes to the racial GPA discrepancies within the undergraduate female population. I am conducting the study from a complex adaptive systems theorist approach, which aided in the quest for a better understanding of the effects of marijuana use by allowing me to examine agents involved in an evolving phenomenon openly. My research yielded information that may help determine if marijuana use has or will further stagnate the development and success of the undergraduate African American female.

Chapter 2: Literature Review

Introduction

Undergraduate GPA disparities continue to be of great importance in society. African American females reportedly had the second-highest college enrollment rates in the United States (National Center for Education Statistics, 2020). Unfortunately, despite such high enrollment rates, graduation rates are significantly lower for African American females in the United States than for females of other races. According to the National Center for Education Statistics (2020), female African Americans have the second-lowest graduation rates at all colleges: public, private non-profit, and private for-profit institutions. Since such graduation disparities exist and because marijuana use is linked to poor educational outcomes, it is crucial to understand how marijuana use may have affected graduation rates. The National Center for Drug Abuse Statistics (2019) indicated that the consumption of marijuana by college students in 2019 was the highest since 1983 at 43 percent. According to the U.S. Department of Justice (2017), college students' eight percent increase in marijuana usage occurred from 2006-2015. Statistics have indicated that college students' usage rates are continuing to increase. With more states favoring the implementation of recreational marijuana legislation, data on the effects of marijuana use on African American female GPAs are needed to help better understand if academic achievement, performance, and graduation rates are negatively affected as a result.

Studies have indicated that marijuana use can negatively impact academic achievement and performance. As indicated by Allen et al. (2019), poor academic performance in college has been associated with marijuana use. The U.S. Department of

Justice (2017) indicated that adverse academic outcomes such as dropping out, low-grade point averages, and poorly performing coursework and exams are associated with marijuana use. Previous studies have also identified associations between marijuana use, lower grade point averages, and poor academic performance. However, very little data exists about how marijuana use affects African American women's graduation rates. Since adverse effects have been linked to marijuana usage, data must be generated to identify how marijuana use affects African American women's academic achievement and undergraduate completion rates. With so many lives at stake, the educational impacts of marijuana legalization must be examined.

College student marijuana usage has increased in the United States. Associations between the usage of marijuana and negative academic achievement and outcomes have been identified. A 2018 national survey on drug use and health indicated that marijuana usage rates of young women had increased significantly from 2016 to 2017 (U.S. Department of Health and Human Services, 2018). A Washington State University cross-sectional study conducted by Cowan et al. (2017) examined the American College Health Association data from seven different years. Cowan et al. (2017) indicated that after recreational marijuana legalization in Washington in 2012, female marijuana usage rates increased, as did college students' frequency and probability of marijuana use. According to Egan et al. (2016), there are associations between marijuana use and factors, including grade point average, academic outcomes, and plans to graduate on time. Egan et al. (2016) also indicated that all marijuana users performed the worst and had lower overall GPAs.

A limited number of studies have addressed the impacts of liberalization and the legalization of marijuana laws. However, research has addressed the effects of recreational marijuana legalization on African American women. Studies include ones by Adumene (2018), Cowan et al. (2017), and Ensminger and Green (2006), but they focus on use, not impacts of education. Archibald et al. (2016) studied the effect of recreational marijuana legalization on African American males. Additionally, a variety of studies, including Arria et al. (2015), Cadigan et al. (2018), Finn (2012), and Marwaha and Patel (2020), have been conducted to illustrate how recreational marijuana use affects cognitive abilities, cannabis usage disorder (CUD), usage rates, academic achievement, and college student graduation rates. Unfortunately, studies include minimal data about female African American college students. With information about the effects of marijuana use on females being limited, rendering new details on the impacts of marijuana use on academic achievement and success of female African American college students may benefit society.

Studies about the relationship between college student achievement and co-usage of marijuana and alcohol have yielded important data. Studies have also indicated different effects of marijuana use on college students' academic achievement. According to Aslanzadeh et al. (2017), co-using marijuana and alcohol can negatively impact college students' success. Cadigan et al. (2018) posited that marijuana and alcohol co-use could be linked to academic and social issues. Further studies are needed with alcohol and marijuana being most widely utilized by college students and linked to negative academic performance and achievement. Further studies may help fill literature gaps

related to the association or relationship between recreational marijuana legalization, alcohol, and marijuana co-usage by college students.

Studies including Brown et al. (2017), Egan et al. (2016), and Kam and Mikos (2019) have yielded significant data about the perceptions of the public toward recreational marijuana legalization. Such studies offer differing opinions and have provided in-depth information about how stakeholders and the community feel about recreational marijuana legalization. Recreational marijuana legalization can significantly affect community members; understanding how the public feels is very important. With recreational marijuana legalization becoming a significant policy shift, more studies must be conducted to provide insight into the effects and impacts of recreational marijuana legalization and use on individuals and society.

My quantitative research aims to examine the effects of marijuana use on African American females' GPAs. Results and findings from the research may provide new insight into how the GPAs of African Americans have been or can be affected by marijuana use. Grade point averages were examined in the study. Examining the issue from a policy learning theorist perspective will help researchers better understand the educational impacts that marijuana use can have on female African American undergraduate students. The results of my research are intended to shed light on whether marijuana use hinders or prevents undergraduate African American women’s collegiate success. My research results may shed light on the impact of marijuana liberalization on the success rates of African American women in higher education and suggest possible program and funding priorities for policymakers and administrators to consider.

Literature Search Strategy

My literature review was completed after accessing sources such as government websites, peer-reviewed journals, state websites, state reports, scholarly articles, and scholarly books. Databases accessed are Sciencedirect.com, Semantic Scholar, the National Center for Biotechnology Information (NCBI), SAM, and the PubMed database. Keywords and phrases searched on scholarly databases to conduct the research included *black women AND undergraduate completion, black women AND low graduation rates, cannabis use disorder AND male AND female, cannabis use disorder AND 21 and older, African Americans or black Americans or blacks AND marijuana effects, cannabis use AND college graduation rates, cannabis use AND black women, cannabis use AND college, improve education for black female students, recreational marijuana AND men OR males AND graduation, recreational marijuana, recreational marijuana AND high school students, recreational marijuana AND colleges, recreational marijuana and public opinion, recreational marijuana AND men OR males, recreational marijuana AND high school students, recreational marijuana AND men OR males AND graduation, recreational marijuana AND college students, recreational marijuana AND undergraduate AND GPA, recreational marijuana AND undergraduate AND GPA, black females and college graduation data, CUD AND marijuana AND females, college students AND cannabis use disorder, black females and college, cognitive effects of marijuana use, graduation rates since legalization, college student undergraduate graduation rates, college student completion rates, college student marijuana usage rates, African American female graduation rates, graduation disparities graduation*

disparities in Colorado, and *graduation disparities in Washington.* All resources used to complete the literature review section were scholarly, reliable, valid, and credible. The information from the sources provided needed data to complete the study.

Theoretical Foundation: Complex Adaptive Systems

A complex adaptive systems theory approach was used to guide the research. According to Chan (2001), the complex adaptive systems movement was established during the 1980s at Santa Fe Institute in New Mexico (Chan, 2001). Chan (2001) also indicated that complex adaptive systems refer to a process that places emphasis on systems and utilizes computer simulation as a tool to conduct extensive research. Chan also identified that combined applied, theoretical, and experimental methods are used to analyze complex adaptive systems. According to the Human Systems Dynamics Institute (2021), the representation of a complex adaptive system during research informs understanding while identifying a system's dominant patterns (Human Systems Dynamics Institute, 2021). Complex adaptive systems allow researchers to examine how patterns emerge between interacting agents that influence future interactions (Human Systems Dynamics Institute, 2021). When adopted for research data, complex adaptive systems techniques can be used to collect and develop new data about issues or problems with limited information or help inform policy decisions at the national, state, or local level. Complex adaptive systems are an important agent examining processes that can help researchers study and better understand developing phenomena. With marijuana use effects being examined by many states and with legalization occurring across the US, utilization of a complex adaptive systems theorist approach to explore the impact of

marijuana use on GPAs of African American females may render data that could inform if recreational marijuana use negatively affects GPAs of the study population.

To effectively assess the impacts of marijuana use on African American undergraduate female students, approaching the study from a complex adaptive systems theorist perspective was beneficial. In complex adaptive systems, data is generated that helps address developing phenomena, topics, or questions with limited to no data by examining interacting agents to identify specific patterns or shared attitudes (Human Systems Dynamics Institute, 2021). As indicated by Corns et al. (2021), complex adaptive systems are defined by Kevin Dooley (1997) as a group of semi-autonomous agents who interact in interdependent ways to produce system-wide patterns, such as that those patterns then influence the behavior of the agents (Dooley as cited in Corns et al., 2021). Examples of complex adaptive systems include hospitals, healthcare systems, and businesses (Corns et al., 2021). According to Chan (2001), complex adaptive systems evolve and adapt to changing environments (Chan, 2001). Complex adaptive systems allow researchers to develop information that may be useful when determining relationships or causes for unaddressed issues or issues with limited or no information. The process allows researchers to classify data that may help identify the impact of specific interactions and relationships between defined agents, which could be beneficial during the policy-making process.

Undergraduate Graduation Disparities

Female African American undergraduate graduation rate disparities are an important issue in society. Compared to females of other races, graduation rates are

significantly lower for African American females in the United States. Libassi (2018) indicated that blacks are less likely to graduate from college. According to the National Center for Education Statistics (2019), African Americans have the lowest graduation rates at all colleges: public, private non-profit, and private for-profit institutions. The National Center for Education Statistics (2019) reported that first-time, full-time African American females have the second-lowest graduation rates in the United States at four-year post-secondary institutions. De Brey et al. (2018) indicated that African American females' 44 % six-year graduation rate ranked second to last compared to females of other races. This indicates that African American females struggle at all institution types, ranking near the bottom when comparing undergraduate completion rates to other races. Existing disparities related to undergraduate graduation rates and academic achievement point out the need for data to be generated continuously.

Graduation discrepancies exist at all collegiate institution types (4 years and 2 years), indicating that African American females are less likely to achieve college success. In a study that examined six-year outcomes of collegiate students at various institution types, Dunbar et al. (2017) indicated that African American females were most likely to drop out of college and most less likely to graduate on the national level from their starting institution. Dunbar et al. (2017) also indicated that African American females had the most students remaining after evaluating six years and were second less likely to graduate from different institutions. Dunbar et al. (2017) also indicated that African American females rank at the bottom at two-year institutions and that when compared to females of other races, African American females were most likely to drop

out of college and most less likely to graduate from their starting institution. The data indicated a significant gap in college achievement. African American women struggle with or seem hindered when trying to obtain academic success in the collegiate environment.

Important data has been collected indicating that gender discrepancies in degree attainment exist within the African American race. In 2018 when examining bachelor's degrees obtained by individuals 25 and older, women obtained 3.7% more degrees than males (*The Journal of Blacks in Higher Education*, 2019). When examining African Americans who held a master's degree in 2018, females outnumbered males by 477,000 (JBHE, 2019). Similarly, women now hold more doctoral degrees than men; in 2018, women who held doctoral degrees outnumbered men by 48,000 (JBHE, 2019). Although data indicated that females do better in the collegiate environment than African American males, attention must be placed on the fact that African American females still rank near the bottom when comparing their collegiate success and academic achievement in the collegiate environment to females of other races. Future studies may help identify what resources may be needed to address disparities that exist when examining collegiate success and academic achievement of African American females in the college environment.

Degree completion and academic achievement discrepancies based on gender and race exist in society. Limited studies, some old and some new, examine African American females' success and academic achievement. Various studies compare African American females' collegiate success and academic achievement to African American

males. Studies include Dunbar et al. (2017), *The Journal of Blacks in Higher Education* (2019), and Zumani (2003). Since most studies focus on disparities that exist when comparing college success and academic achievement of African American females to females of other races, there was a need for my research and further studies to identify how marijuana use affects academic success or related variables used to gauge achievement.

Usage of Recreational Marijuana

Marijuana usage rates of college students continue to increase as more states consider recreational marijuana legalization. The consumption of marijuana by college students in 2019 was the highest since 1983 at 43 percent (National Center for Drug Statistics, 2019). According to Balodis and Mackillop (2018), marijuana use is most prevalent where it has been legalized. Findings from the National Survey on Drug Use and Health 2016-2017 study indicated that past month, daily and near-daily marijuana usage rates increased in young adults 18-25 (U.S. Department of Health, 2018). Data also indicated that marijuana usage rates for young women had increased significantly (U.S. Department of Health and Human Services, 2018). According to the U.S. Department of Justice (2017), marijuana is the most prevalent drug college students use. A significant increase in marijuana use by young women and increasing college student usage rates combined with more states considering recreational marijuana suggests a need for future studies on the effects of marijuana use on college success. Further studies may provide valuable data that may be used when determining a need for marijuana intervention and education programs on college campuses.

Marijuana, being that it is the most widely used substance by college students, is a topic that must be continuously investigated to identify how its usage affects the college population and academic achievement. According to Cadigan et al. (2018). there are 10.7 million students enrolled at four and two-year colleges in the United States–the majority (62%) of the students reported utilizing marijuana in the past month Aston et al. (2020) in a fall 2017 study conducted to examine symptoms related to cannabis use disorder, consequences of cannabis use, and user types indicated that individuals 18-24 past-year cannabis use sit at 33.3%. Daily cannabis use is near 4%. As indicated in Cadigan et al. (2018) longitudinal study conducted from February 2015 through January 2016, half of the U.S. college population reported using marijuana in the past month. Understanding the effects of marijuana use on college students' success becomes even more important in society.

As states continue to legalize marijuana for recreational purposes, evidence continues to be generated that indicates that college students' marijuana utilization has and continues to increase. According to Agaku et al. (2019) study that examined data from the 2002-2016 National Survey on Drug Use and Health, college students saw usage rates increase faster compared to students not enrolled in college. In addition to faster increases in marijuana usage rates, Agaku et al. also identified that in 2016 college students' past 30-day and past 12-month usage rates of marijuana were higher as well. Similarly, Jones et al. (2018) identified that in Colorado, marijuana usage rates of college students are higher than the national average. Jones et al. also indicated that college students aged 18-24 reported the highest rates of marijuana utilization in the United

States. With statutes related to recreational marijuana legalization being considered and college student usage rates continuing to increase around the United States, surveying the impacts and effects of marijuana use is even more critical.

Marijuana continues to be one of the most widely used substances in the United States. As indicated by Jones et al. (2018), the likelihood of current drug use is highest in individuals aged 18-29. According to Jones et al., college enrollment may lead to increases in the overall usage rates of marijuana by young adults. Additionally, Jones et al. indicated that college students aged 18-24 are the number one users of marijuana in the United States. With recreational marijuana legalization up for debate in several states, and since marijuana is the most widely used substance by college students (Egan et al., 2016), it remains a significant concern in society. Egan et al. modeled outcomes by utilizing group-based trajectory models and regression tests -random-effects linear and logistic tests- examined usage patterns and academic outcomes of 3146 college students from North Carolina and Virginia, indicated that daily and past 30-day usage rates of marijuana by college students have experienced steady increases from 2007-2013.

Similarly, another study by Adkins et al. (2018) identified marijuana as the most utilized illicit drug by college students on college campuses. Additionally, Adkins et al. indicated that young adult marijuana usage rates continue to increase with frequent use while attending college. As marijuana usage rates continue to rise, researchers must understand the relationship between marijuana use by college students and academic achievement.

Cannabis Use Disorder

Cannabis use disorder is a growing concern in society. According to Balodis and Mackillop (2018), cannabis use disorder is defined as a cannabis addiction that requires a psychiatric diagnosis. According to Chou et al. (2018), cannabis use disorder is defined as cannabis use at the problematic level, which leads to withdrawal/tolerance, cravings, social and medical problems, and impairment or distress at a significant level. Marwaha and Patel (2020) indicated that diagnosis must adhere to guidelines outlined in the DSM-5. According to Balodis and Mackillop, cannabis use disorder can be diagnosed when two of the following criteria exist: (a) utilization of the drug under hazardous circumstances (ex: while operating heavy machines or driving); (b) utilization of the drug in more significant amounts than intended; (c) cannabis preoccupation; (d) not being able to quit or cut back on usage of marijuana; (e) high tolerance; (f) neglect of major roles; (g) the occurrence of interpersonal problems because of marijuana usage.

In addition to the above-listed characteristics related to a cannabis use disorder diagnosis, Marwaha and Patel identified the chronic and acute effects of cannabis use disorder. According to Marwaha and Patel, acute or chronic effects that may occur when diagnosed with a cannabis use disorder include cannabis withdrawal, cannabis intoxication, cannabis intoxication delirium, cannabis-induced psychotic disorder, cannabis-induced anxiety disorder, and cannabis-induced sleep disorder. With cannabis being the most widely used substance in the United States, understanding who and how individuals are affected is necessary.

Studies have indicated that individuals of all ages can suffer from cannabis use disorder. According to Marwaha and Patel (2020), marijuana remains the most utilized drug in the United States; teens and adolescents are the primary users. According to Aston et al. (2020), worldwide, approximately 13 million people in the U.S. meet the criteria to be diagnosed with cannabis use disorder. Chou et al. (2018) indicated that cannabis use disorder is most likely to occur in younger people. According to Brady et al. (2015), non-white adolescents have a greater probability of partaking in cannabis use and suffering from cannabis use disorder. A 2015 study on adolescent (aged 12-17) cannabis use conducted by Brady et al. indicated that cannabis use disorder is the most common substance use disorder amongst adolescents in the clinical setting. As indicated by Aston et al. (2020), cannabis use disorder affects individuals 18-25 at a much greater rate than other age groups. Aston et al. (2020) also indicated that the mean age for cannabis use disorder to begin to manifest in adults who fall between 18-29 is age 21. Cannabis use disorder affects marijuana users of all ages across the nation. With more states considering marijuana legalization and with studies indicating that cannabis use can negatively affect academic achievement and performance, it is a must that further studies occur to help researchers better understand the relationship between cannabis use, cannabis use disorder, and academic achievement of specific populations.

Cannabis use disorder affects males and females. According to Chou et al. (2018), life quality for individuals diagnosed with cannabis use disorder is low for males and females. As indicated by Aston et al. (2020), individuals 18-25, the general age range of the undergraduate student, are most likely to be diagnosed with cannabis use disorder.

According to Chou et al., in the United States, cannabis use disorder is more prevalent among African American males and females. According to Aston et al., lifetime cannabis use disorder rates are nearly two times higher in males than females. As indicated by Chou et al., men start utilizing cannabis at an earlier age than females; however, the onset of cannabis use disorder occurs earlier in females. Chou et al. also indicated that the onset mean for cannabis use is 17.5 for men and 18.1 for females; the onset mean age for cannabis use disorder is 20.8 for females and 21.9 for males, all typical ages for undergraduate students. Since cannabis use and cannabis usage disorder rates are highest in ages associated with the undergraduate student, further studies must be conducted to identify the relationship between marijuana use, legalization, cannabis use disorder, and academic achievement.

Cognitive Effects of Marijuana Use

The cognitive effects of marijuana use are a topic that must be explored continuously–especially with college students making up a large portion of the marijuana user population. As indicated by The Hamilton Project (2017), in 2015, the average age for undergraduate students at two and 4-year institutions was 18-24; students who attended for-profit colleges are usually older. The human brain reaches maturity at 25 or beyond (The University of Rochester Medical Center, 2021). According to Egan et al. (2016), marijuana remains one of the top 2 most used substances by college students. Studies that include Gabrys (2019), Geyer et al. (2020), and Jones et al. (2018) have yielded evidence that cognitive abilities or functions may be affected by marijuana use. With marijuana being the most utilized substance by college students, further studies

about the effects of marijuana on cognitive abilities or functions may help determine if marijuana use during college increases the likelihood of academic failure.

Cannabis use has been linked to a decline in cognitive abilities and functions. Mandelbaum and Monte (2017) indicated that heavy marijuana use might cause neuropsychologic issues or problems in multiple areas. Additionally, Mandelbaum and Monte indicated that neuropsychological functions do not restore or repair even if users stop using marijuana. According to Calabrese and Casillas (2018), cannabis use at a heavy rate can cause reversible disruptions in the memory function of both animals and humans and cognitive impairment in various areas, including working memory, verbal memory, and other memory functions. According to Jones et al. (2018), there may be a small association between continuous marijuana use and slight declines in cognitive abilities or functions. According to Gabrys (2019), marijuana use may negatively impact various aspects of life, including mental health, motor skills, physical health, pregnancy, and life aspects related to human development and health. Adverse cognitive effects associated with the use of marijuana have the potential to negatively affect life as a whole and processes associated with living, learning, and being productive members of society.

Marijuana utilization has been linked to a variety of effects. Studies that include Gabrys (2019), Geyer et al. (2020), Jones et al. (2018), and Mandelbaum and Monte (2017) and have identified adverse relationships between adverse cognitive effects and marijuana use. According to Mandelbaum and Monte, marijuana utilization at a chronic rate adversely affects the brain and cognitive abilities. Mandelbaum and Monte also indicated that varied severe neuropsychiatric effects include a lack of motivation or a

reduction in activity, the occurrence of symptoms associated with schizophrenia or psychotic disorders, or hallucinations have been associated with marijuana use. Additionally, Mandelbaum and Monte show an association between heavy marijuana use and impaired cognitive abilities, mental illness diagnosis, and high rates of adverse life outcomes. According to Gabrys, mild cognitive difficulties have been associated with regular marijuana use when used regularly. Gabrys also indicated a relationship between heavy daily marijuana use and distinguishable cognitive impairment. Additionally, Gabrys indicated that regular marijuana use could affect various cognitive functions and abilities, including brain structure and function, attention, learning memory, working memory, and cognitive flexibility.

Results from studies about marijuana use and cognitive effects differ in many ways. Studies, including Cousijin et al. (2021), Calabrese and Casillas (2018), and Johnston et al. (2011) related to the use of marijuana and its cognitive effects, have yielded varying evidence that warrants further research. As indicated by Cousijin et al. (2021) in a review of current evidence about the short and long-term cognitive effects of marijuana use, continued research is needed to understand better the suggested effects of marijuana use on cognitive abilities or functions. Cousijun et al. indicated that measuring the effects of marijuana use on cognition has proven to be difficult because of several variable constraints—usage history, limited sample compositions, and identifying exposure parameters. According to Cousijin et al., an abundant amount of evidence suggests marijuana use adversely affects episodic memory, attention, and motor skills; however, more studies are needed, especially those that examine the long-term effects of

marijuana use and the possible recovery of a loss of or a decline in cognitive functions or abilities. Additionally, Cousijin et al. indicated that a relationship between marijuana use, substance use disorder, and cannabis use disorder might exist.

In contrast, several studies have identified beneficial cognitive effects related to marijuana use. Calabrese and Casillas (2018) have indicated that marijuana utilization may benefit cognitive functions or abilities. According to Calabrese and Casillas (2018), THC has been shown to improve neurological functions, prevent neurodegenerative processes, and restore memory and cognitive functions when tested on animals. According to Jones et al. (2018), small but significant associations exist between heavy marijuana use by young adults and adverse cognitive effects. According to Johnston et al. (2011), marijuana use has been linked to specific neuropsychological functions; however, some research has indicated that declines in cognitive functions and abilities may not be associated with long-term marijuana use. According to Gabrys (2019), cognitive functions are not severely or grossly impacted by heavy marijuana use. Additionally, Gabrys indicated that ongoing debates continue about whether marijuana utilization causes permanent adverse effects on cognitive abilities or functions and whether such adverse effects are reversible. According to Jones et al., abstinence from marijuana use may help reduce or remove cognitive deficits related to marijuana use. With studies Calabrese and Casillas (2018), Gabrys (2019), Geyer et al. (2020), Johnston et al. (2011), and Mandelbaum and Monte (2017) revealed differing opinions about the effects of marijuana use on cognitive functions and abilities further exploration is needed to provide a better understanding.

Marijuana and Alcohol Co-Usage by College Students

Substance abuse at colleges and universities continues to be a significant problem in the United States. Studies have identified relationships between student achievement and the co-usage of marijuana and alcohol. Aslanzadeh et al. (2017) indicated that marijuana, the 2nd most used substance by college students, and alcohol, represent the two most used substances at colleges in the United States. Aslanzadeh et al. indicated that eighty percent of the student body at colleges and universities drink alcohol, and forty percent of the identified drinkers are binge drinkers. Similarly, Egan et al. (2016) indicated that college students' most utilized illicit drug is marijuana. According to Aslanzadeh et al., nationally, simultaneous use of marijuana and alcohol has been reported by fifty-eight percent of adolescents who consume alcohol. Usage rates of marijuana and alcohol rank at the top at colleges and universities in the United States. With the above trends existing and co-using marijuana and alcohol rates so high, understanding the topic is a must, especially with more states considering recreational marijuana legislation.

Studies have examined how marijuana use has affected alcohol and marijuana usage patterns—independently and simultaneously. With alcohol and cannabis being the most prevalent used substances by college students understanding the effects of usage patterns of alcohol and marijuana by college undergraduates remains a topic of great importance in society. As indicated by Kerr and Subbaraman (2020), in a study that examined changes in alcohol and marijuana use after recreational marijuana legalization in the state of Washington (I – 502), alcohol usage did not experience a significant

change; however, there was a significant increase in the occurrence of cannabis use by men and women. Similarly, a study conducted by Cowan et al. (2017) that assessed the impact, increased use by college students, and frequency of use of recreational marijuana by undergraduate college students at Washington State University before and after legalization indicated that no evidence could be found that indicate that recreational marijuana legalization affected alcohol utilization by undergraduate college students. Since alcohol and marijuana are the most utilized substances by college students, there will continue to be a need for studies to identify relationships between recreational marijuana legalization, marijuana and alcohol co-use, and collegiate academic success.

With negative academic, health, and cognitive outcomes being associated with both marijuana and alcohol use, a better understanding of the relationship between the two may help address or identify if recreational marijuana legalization increases or decrease the likelihood of the co-usage of marijuana and alcohol by college students; which in turn may lead to academic failure or struggle. A better understanding of the relationship between alcohol and marijuana is a must, especially since binge drinking is associated with alcohol use and since the two substances remain the top two substances of choice amongst college students. According to Jones et al. (2018), since Amendment 64 in 2012, the relationship between marijuana and alcohol use has decreased in Colorado. Additionally, Jones et al. indicated that college students who support or endorse the utilization of marijuana also endorse utilizing alcohol, with frequent marijuana users being the predominant user of alcohol. Jones et al. also indicated a strong association between binge drinking and frequent marijuana use by college students; 73%

of college students who do not utilize marijuana reported no occurrences of binge drinking. Simultaneous, concurrent, and separate use of alcohol and marijuana by college students has been linked to adverse health and academic outcomes, thus understanding the even more meaningful relationship.

The co-usage of alcohol and marijuana can adversely affect components associated with academic performance. Aslanzadeh et al. (2017) indicated that the co-use of alcohol and marijuana could negatively impact college students' GPAs. Aslanzadeh et al. indicated, during a study conducted over two years, that college students who consume moderate to heavy amounts of alcohol and marijuana initially had lower grade point averages. Similarly, a study conducted by Cadigan et al. (2018) indicated that various issues arising from marijuana and alcohol co- usage had been identified. According to Cadigan et al., there is also a greater likelihood of interpersonal problems and driving difficulties occurring since such actions have been associated with marijuana and alcohol co–usage. Since marijuana and alcohol co-use can adversely affect academic success and achievement, further studies may be conducted to understand better how marijuana and alcohol co-use impacts college students' academic achievement and success. Future studies may help researchers determine if there is a need for combined marijuana and alcohol prevention, education, and usage programs on college campuses.

Recreational Use: Academic Effects on the College Student

It has been identified that marijuana use can affect academic performance, GPA, college completion rates, and performance indicators related to the college student. Allen et al. (2019) indicated that poor academic performance is associated with marijuana use.

According to Egan et al. (2017), other factors associated with marijuana use include GPA, academic outcomes, and plans to graduate on time. Egan et al. also indicated that all marijuana users performed the worst academically and had lower overall GPAs. Similarly, studies related to the effects of utilizing marijuana have also identified adverse cognitive effects related to marijuana usage. According to Arria et al. (2015), functions associated with academic achievement and performance affected by marijuana usage include learning, processing information, and memory. Arria et al. also indicated that heavy marijuana usage could affect academic achievement and performance. Additionally, Arria et al. indicated that first-year students who most frequently used marijuana skipped more classes and were more likely to underachieve academically. With the utilization of marijuana being negatively associated with several functions related to academic achievement and performance, understanding the effects of marijuana use may have on cognitive abilities may prove beneficial to the college population. With marijuana usage being linked to poor academic performance and other factors associated with academic performance, marijuana use effects on undergraduate GPAs must be considered.

Studies indicated a relationship between marijuana usage and lower undergraduate and graduate degree completion rates. As indicated by Allen et al. (2019), marijuana usage can be a barrier to graduation. Arria et al. (2015) also indicated that marijuana use could lead to skipping, leading to delayed graduations. Similarly, Egan et al. (2016) indicated a negative association between study time and achievement motivation while enrolled in college. Egan et al. also indicated that the likelihood of

college graduation decreases as usage increases. The negative association between marijuana usage and college completion warrants further investigation. Since negative associations exist between marijuana use and college completion, future studies at the state level may help researchers identify if recreational marijuana legalization acts as a barrier or predictor of college completion.

College student marijuana usage rates are continuing to increase. Marijuana use can negatively impact the academic achievement of users of all types. Studies have identified a relationship between marijuana usage and lower grade point averages. According to Arria et al. (2015), declines in GPA can be predicted by increased marijuana usage. A study by Egan et al. (2016) identified five marijuana user groups: non-users, infrequent users, decreasing users, increasing users, and frequent users. According to Egan et al., all user types had lower GPAs than non-users; non-users reported higher GPAs than all other users. Increasing usage rates of marijuana by college students may warrant further studies since academic achievement seems to decline as college student marijuana usage rates increase. Data from future studies can help determine if marijuana use is a predictor of collegiate success.

Public Opinion

Recreational marijuana legislation continues to be a controversial topic in the United States. Currently, 15 states and 3 territories allow marijuana to be utilized for recreational purposes (NCLS, 2020b). Since the 2020 presidential election, the public support for recreational marijuana has increased, and so has the number of states that allow marijuana to be used for recreational purposes (Brenan, 2020; National Conference

of State Legislatures, 2020b). Studies have indicated that views or opinions on recreational marijuana legislation vary. According to Kerr and Subbaraman (2016), very few studies have been published since marijuana legalization became a reality in several U.S. states. Kerr and Subbaraman also indicated that nationally, support for marijuana legalization has increased. Kerr and Subberman also indicated that in 2015 marijuana legalization garnered 58% of Americans' support of marijuana legalization, a Gallup poll high since its 46-year existence. Similarly, Brenan (2020) indicated that marijuana legalization support in the United States is at an all-time high of 68% compared to the past five decades. With support for marijuana legalization, a growing understanding of how specific populations are affected by marijuana use may prove beneficial to policy developers during marijuana-related policy development.

Opinions related to marijuana legalization differ in the United States. Brenan (2020), when assessing 2020 Gallup data, indicated that over half—both males (69%) and females (66%)—in the U.S. support marijuana legalization. Brenan also indicated that Democrats and Independents are more vigorous supporters of recreational marijuana legalization than Republicans. Brenan also indicated that individuals aged 18-29 are the strongest supporters of marijuana legalization and have the least non-supporters of marijuana legalization out of all age groups; 30-49, 50-64, 65, and up. Additionally, Brenan identified that college graduates (76%) and non-college graduates (64%) support marijuana legalization. Mixed opinions exist about recreational marijuana legalization. Recent evidence suggests that support for recreational marijuana will continue to increase across all demographics, with college-aged students being the strongest supporters. With

data indicating that individuals aged 18-29, in or out of college, are strong supporters of marijuana legalization, future studies may help inform if significant relationships exist between recreational marijuana use, legalization, public opinion of marijuana policy, and academic success.

Most young adult marijuana users do not perceive using marijuana to be harmful. College students tend to be strong supporters of marijuana legalization. According to Egan et al. (2016), over sixty percent of young adults do not feel that risks are associated with regular marijuana use. According to Kerr and Subbaramann (2016), data from a study conducted on college students from Wisconsin and Washington state indicated that half (50.6%) of the participants from Wisconsin favored marijuana legalization; similarly, nearly half (46.3%) of the students from Washington state favored marijuana legalization. Additionally, a study conducted by Adkins et al. (2018) at a midwestern faith-based university that assessed the perceptions of marijuana utilization by undergraduate students indicated that over 50% of the undergraduate population believed that marijuana should be allowed for recreational purposes, while 90% believed it should be allowed for medicinal purposes. Adkins et al. also indicated that more than 50% percent of the undergraduate population felt that marijuana legalization could benefit society and that they would utilize marijuana more frequently if legalized. With college students being the majority users of marijuana and strong supporters of marijuana legalization, further studies may help identify if marijuana use adversely affects academic achievement or success while identifying a need for health and educational resources geared at safely utilizing marijuana.

Since the legalization of marijuana for recreational purposes in Colorado (Amendment 64) and Washington state (I-502), support for marijuana legalization has not diminished. Data indicates that support for marijuana legalization continues to increase in Colorado and Washington state since its legalization in 2012. Kerr and Subbaraman (2016) indicated that over 25% of voters who voted against legalization in 2012 would vote to legalize marijuana today. Additionally, Kerr and Subbaraman indicated that if voters were to vote for marijuana legalization in Washington state today, the vote would pass with more votes than in the past election. Support for recreational marijuana legalization in Colorado has not declined since Amendment 64 was passed and made marijuana legal for recreational purposes. As Kerr and Subbaraman (2016) indicated, like in Washington state, support for marijuana legalization in Colorado has increased while opposing views have declined (Marijuana Policy Project, 2021). According to the Marijuana Policy Project, a poll conducted in 2016 indicated that close to 50 % of the participants felt that recreational marijuana legalization benefited the community. With increasing support for marijuana legalization in many states understanding the impacts of use is a must.

Summary

Since recreational marijuana legalization in Colorado (I-502) and Washington State (Amendment 64) in 2012, marijuana use has remained an important topic that has and continues to require significant attention in society. Both support for marijuana legalization and college student usage rates continue to increase nationally. In addition to increased marijuana usage rates and acceptance rates, marijuana remains one of the top 2

utilized illicit substances by college students. With marijuana use being linked to disparities related to academic achievement and success in college. Recreational marijuana is legal in 15 states. With many States in the U.S. considering recreational marijuana legalization, a better understanding of the effects or impacts of marijuana use on specific populations may benefit the community, policy, developers, institutions of education, and more.

There are a variety of adverse and beneficial cognitive effects that have been shown to have a relationship with, be associated with, or correlate with marijuana use; however, more studies are needed to provide more substantial evidence and a better understanding of the effects of marijuana use on cognitive functions and abilities. Adverse effects related to marijuana use include low or below-average academic success and achievement, higher CUD diagnosis, and increased marijuana and alcohol co-use. With adverse effects being linked to marijuana use, a better understanding of the subject matter may help identify what and when education, usage, and prevention information about marijuana should be made available to the female African American undergraduate student. Conducting my research provided a better understanding of the effects and impacts of marijuana use on GPAs. Data from the study may help researchers better identify if and how African American female undergraduate college students' success and academic achievement are adversely affected by marijuana use.

Studies on the impacts or effects of marijuana use must be conducted continuously. Since more states have legalized marijuana for recreational use and since more states are considering recreational marijuana legalization, understanding the

impacts or effects of marijuana use may help identify resources that may be needed on college campuses. Such resources may be used to help ensure that recreational marijuana legalization does not adversely affect any population, African American, Hispanic, White, Native American, and others. Limited but significant data indicated relationships between several variables related to or used to gauge collegiate academic success or achievement. With existing relationships between marijuana use, academic success and achievement, cannabis use disorder diagnosis, and the co-use of marijuana and alcohol, understanding how such factors affect female African American college students may help researchers determine if college campuses lack sufficient resources. Resources may be used to inform students about marijuana risks and harms, instruct students on how to use marijuana properly, or deter improper or illegal marijuana use. By examining GPA and usage data from the ACHA National College Health Assessment survey, literature gaps about the relationship between marijuana use by African American females on undergraduate GPAs was addressed. Data from the study provided in-depth needed literature that may be of use to researchers when determining the effects of marijuana use GPAs to identify the appropriate measures to utilize when addressing adverse effects that marijuana use can or may have on populations in the collegiate environment.

Chapter 3: Research Method

Introduction

Grade point averages of undergraduate African American females are significantly lower than white females. Additionally, graduation rates are significantly lower as well. The National Center for Education Statistics (2019) indicated that undergraduate African American females performed better than males while enrolled in undergraduate studies; however, compared to white females, African American females underperform. Researchers including Arria et al. (2015), Cadigan et al. (2018), Finn (2012), and Marwaha and Patel (2020) have linked poor academic success, lower grades, and other factors used to gauge academic success to marijuana use. Amendment 64 (Colorado) and I-502 (Washington State) legalized marijuana for recreational purposes in 2012; other states would soon follow. With legalization came greater access to marijuana; presumably, adverse academic effects are likely to be linked to marijuana use. Alas and Hansen (2021) indicated that Colorado, Washington State, 17 other states, Washington D.C., and Guam had approved marijuana use for recreational purposes. Given the shift in attitudes and marijuana policy, understanding the impacts of recreational marijuana use may better help researchers identify and understand the relationship, if any exists, between marijuana use and undergraduate GPAs of the female African American undergraduate population.

The purpose of this quantitative study was to explore if marijuana use has been a factor in academic success, particularly in GPAs. This chapter thoroughly analyzed the correlation research design used to approach the research and the methodology and

processes used to examine the effect of marijuana use on female African American undergraduate students' GPAs. A correlation test was used to examine further data collected from students located in colleges in the United States. Data collected reveal a relationship between marijuana use and low undergraduate GPAs of African American females.

Research Design and Rationale

Variables used for this research include independent, dependent, and control variables. Variables for the study are the following. How often the student has used marijuana served as the independent variable, undergraduate GPAs of African American females served as the dependent variable during the testing phase of the study, and control variables utilized were sex, institution type, and race. With recreational marijuana legalization being one of the most controversial topics in the U.S., examining data collected from the ACHA National College Assessment Survey database utilizing a quantitative method while controlling for other variables may help researchers better understand the relationship between marijuana use and grade point averages of African American women.

Quantitative research allows researchers to utilize numerical data to evaluate, explore, examine, and analyze topics, issues, policies, and concerns. Quantitative research is a process in which preexisting statistical data is manipulated utilizing statistical computing programs, methods, or techniques. The goal of quantitative research is to identify the relationship between independent and dependent variables within a defined population (University of Southern California, 2021). After accessing available

secondary data, a quantitative approach was taken in my research to explore further if marijuana use adversely impacted the grade point averages of undergraduate African American female students. With marijuana being one of the most utilized substances by college students (Arria et al., 2015), utilizing a quantitative approach for the research may aid in the quest for a better understanding of the effects of marijuana use on undergraduate GPAs of African American women. My research may help corroborate a relationship between marijuana use and test assumptions of traditionally lower GPAs and academic outcomes for undergraduate African American women. Utilization of a quantitative design may yield statistical data/results that may help better understand if and what kind of relationship exists between marijuana use and undergraduate completion rates of African American females.

A quantitative correlation research design was utilized because it allowed data to be generated that may help direct policy to identify better and address negative consequences related to or associated with the use of marijuana by undergraduate African American undergraduate students, which happen to represent and is included in the group identified as the predominant users of the substance on college campuses. Correlation studies identify relationships but not causation (Chiang et al., n.d.). A correlation research design worked best for my research because it allowed for data to be compared to assess better the relationship between marijuana use and the study population. Utilizing a quantitative correlation research design allowed me to explore if marijuana utilization by African-American undergraduate female students in the U.S. adversely affected their GPAs. GPAs and marijuana use data about other races was also examined. Utilizing a

quantitative study with a correlation research design allowed for statistical data to be thoroughly examined and tested. Literature on the topic appeared limited; for example, see the work by Borcherding (2016), Cowan et al. (n.d.), and Fisher (2018), which addressed college students' perception of marijuana use, academic differences between users and non-users, grades, and overall academic success. Such studies indicated that college students tend to think positively about marijuana use. Additionally, Borcherding (2016) indicated that significant correlations between marijuana use and academic involvement, which refers to skills that include completing class and homework, studying, and participating in class, did not exist. Borcherding (2016) also indicated significant positive academic differences between users and non-users of marijuana exist. In a quantitative study, Coco (2017) demonstrated that grade averages decreased when marijuana use increased. The lack of extensive research on outcomes and use indicates that further studies are warranted. Examination of statistical data about undergraduate African American female GPAs in the US utilizing a quantitative research design may help contribute to the literature about the relationship between African American female academic performance and marijuana usage.

Methodology

The target population for the study is African-American undergraduate female college students. Data about the targeted population was collected from the ACHA National College Health Assessment archived data set files. Data collected provided insight into whether lower undergraduate GPAs of female African Americans are related to marijuana use. A specific stratified sampling process was utilized to identify

appropriate individuals for the study. Careful utilization of stratified sampling to conduct the study helped ensure that the data would be most representative of the African American female undergraduate college population. Stratified sampling helped ensure that those participating in the study met the specific criteria required to participate. McCombes (2019) indicated that stratified sampling allows researchers to examine groups based on specific characteristics. Advantages of stratified sampling include being cost and time-effective and being, in some cases, the best option because of limited data and choice. Stratified sampling allowed for a specific study population to be thoroughly examined to identify the effects of marijuana use on undergraduate African-American female college students' GPAs.

A correlation test was used for testing. Chiang et al. (n.d.) indicated that correlation tests allow for two variables to be measured to assess the relationship between the two; independent variables cannot be manipulated. In the study, the utilization of a correlation test to determine and identify the relationship between marijuana use and lower GPAs of undergraduate African-American females was appropriate and rendered results suitable enough to address the research question. The Alpha level was set at the .05 standard, indicating that I accepted that there is a 5% chance that the test results occurred by chance. The effect size was identified. Effect size calculations indicated that out of a population of 426,259, at least 384 surveys or more must be evaluated, within each racial group, to yield a confidence level of 95% with a margin of error of 5%. Additionally, the p-value was identified as well.

Secondary data was used for my research. Appropriate permissions were gained to obtain data. Data about GPAs and marijuana usage rates of undergraduate females were collected from the ACHA National College Health Assessment archived data files. SPSS was used during the study to perform a correlation test.

Threats to Validity

A correlation research design was used to conduct the study. Data collected by the ACHA from a national sample of human participants were involved. Both internal and external threats to validity were considered. Internal threats that were considered include that there may be a lack of or limited data, primarily since controversy still exists about marijuana use. Another internal validity threat I considered is that some participants may not have answered all the questions honestly. External variables considered during the study include low population validity. Although growing access to marijuana is a reality in all states, population validity must be considered since not all populations are under the same laws. Another external validity threat that was considered is ecological validity. Similar settings in which the study examines the targeted population are where the findings can be generalized to the population. Situation effects must also be considered. To address mentioned threats, testing of a large sample size of the sample group occurred. I also considered that since opinions about marijuana use have changed over time, so have usage rates and acceptance rates. My research was conducted so that duplication and replication could occur to strengthen generalizability. Ethical procedures were followed during the study. No conflicts of interest nor ethical concerns exist.

Summary

With increasing marijuana use occurring across colleges in the United States, there is a need to explore further how marijuana use affects undergraduate GPAs of a class ranked near the bottom when evaluating completion rates of undergraduate females-African American women. A quantitative correlation study is necessary to assess best the relationship between marijuana use and the given study population. Conducting this quantitative correlation research study helped further clarify how and if there is a relationship between marijuana usage and GPAs of undergraduate studies by African American females. To further explore and examine the effects of marijuana usage on GPAs of undergraduate African American females running a correlation test rendered data that provided needed knowledge. Utilization of the statistical analysis program SPSS yielded detailed results that either rejected or accepted the null hypothesis.

Chapter 4: Results

Introduction

Marijuana use is prevalent among college students and continues to be a topic of great importance. According to the National Institute of Health (2021), marijuana use among college students has continuously increased over the past five years (National Institute of Health, 2021). With usage rates continuing to increase, understanding if marijuana use impacts the GPAs of undergraduate female students remains essential. According to Libassi (2018), African American females are the least likely to complete their undergraduate studies (Libassi, 2018). With studies such as Libassi (2018), Dundar et al. (2017), and Marwaha and Patel (2020) indicating that African American female students perform worst at undergraduate institutions in the United States, the results of my research may prove to be beneficial when determining if usage restrictions need to be implemented at the collegiate level to promote improving GPAs. My research will help researchers determine if a negative relationship exists between marijuana use and GPAs of undergraduate female students.

My research aimed to determine if a relationship between marijuana use and lower GPAs of females exists in undergraduate institutions in the United States. Data from the American College Health Association - National College Health Association, was examined using a multiple linear regression test on SPSS. The dependent variable in the study was the GPAs of undergraduate students. Controlling for gender, the independent variables in the study were marijuana usage rates and the following races

African American, White, Hispanic/Latino/a, Asian or Pacific Islander, Biracial or Multiracial, American Indian, Alaskan Native, or Native Hawaiian, and other. The research questions and hypothesis questions related to the research are the following:

$H_0$1 – Marijuana use has not had a significant effect on female African American GPAs.

*Ha*1 – Marijuana use has had a significant effect on female African American GPAs.

Research question: To what extent has marijuana use influenced female White college-level GPAs?

$H_0$1 – Marijuana use has not had a significant effect on female White GPAs.

*Ha*1 – Marijuana use has had a significant effect on female White GPAs.

Research question: To what extent has marijuana use influenced female Hispanic/Latino/a college-level GPAs?

$H_0$1 – Marijuana use has not had a significant effect on female Hispanic/Latino/a GPAs.

*Ha*1 – Marijuana use has had a significant effect on female Hispanic/Latino/a GPAs.

Research question: To what extent has marijuana use influenced female Asian or Pacific Islander college-level GPAs?

$H_0$1 – Marijuana use has not had a significant effect on female Asian or Pacific Islander GPAs.

*Ha*1 – Marijuana use has had a significant effect on female Asian or Pacific Islander GPAs.

Research question: To what extent has marijuana use influenced female Other college-level GPAs?

$H_0$1 – Marijuana use has not had a significant effect on female Other GPAs.

*Ha*1 – Marijuana use has had a significant effect on female Other GPAs.

Research question: To what extent has marijuana use influenced college-level GPAs?

$H_0$1 – Marijuana use has not had a significant effect on female American Indian, Alaskan Native, or Native Hawaiian GPAs.

*Ha*1 – Marijuana use has had a significant effect on female American Indian, Alaskan Native, or Native Hawaiian GPAs.

Research question: To what extent has marijuana use influenced female Biracial or Multiracial college-level GPAs?

$H_0$1 – Marijuana use has not had a significant effect on female Biracial or Multiracial GPAs.

*Ha*1 – Marijuana use has had a significant effect on female Biracial or Multiracial GPAs.

To examine the relationship between marijuana usage rates and female undergraduate GPAs in the United States, secondary data was obtained from the ACHA-NCHA yearly survey conducted from Fall 2015-Spring 2019. The remaining information presented in this chapter addressed data collection, data analysis, and testing results.

Data Collection

Secondary data from the American College Health Association – National College Health Association was requested and required to conduct my research. The requested data was obtained from the ACHA-NCHA yearly survey (Fall '15-Spring '19). The first step of the data collection process required me to complete and submit a data use permission letter, which was done on 07/07/2021. I was granted access and permission to utilize the data on 01/07/2022. The study proceeded without complications.

Baseline Description of the Sample

The data examined represents answers related to undergraduate GPAs and marijuana use by undergraduate females who participated in the American College Health Association – National College Health Association yearly survey (Fall '15 – Spring '19). Data was filtered only to include the responses of undergraduate female students. Table 1 describes the sample utilized for the study.

Table 1

Frequency Statistics

Race/ Ethnicity		White	Black	Hispanic or Latino/a	Asian or Pacific Islander	American Indian, Alaskan Native, or Native Hawaiian	Biracial or Multiracial	Other
N	Valid	426259	426259	426259	426259	426259	426259	426259
	Missing	166	166	166	166	166	166	166
Sum		280179	24146	61150	62477	8103	19663	11376

Notes. N = 426359

Table 2 displays the mode, median, mean, and sum of GPAs of undergraduate females who participated in the surveys. GPAs were represented as followed 1 = A, 2 = B, 3 = C, 4 = D/F, and 5 = N/A.

Table 2

GPA Frequency

N	Valid	420271
	Missing	6154
Mean		1.7126
Median		2.0000
Mode		1.00
Std. Deviation		.83082
Minimum		1.00
Maximum		5.00

Note. Avg. GPA = 2 or the letter grade B

Demographics of the Sample

The sample used for the study consisted of seven different race categories, which were only undergraduate females. The total number of participants that made up the sample is 426,259. Of the sample, 65.7% were white, 5.7% were black, 14.3% were Hispanic or Latino/a, 14.7% were Asian or Pacific Islander, 1.9% were American Indian, Alaskan Native, or Native Hawaiian, 4.6% were Biracial or Multiracial, and 2.7% were other (n = 426,259). The data was retrieved from willing undergraduate females who participated in the ACHA-NCHA yearly survey (Fall 2015-Spring 2019). Sampling was used to isolate the needed sample to focus only on undergraduate females. The sample seemed to be representative of the undergraduate female college population based on data examined by the National Center for Education Statistics (NCES, 2020). With data

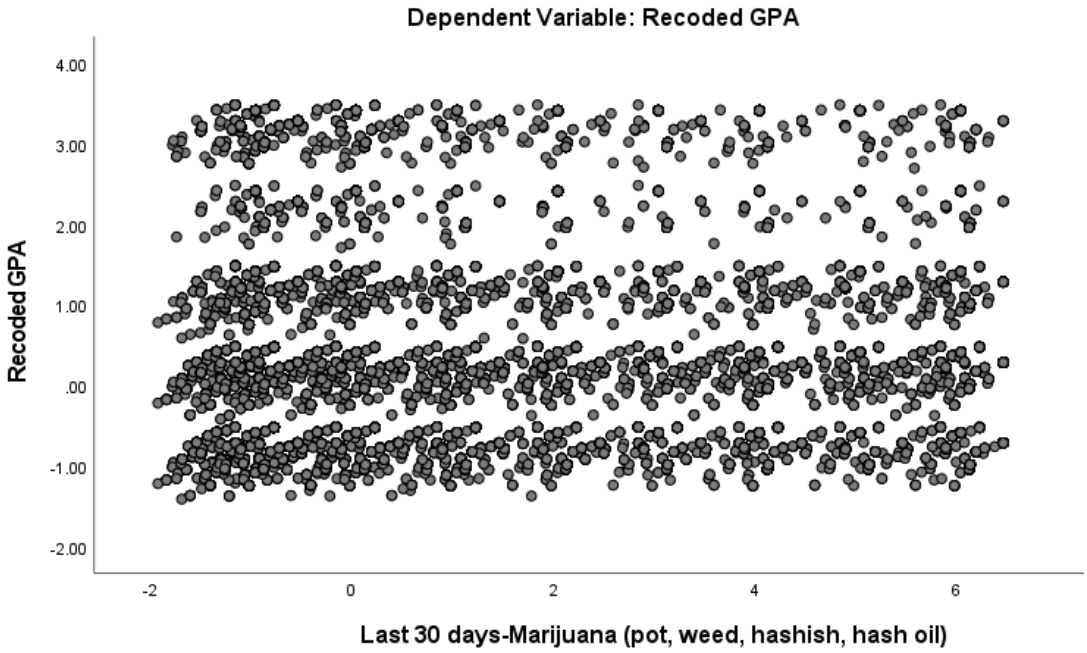
rendered from testing being significant, a relationship between marijuana use and GPAs exists. A future study with more variables, such as study marijuana type (Indica, Sativa, CBD, CBG), time, study time, and sleep time, would help researchers better determine and identify other variables that may play more significant roles in influencing the GPAs of undergraduate female students. Additionally, a study that includes males will render valuable data about the impact of marijuana use and other variables on GPAs in undergraduate universities.

Data Cleaning and Assumptions

SPSS was utilized to filter the data for female-only cases. After filtering for female subjects, only cases in which the respondent was female were utilized for testing. Assumption testing was also conducted, and all eight assumptions were met. The homoscedasticity assumption was met (Figures 1-8). The data values were spread out evenly and could not be predicted. The assumption of linearity was met (Figure 9), and a negative relationship was identified. SPSS also identified missing cases and excluded them from the study. The data were filtered to include only women. Stratified sampling was utilized to isolate the necessary variables for testing because it allows researchers to examine groups based on specific characteristics. Descriptive statistics were used to identify outliers, and no outliers existed. The data was cleaned after obtaining the data from the American College Health Association – National College Health Association **(**ACHA-NCHA).

Figure 1

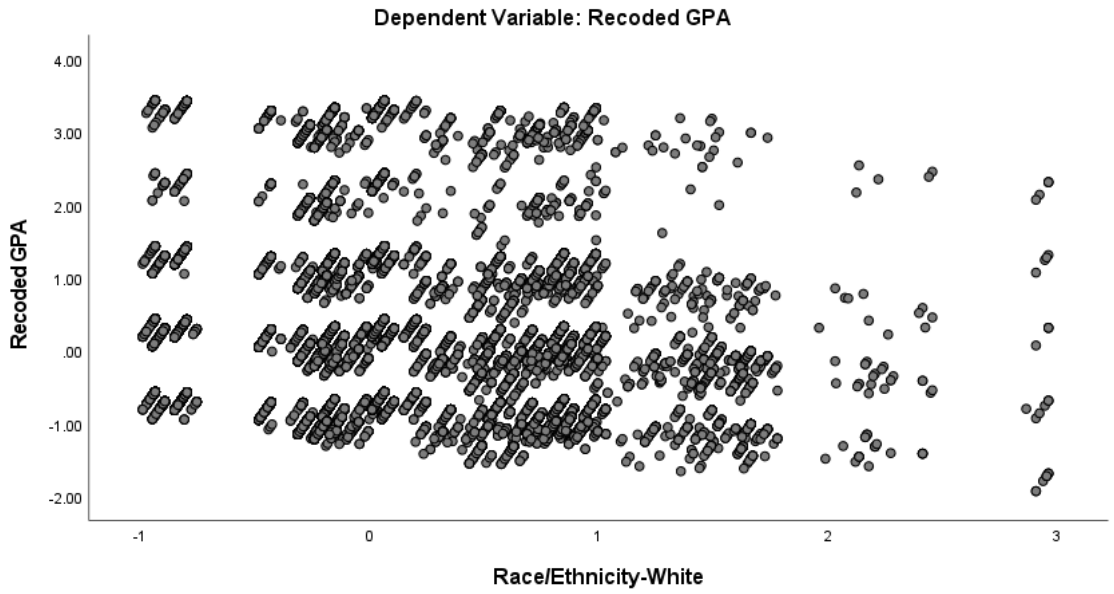
Partial Regression Plot 1



Note: Figure 1 indicates that homoscedasticity exists. The dependent and independent variable data values were spread out evenly and could not be predicted. *Source:* Author's analysis of the undergraduate females who participated in the ACHA-NCHA yearly survey (Fall '15-Spring '19).

Figure 2

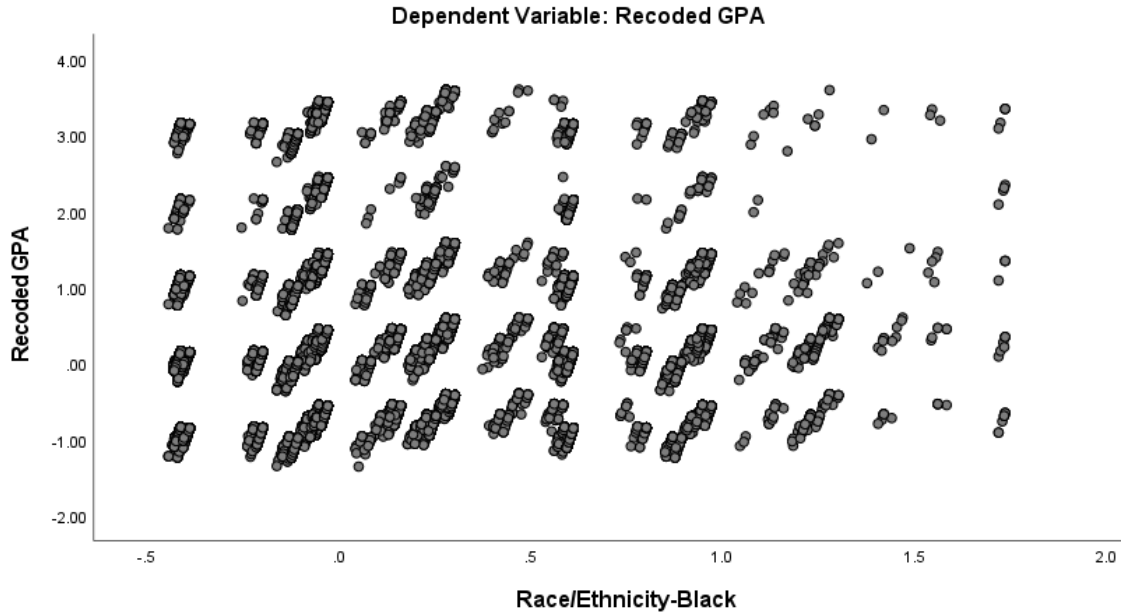
Partial Regression Plot 2



Note: Figure 2 *i*ndicates that homoscedasticity exists. The dependent and independent variable data values were spread out evenly and could not be predicted. *Source:* Author's analysis of the undergraduate females who participated in the ACHA-NCHA yearly survey (Fall '15-Spring '19).

Figure 3

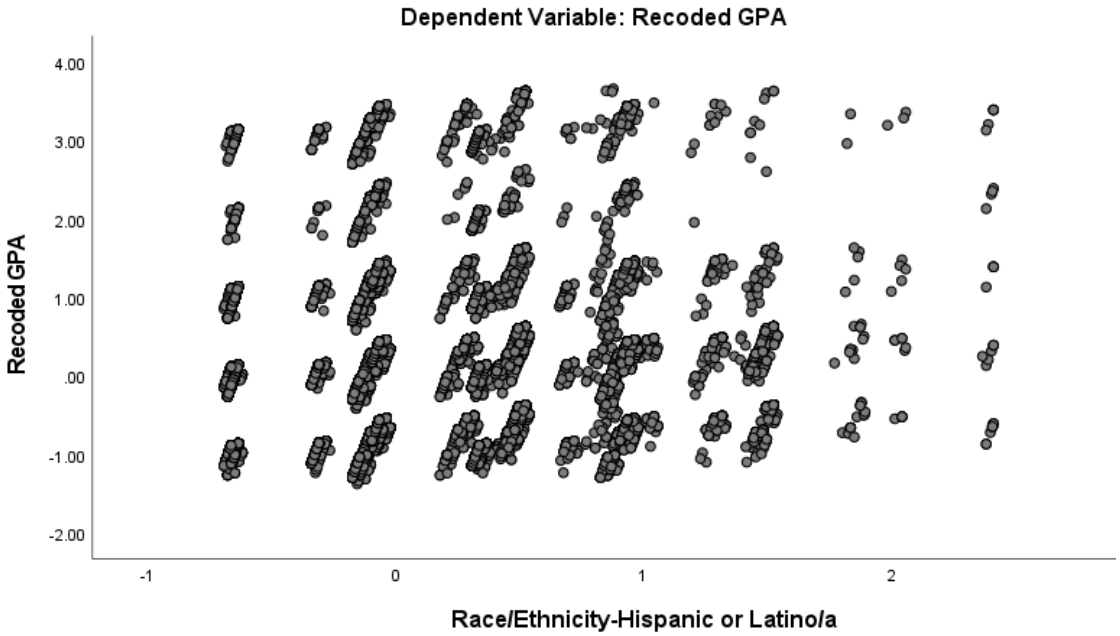
Partial Regression Plot 3



Note: Figure 3 indicates that homoscedasticity exists. The dependent and independent variable data values were spread out evenly and could not be predicted. *Source:* Author's analysis of the undergraduate females who participated in the ACHA-NCHA yearly survey (Fall '15-Spring '19).

Figure 4

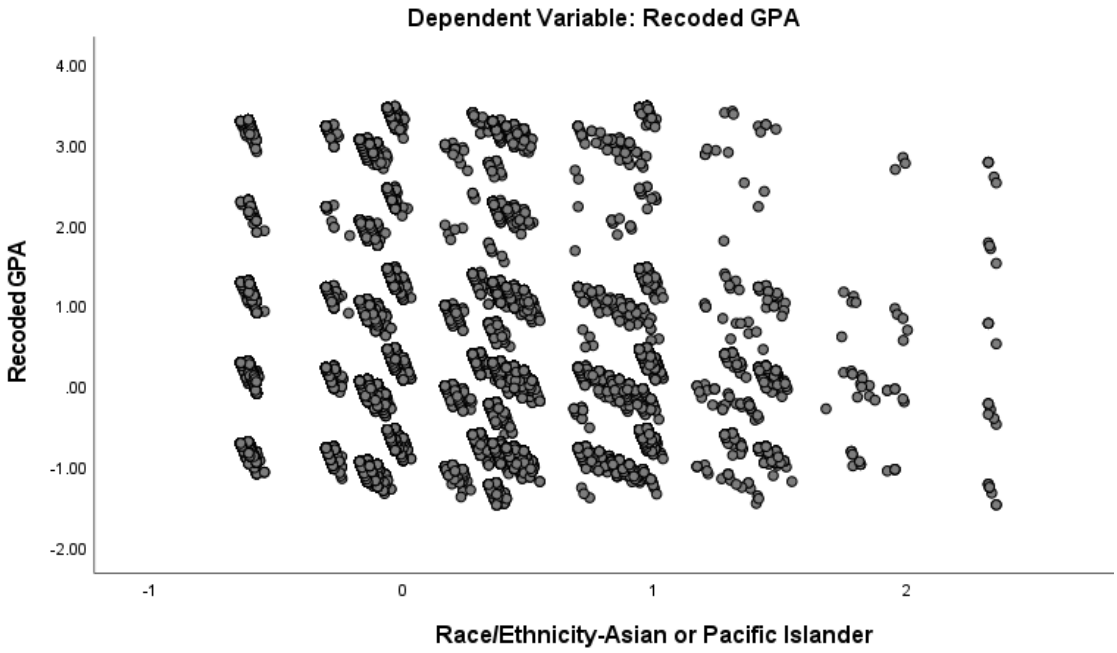
Partial Regression Plot 4



Note: Figure 4 indicates that homoscedasticity exists. The dependent and independent variable data values were spread out evenly and could not be predicted. *Source:* Author's analysis of the undergraduate females who participated in the ACHA-NCHA yearly survey (Fall '15-Spring '19).

Figure 5

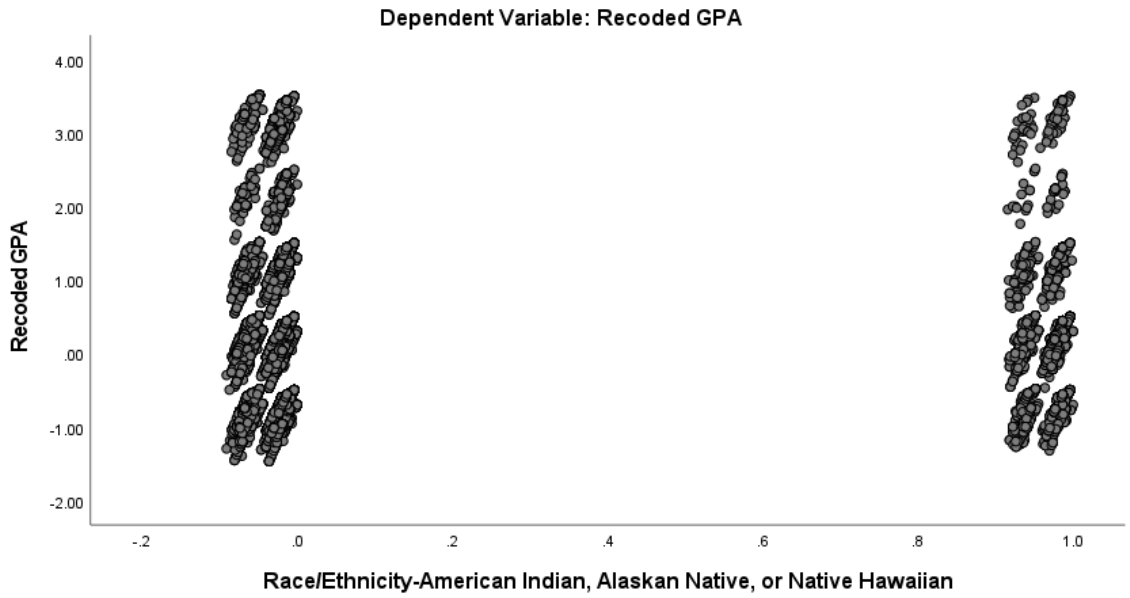
Partial Regression Plot 5



Note: Figure 5 indicates that homoscedasticity exists. The data values for the dependent and independent variables were spread out evenly and could not be predicted. *Source:* Author's analysis of the undergraduate females who participated in the ACHA-NCHA yearly survey (Fall '15-Spring '19).

Figure 6

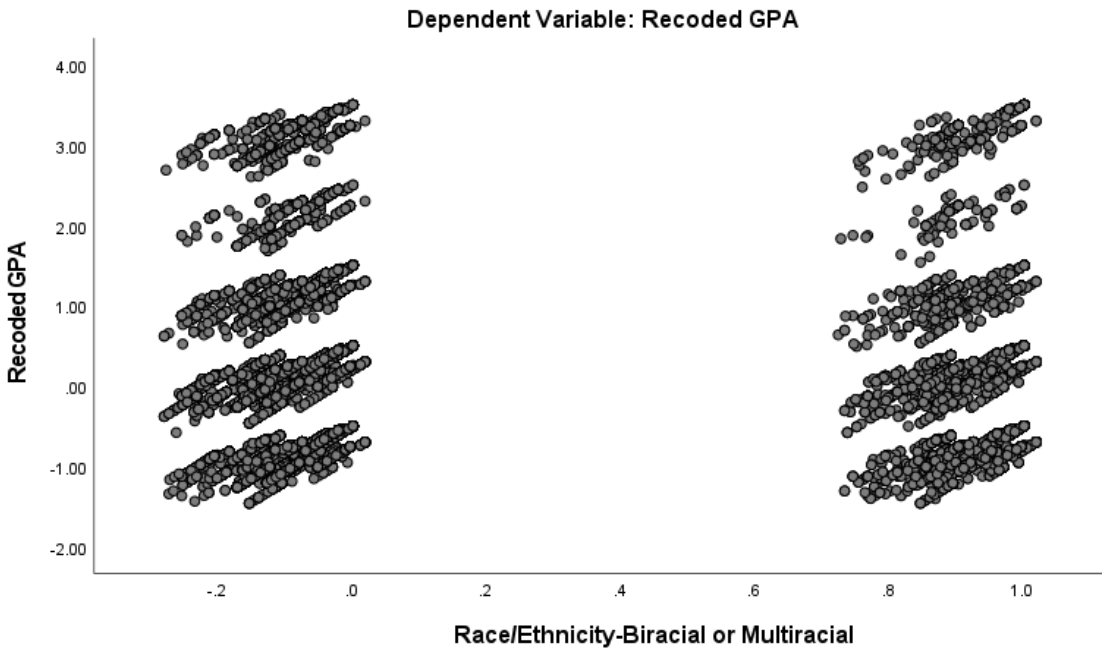
Partial Regression Plot 6



Note: Figure 6 indicates that homoscedasticity exists. The dependent and independent variable data values were spread out evenly and could not be predicted. *Source:* Author's analysis of the undergraduate females who participated in the ACHA-NCHA yearly survey (Fall '15-Spring '19).

Figure 7

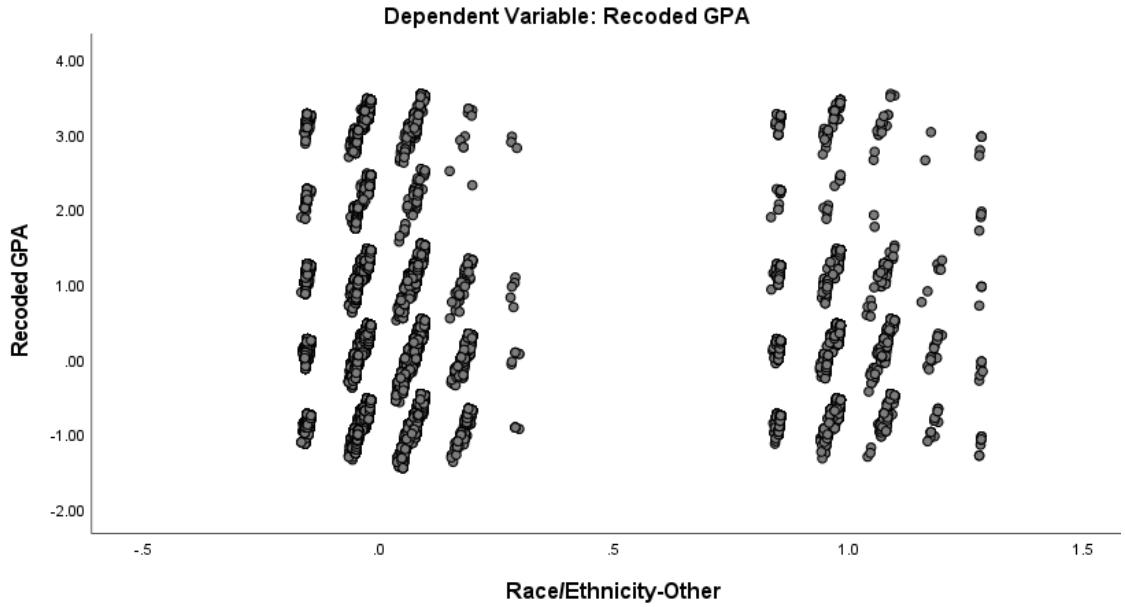
Partial Regression Plot 7



Note: Figure 7 indicates that homoscedasticity exists. The dependent and independent variable data values were spread out evenly and could not be predicted. *Source:* Author's analysis of the undergraduate females who participated in the ACHA-NCHA yearly survey (Fall '15-Spring '19).

Figure 8

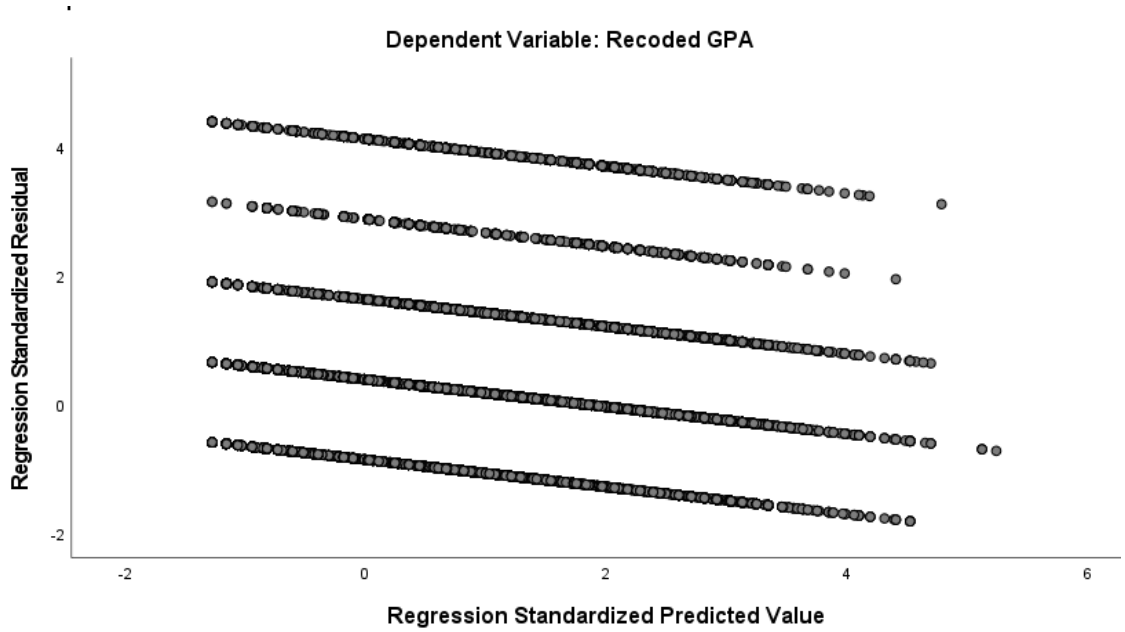
Partial Regression Plot 8



Note: Figure 8 indicates that homoscedasticity exists. The dependent and independent variable data values were spread out evenly and could not be predicted. *Source:* Author's analysis of the undergraduate females who participated in the ACHA-NCHA yearly survey (Fall '15-Spring '19).

Figure 9

Scatterplot



Note: Figure 9 indicates that the assumption of linearity was met. A negative relationship was identified.
Source: Author's analysis of the undergraduate females who participated in the ACHA-NCHA yearly survey (Fall '15-Spring '19).

Results

Crosstab Analysis

When examining the variables Approximate GPA (A, B, C, D, DF, and N/A), Race/Ethnicity (Black, American Indian, Alaskan Native, or Native Hawaiian, Hispanic or Latino/a, Biracial or Multiracial, Asian or Pacific Islander, White, and other), and Last 30 days Marijuana (pot, weed, hashish, hash oil) (Never used, Have used, but not in last 30 days, 1-2 days, 3-5 days, 6-9 days, 10-19 days, 20-29, Used daily), crosstab analysis indicated that A's and B's were the most achieved GPA across each race when examining Last 30 days Marijuana (pot, weed, hashish, hashish oil) usage rates (N=285985). Crosstab analysis also indicated that D/F's were the least achieved GPA across each race

when examining Last 30 days' Marijuana (pot, weed, hashish, hashish oil) usage rates. C's were the third most achieved GPA across each race when examining Last 30 days Marijuana (pot, weed, hashish, hashish oil) usage rates. B's were the most achieved GPA across each race when examining Last 30 days Marijuana (pot, weed, hashish, hashish oil) usage rates of daily users. Finally, A's were the most achieved GPA across every race except Black, Hispanic or Latino/a, and American Indian, Alaskan Native, or Native Hawaiian females when examining Last 30 days Marijuana (pot, weed, hashish, hashish oil) usage rates of those who have never used marijuana.

Undergraduate white females represented the most significant portion of the sample population (N=190,827). Crosstab analysis shows that overall A's (51.4%), followed by B's (40.5%), and C's (6.2%) were the most achieved GPA by white female undergraduate students. Crosstab analysis also indicated that B's, as opposed to A's, were the most achieved GPA, except for users who Never used, Have used but not in last 30 days, and users who used 1-2 days ago. When examining GPAs and Last 30 days Marijuana (pot, weed, hashish, hashish oil) usage rates, crosstab analysis also indicated that daily users (N=4740) had the most significant number of individuals to achieve a GPA of D/F (0.9%) when compared to other users. When examining GPAs and Last 30 days Marijuana (pot, weed, hashish, hashish oil) usage rates, crosstab analysis also indicated that those who Never used (N=109,730), when compared to other users, had the most significant number of individuals to achieve a GPA of A (54.5%).

Hispanic or Latino/a undergraduate females represented the second largest portion of the sample population (N=42,933). Crosstab analysis shows that overall, B's (51.2%),

followed by A’s (30%), and C’s (15%) were the most achieved GPA by Hispanic or Latino/a undergraduate female students. Additionally, crosstab analysis indicated that B’s, as opposed to A’s, were the most achieved GPA for all user types. When examining GPAs and Last 30 days Marijuana (pot, weed, hashish, hashish oil) usage rates, crosstab analysis also indicated that Daily users (N=1157), when compared to other users, had the most significant number of individuals to achieve a GPA of D/F (1.9%). When examining GPAs and Last 30 days' Marijuana (pot, weed, hashish, hashish oil) usage rates, crosstab analysis also indicated that those who Never used (N=25,561), when compared to other users, had the most significant number of individuals to achieve a GPA of A (31.5%).

Asian or Pacific Islander undergraduate females represented the third largest portion of the sample population (N=39,344). Crosstab analysis shows that overall A's (47.8%), followed by B's (41.0%), and C's (7.4%) were the most achieved GPA by Asian or Pacific Islander undergraduate female undergraduate students. Crosstab analysis indicated that B's, as opposed to A's, were the most achieved GPA except for users who Never used or Have used but not in the last 30 days. When examining GPAs and Last 30 days' Marijuana (pot, weed, hashish, hashish oil) usage rates, crosstab analysis also indicated that Daily users (N=381), when compared to other users, had the greatest number of individuals to achieve a GPA of D/F (1.6%). When examining GPAs and Last 30 days' Marijuana (pot, weed, hashish, hashish oil) usage rates, crosstab analysis also indicated that those who Never used (N=28,448), when compared to other users, had the most significant number of individuals to achieve a GPA of A (50.6%).

Black undergraduate females represented the fourth largest portion of the sample population (N=17,115). Crosstab analysis shows that overall, B's (49.4%), followed by A's (28.6%), and C's (16%) were the most achieved GPA by black undergraduate female students. Crosstab analysis indicated that B's, as opposed to A's, were the most achieved GPA by all user types. When examining GPAs and Last 30 days Marijuana (pot, weed, hashish, hashish oil) usage rates, crosstab analysis also indicated that individuals who used marijuana in the past 6 – 9 days (N=386), when compared to other users, had the most significant number of individuals to achieve a GPA of D/F (3.1%). When examining GPAs and Last 30 days, Marijuana (pot, weed, hashish, hashish oil) usage rates crosstab analysis also indicated that those who Never used (N=10,573), when compared to other users, had the most significant amount of individuals to achieve a GPA of A (30.9%).

Biracial or Multiracial undergraduate females represented the fifth largest portion of the sample population (N=14,176). Crosstab analysis shows that overall, B's (45.1%), followed by A's (41.3%), and C's (10.1%) were the most achieved GPA by biracial or Multiracial undergraduate female students. Crosstab analysis indicated that B's, as opposed to A's, were the most achieved GPA except for users who Never used marijuana. When examining GPAs and Last 30 days Marijuana (pot, weed, hashish, hashish oil) usage rates, crosstab analysis also indicated that Daily users (N=559), when compared to other users, had the most significant number of individuals to achieve a GPA of D/F (2.7%). When examining GPAs and Last 30 days Marijuana (pot, weed, hashish, hashish oil) usage rates, crosstab analysis also indicated that those who Never used (N=7,279),

when compared to other users, had the most significant number of individuals to achieve a GPA of A (45.2%).

American Indian, Alaskan Native, or Native Hawaiian undergraduate females represented the sixth largest portion of the sample population (N=5,847). Crosstab analysis shows that overall, B's (48.1%), followed by A's (35.8%), and C's (12.7%) were the most achieved GPA by American Indian, Alaskan Native, or Native Hawaiian undergraduate female students. Crosstab analysis indicated that B's, as opposed to A's, were the most achieved GPA for all user types. When examining GPAs and Last 30 days' Marijuana (pot, weed, hashish, hashish oil) usage rates, crosstab analysis also indicated that Daily users (N=233), when compared to other users, had the most significant number of individuals to achieve a GPA of D/F (2.1%). When examining GPAs and Last 30 days Marijuana (pot, weed, hashish, hashish oil) usage rates, crosstab analysis also indicated that those who Never used (N=3,043), when compared to other users, had the greatest number of individuals to achieve a GPA of A (39.4%).

Those classified as Other undergraduate females represented the seventh largest portion of the sample population (N=6,626). Crosstab analysis shows that overall A's (43.1%), followed by B's (42.7%), and C's (9.2%) were the most achieved GPA by females classified as Other undergraduate female students. Crosstab analysis indicated that B's, as opposed to A's, were the most achieved GPA for all user types. When examining GPAs and Last 30 days' Marijuana (pot, weed, hashish, hashish oil) usage rates, crosstab analysis also indicated that Daily users (N=222), when compared to other users, had the most significant number of individuals to achieve a GPA of D/F (1.8%).

When examining GPA's and Last 30 days Marijuana (pot, weed, hashish, hashish oil) usage rates crosstab analysis also indicated that those who Never used (N=4,232), when compared to other users, had the greatest number of individuals to achieve a GPA of A (45.5%).

Multiple Linear Regression Test

To examine if a relationship exists between lower GPAs and marijuana use, the dependent variable (GPA) and independent variables (Race/Ethnicity-Other, Last 30 days-Marijuana (pot, weed, hashish, hash oil), Race/Ethnicity-Black, Race/Ethnicity-American Indian, Alaskan Native, or Native Hawaiian, Race/Ethnicity-Hispanic or Latino/a, Race/Ethnicity-Biracial or Multiracial, Race/Ethnicity-Asian or Pacific Islander, Race/Ethnicity-White, and other) were measured using Multiple Linear Regression testing. Results of the model summary (Table 3) indicate the following: 0.043 represents the R Square value which suggests that 4.3% of the variance in the dependent variable (GPA) can be predicted from the independent variables (Race/Ethnicity-Other, Last 30 days-Marijuana (pot, weed, hashish, hash oil), Race/Ethnicity-Black, Race/Ethnicity-American Indian, Alaskan Native, or Native Hawaiian, Race/Ethnicity-Hispanic or Latino/a, Race/Ethnicity-Biracial or Multiracial, Race/Ethnicity-Asian or Pacific Islander, Race/Ethnicity-White) which is low. Based on the low R Square value (R Square = 4.3%), other variables such as marijuana type, study time, socioeconomic factors, years of usage, and other variables may have a stronger relationship and impact on the GPAs of undergraduate female students on university campuses in the United States. The value of the Adjusted R Square is 0.043 (4.3%)

Table 3

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.207[a]	.043	.043	.80219	.043	1603.565	8	285976	.000	1.925

Note. The value of the Adjusted R Square is 0.043 (4.3%)

The Anova table (Table. 4) indicates 8 df (degrees of freedom). The table also indicated a Sig. Value of .000, which is lower than the 0.05 alpha level, concluding that the independent variables reliably predict the dependent variable GPA. The results indicated that the variables account for significant variance in the female undergraduate GPAs. The overall regression model was statistically significant and a good fit, $F(8, 285, 976) = 1{,}603.57$, $p<0.05$, $R^2 = .043$. The independent variables as a group can be used to predict female undergraduate GPAs.

Table 4

ANOVA Table

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8255.248	8	1031.906	1603.565	.000[b]
	Residual	184027.658	285976	.644		
	Total	192282.906	285984			

Notes. P<0.05

The coefficient table (Table 5) indicated p values less than the alpha value set at the standard of 0.05. Testing, however, did identify a p-value of 0.04 for the independent variable Race/Ethnicity, Biracial or Multiracial. Testing indicated that all independent

variables are predictors of the GPAs of female undergraduate students. Each independent variable accounts for a significant amount of unique variance in the GPAs of undergraduate female students. Each variable accounts for a specific amount of variance in GPAs of female undergraduate students that the other variables do not. The results of the test are statistically significant.

Table 5

Coefficients

	Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
Model	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	1.719	.005		314.325	.000	1.708	1.730					
Last 30 days-Marijuana (pot, weed, hashish, hash oil)	.036	.001	.071	38.485	.000	.034	.038	.068	.072	.070	.990	1.010
Race/Ethnicity-White	-.200	.005	-.115	-38.634	.000	-.211	-.190	-.158	-.072	.071	.377	2.654
Race/Ethnicity-Black	.254	.007	.074	34.003	.000	.240	.269	.106	.063	.062	.715	1.399
	.201	.006	.087	36.329	.000	.190	.211	.133	.068	.066	.579	1.728
Race/Ethnicity-Asian or Pacific Islander	-.057	.006	-.024	-9.503	.000	-.069	-.045	.005	-.018	-.017	.523	1.910

Race/Ethnicity-American Indian, Alaskan Native, or Native Hawaiian	.122	.011	.020	11.088	.000	.100	.143	.028	.021	.020	.993	1.007
Race/Ethnicity-Biracial or Multiracial	-.020	.007	-.005	-2.869	.004	-.034	-.006	.025	-.005	-.005	.968	1.033
Race/Ethnicity-Other	.042	.010	.008	4.020	.000	.021	.062	.021	.008	.007	.932	1.073

Notes. All p values were less than the alpha value set at the standard of 0.05. Testing, however, did identify a p-value of 0.04 for the independent variable Race/Ethnicity, Biracial or Multiracial.

Summary

After analyzing the data using a multiple linear regression test, I rejected the null hypothesis (Marijuana use has not had a significant effect on undergraduate female GPAs). The following results were yielded after testing:

The coefficient table (Table 5) indicates that a one-unit increase in Last 30 days-Marijuana (pot, weed, hashish, hash oil) results in a .036 increase in the dependent variable GPA. The findings are significant at .000. The null hypothesis can be rejected because .000 < p-value .05. The coefficient table (Table 5.) indicates that a one-unit increase in Last 30 days-Marijuana (pot, weed, hashish, hash oil) results in a .200 decrease in the dependent variable GPA for females who are Race/Ethnicity-White. The findings are significant at.000 The null hypothesis can be rejected because .000 < p-value .05. The coefficient table indicates that a one-unit increase in Last 30 days-Marijuana (pot, weed, hashish, hash oil) results in a .254 increase in the dependent variable GPA for females who are Race/Ethnicity-Black. The null hypothesis can be rejected because .000

< p-value .05. The coefficient table (Table 5.) indicates that a one-unit increase in Last 30 days-Marijuana (pot, weed, hashish, hash oil) results in a .201 increase in the dependent variable GPA for females who are Race/Ethnicity-Hispanic or Latino/a. The null hypothesis can be rejected because .000 < p-value .05. The coefficient table (Table 5) indicates that a one-unit increase in Last 30 days-Marijuana (pot, weed, hashish, hash oil) results in a .057 decrease in the dependent variable GPA for females who are Race/Ethnicity-Asian or Pacific Islander. The findings are significant at .000. The null hypothesis can be rejected because .000 < p-value .05. The coefficient table (Table 5) indicates that a one-unit increase in Last 30 days-Marijuana (pot, weed, hashish, hash oil) results in a .122 increase in the dependent variable GPA for females who are Race/Ethnicity-American Indian, Alaskan Native, or Native Hawaiian. The findings are significant at .000. The null hypothesis can be rejected because .000 < p-value .05. The coefficient table indicates that a one-unit increase in Last 30 days-Marijuana (pot, weed, hashish, hash oil) results in a .020 decrease in the dependent variable GPA for females who are Race/Ethnicity-Biracial or Multiracial. The findings are significant at .004. The null hypothesis can be rejected because .000 < p-value .05. The coefficient table indicates that a one-unit increase in Last 30 days-Marijuana (pot, weed, hashish, hash oil) results in a .042 increase in the dependent variable GPA for females who are Race/Ethnicity-other. The findings are statistically significant at .000. The null hypothesis can be rejected because .000 < p-value .05.

Overall testing showed significant relationships between the independent variables as a group or individually and the GPAs of undergraduate female students.

Testing results indicated that each variable contributes a unique variance when predicting the GPAs of undergraduate female students. Of the independent variables, all independent variables had a positive relationship with the dependent variable except the independent variable, Ethnicity/Race-White. Overall, B's were the most prevalent GPA across all user types and races. F's were the least achieved grade across all user types. Multiple linear regression tests identified that the model was a good fit for testing. Significant relationships were identified both individually and as a group. The implications of the findings will be discussed further in *Chapter 5*. I will elaborate further on the purpose of my research, recommendations, and what social change implications can be gathered from the study.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

My research examined the relationship between marijuana use and academic GPAs of undergraduate female students, exploring whether marijuana use contributed to the GPAs of undergraduate African American females, which traditionally rank near the bottom. The study examined secondary data from the American College Health Association-National College Health Association (ACHA-NCHA) and was obtained from the ACHA-NCHA yearly survey (fall 2015-spring 2019). The first step of the data collection process was completing and submitting a data use permission letter. I was granted access and permission to utilize the data on January 7, 2022. After analyzing the data using multiple linear regression testing, the analysis demonstrated a significant relationship between marijuana use and GPAs of undergraduate females.

Interpretation of the Findings

Limited studies exist related to the analysis of the relationship between marijuana use and academic achievement, specifically GPAs; findings from studies have yielded similar and differing results. A Washington State University cross-sectional study conducted by Cowan et al. (2017) and a 2018 national survey on drug use and health (U.S. Department of Health and Human Services, 2018) indicated that marijuana usage rates of females had increased significantly. Adumene (2018), Cowan et al. (2017), and Ensminger and Green (2006) focused on use, not education outcomes, and did not discuss significant relationships between marijuana use and academic achievement. My research

extended knowledge in the discipline by further examining the relationship between marijuana use and the GPAs of female undergraduate students by race.

Marijuana Usage Frequency and Undergraduate Female GPAs

Studies such as Adumene (2018), Arria et al. (2015), Cadigan et al. (2018), Cowan et al. (2017), Ensminger and Green (2006), and Marwaha and Patel (2020), though limited, have yielded significant results related to the relationship between academic success and marijuana use by undergraduate female students. The results of my research indicated that marijuana use is a significant predictor of GPA. Consistent with results from Adumene (2018), Cowan et al. (2017), and Ensminger and Green (2006), my research results, which focused primarily on undergraduate female students, indicated that daily marijuana users across all races were more likely to achieve a GPA of D/F. In contrast, non-users were most likely to achieve a GPA of A.

Studies, including Arria et al. (2015), Cadigan et al. (2018), and Marwaha and Patel (2020), have illustrated how marijuana use affects cognitive abilities, cannabis usage disorder, usage rates, academic achievement, and college student graduation rates. Consistent with the results above, my research indicated that, with marijuana use being utilized as the predictor of undergraduate GPAs of females, daily users were most likely to achieve a GPA of D/F. When examining daily users, my results also indicated that, overall, A grades were achieved mainly by White (51.4%) undergraduate females and were least achieved by most African American (28.6%) females. A GPA of F was achieved mainly by African American females (3.1%) and least by White (0.9%) female undergraduate students. My research also identified that African American females had

the most significant number of undergraduate female students to achieve a GPA of D/F (3.1%).

My research extended knowledge in the discipline by further examining the relationship between marijuana use and GPAs of female undergraduate students by race and by providing information that identified a significant relationship between marijuana use and GPAs of undergraduate female students. The study indicated that marijuana use is a significant predictor of GPAs; however, other variables should be considered. The study's findings further indicated that marijuana use is associated with lower GPAs and that marijuana use may negatively impact the success and achievement of undergraduate female students of all races, more so undergraduate African American females.

Limitations of the Study

The primary strength of my research was that it was large and conducted using a population representative of the undergraduate female population. The sample data was collected from yearly surveys conducted by the ACHA-NCHA. Despite these benefits, generalization issues exist. Since this is the first study of its kind, it is essential to note that population discrepancies exist. For one, all colleges in the United States did not participate in the study, and population discrepancies at the universities that participated existed during the study. For example, males were excluded from the study, ages were not considered when looking at the sample population, and populations at each institution differed, which was another generalization issue. Access to data was limited during the study. There is also a lack of data about marijuana use and its effects on GPAs at the collegiate level. The data may have been biased, being that it was self-reported data.

Epidemiological factors, which could serve as variables, such as alcohol use, other drug use, marijuana use start date, study time, sleep, and other possible predictor variables, were not utilized in the study; however, other relationships may exist and may be more significant predictors of GPAs of undergraduate females than marijuana use. Future studies adding more predictors may yield direct results that may benefit marijuana policy in the US.

Crosstabs and multiple linear regression techniques were used to assess the data. Though the method yielded significant data, other techniques may also yield significant data. The hypothesis of the study, developed from examining self-reported data, yielded results of the study that were interpreted for the study's context and a deeper understanding of the impacts of marijuana use on GPAs; however, results may be interpreted in other manners.

Recommendations

A large sample representative of the female undergraduate population was used to examine the effects of the predictor variable, marijuana use, on the GPAs of undergraduate female students. The study failed to identify female students who fall within the traditional age range of undergraduate female students. To improve the study, including the traditional age ranges (18-25) of undergraduate students as a variable to examine more thoroughly those female students who are classified as undergraduate students may lead to more significant findings. Another recommendation to improve the study is to identify if the student used alcohol or other drugs. With alcohol being one of the top two substances used by college students, alcohol use combined with marijuana

use may be identified as a significant predictor of undergraduate GPAs of female students. Focusing specifically on states where marijuana has been legalized may benefit a future study by rendering results that may help researchers identify if legalization impacts use, thus negatively impacting the GPAs of undergraduate female students. In addition to adding alcohol and other drugs as predictors of undergraduate GPAs, utilizing predictor variables such as study time, marijuana usage duration, sleep time, socioeconomic status, years of usage, parents' usage history, reasons for use, and other factors that have been noted to affect academic success may also benefit future studies. Further experimental studies are needed to assess better the impact of marijuana use on undergraduate GPAs and academic achievement.

Implications

The results yielded from my research can strengthen social change while providing significant information that may inform and direct policy developers and undergraduate female marijuana users. Social change implications include helping policymakers, and university stakeholders, i.e., teachers, city leaders, parents, and the student body determine if there is a need for intervention programs aimed at marijuana use by young adults at the collegiate or high school level. Implementing such programs may act as deterrents or provide significant information regarding how to use when to use, and the effects of marijuana use on the increasing population of undergraduate female marijuana users. Additionally, my research may inform policymakers and university stakeholders if there is a need for marijuana intervention programs on college campuses where marijuana legalization statutes exist. With marijuana use continuing to

climb amongst the undergraduate female population and as marijuana legalization policy acceptance continues to increase across the US, more research is needed to examine and identify possible negative and positive ramifications of legalization on academic achievement. My research may help researchers determine policy direction while identifying weaknesses that may have contributed to African American women underachieving in undergraduate institutions.

Conclusion

Limited studies have attempted to identify and examine the effects and impacts of marijuana use on academic success. My research examined the effects of marijuana use on undergraduate female students by race. The study identified marijuana use as a significant predictor of the GPAs of undergraduate female students. A large sample representative of the undergraduate female population was used to examine the hypothesis developed during the study. Usage rates and GPAs were self-reported and may be biased. A variety of variables could have been added to render results that may be more significant than the yielded results based on interpretations of the study. My research adds to the existing literature by providing significant data about the relationship between usage rates and GPAs of undergraduate female students and possibly by helping users better understand the potential impacts and effects of marijuana use while enrolled in undergraduate studies.

References

Adkins, R. B., Ashbrrok, T. E., Brookshire-Green, M., Mitchell, J., Pertl, E. A., Salvador, S., & Wilkins, K. (2018). College students' perceptions and use of marijuana. *Symposium of Undergraduate Research and Creative Expression (SOURCE)*. 669. https://scholar.valpo.edu/cus/669

Adumene, K. (2018). Female students of color in higher education. *Community Engagement Student Work.* 9. https://scholarworks.merrimack.edu/soe_student_ce/9

Agaku, I., King, A. B., Lavinghouze, R., Odani, S., Soura, D. B., & Tynan, A. M. (2019). Tobacco and marijuana use among us colleges and noncollege young adults, 2012-2016. *Pediatrics*, *144*(6), e20191372. https://doi.org/10.1542/peds.2019-1372

Alas, H., & Hansen, C. (2021, October 7). Where is marijuana legal? A guide to marijuana legalization. *U.S. News.* https://www.usnews.com/news/best-states/articles/where-is-marijuana-legal-a-guide-to-marijuana-legalization

Allen, K. H., Arria, M. A., Beck, H. K., Lilly, F., & Vincent, B. K. (2019). Graduate degree completion: Association with alcohol and marijuana use before and after enrollment. *Addictive Behaviors Reports*, (9). https://doi.org/10.1016/j.abrep.2018.100156

American Psychological Association. (2021). Cognitive ability. In *apa.org dictionary.* Retrieved from https://dictionary.apa.org/cognitive-ability

Archibald, P., Benjamin, T., Parker, J. L., and Thorpe, J. R. (2016). The association

between marijuana usage and discrimination among adult men. *American Journal of Men's Health, (11)*2, 435-442. https://journals.sagepub.com/doi/epub/10.1177/1557988316664896

Arria, M. A., Bugbee, A. B., Caldeira, M. K., O' Grady, E. K., & Vincent, B. K. (2015). The academic consequences of marijuana use during college. *Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors, 29*(3), 564-575. https://doi.org/10.1037/adb0000108

Aslanzadeh, F., Austad, C. S., Meda, S. A., Dager, A., Fallahi, C., Gueorguieva, R. V., Hawkins, K., Leen, S., Pearlson, G. D., Pittman, B., Raskin, S., Rosen, R. R., Tennen, H., Wood, R. M. (2017). Longitudinal influence of alcohol and marijuana use on academic performance in college students. *PloS one, 12*(3), e0172213. https://doi.org/10.1371/journal.pone.0172213

Aston, R. E., Gunn, L. R., Jackson, M. K., Sokolovsky, W. A., & White, R. H. (2020). Complex cannabis use patterns: Associations with cannabis consequences and cannabis use disorder symptomatology. *Addictive Behaviors, 105*. https://doi.org/10.1016/j.addbeh.2020.106329

Baodis, I., & ManKillop, J. (2018). Cannabis use disorder. In W. Costain & R. Laprairie (Eds). *Recent Advances in Cannabinoid Research.* IntechOpen. https://doi.org/10.5772/intechopen.80344

Bennet, J. C. & Howlett, M. (1992). The lessons of learning: Reconciling theories of policy learning and policy change. *Policy Sciences, 25*, 275-294. https://www.sfu.ca/~howlett/documents/16845049.pdf

Bolin, M. R., McClintock, J., & Pate, M. (2017). The impact of alcohol and marijuana use on academic achievement among college students. *The Social Science Journal, 54*(4), 430-437. https://doi.org/10.1016/j.soscij.2017.08.003

Borcherding, J. M. (2016). Marijuana use among community college students: A study of academic and social involvement. *Culminating Projects in Higher Education Administration, 7.* https://repository.stcloudstate.edu/hied_etds/7

Brad, T. K., Hoyle, H. R., Swartz, S. M., and Wu, L. (2015). Perceived cannabis use norms and cannabis use among adolescents in the United States. *Journal of Psychiatric Research, 64,* 79-87. https://doi.org/10.1016/j.jpsychires.2015.02.022

Braun, D., Fuglister, K., Gilardi, F., & Luyet, S. (2007). Ex pluribus unum: Integrating the different strands of policy diffusion theory. In: Holzinger, K., Jörgens, H., Knill, C. (eds) *Transfer, Diffusion und Konvergenz von Politiken*. VS Verlag für Sozialwissenschaften. https://doi.org/10.1007/978-3-531-90612-6_2

Brenan, M. (2020). Support for legal marijuana inches up to new high of 68%. *Gallup.* https://news.gallup.com/poll/323582/support-legal-marijuana-inches-new-high.aspx

de Brey, C., Branstetter, C., Diliberti, M., McFarland, J., Musu, L., Wang, X., Wilkinson – Flicker, S., & Zhang, A. (2019). Status and trends in the education of racial and ethnic groups 2018 (NES 2019-038). *U.S. Department of Education*. Washington DC: National Center for Education Statistics. Retrieved from https://nces.ed.gov/pubs2019/2019038.pdf

Britannica, T. Editors of Encyclopedia (2021). Cannabis. In *Encyclopedia Britannica*.

https://www.britannica.com/plant/cannabis-plant

Cadigan, M. J., Dworkin, E. R., Lee, C. M., & Ramirez, J. J. (2018). Patterns of alcohol use and marijuana use among students at 2 - and 4 - year institutions. *Journal of American College Health: J of ACH*, 67(4), 383–390. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6320719/

Cairney, P. (n.d.). Chapter 12 policy learning and transfer: Can it be 'evidence based'. *Understanding Public Policy: Theories and Issues 2nd Edition.* https://paulcairney.files.wordpress.com/2019/03/chapter-12-policy-transfer-learning-upp-2nd-ed-9.3.19.pdf

Calabrese, J. E. & Casillas-Rubio, A. (2018). Biphasic effects of thc in memory and cognition. *European Journal of Clinical Investigation, (48)*5. https://onlinelibrary.wiley.com/doi/full/10.1111/eci.12920

Chan, S. (2001). Complex adaptive systems. *ESD.83 Research Seminar in Engineering Systems* https://web.mit.edu/esd.83/www/notebook/Complex%20Adaptive%20Systems.pdf

Chen, X., Chen, X., Yan, H., & Yu, B. (2020). Marijuana legalization and historical trends in marijuana use among US residents aged 12-25: Results from the 1979-2016 national survey on drug use and health. National Survey on drug use and health. *BMC Public Health* 20, 156. https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-020-8253-4

Chiang, A. C-I., Jhangiani, R., & Price, C. P. (n.d.). Research Methods in Psychology 2nd

Canadian Edition. *Research Methods in Psychology 2nd Canadian Edition. BCcampus*. https://opentextbc.ca/researchmethods/chapter/correlational-research/

Chou, P., Hasin, S. D., Kerridge, T. B., Pickering, R., and Saha, D. T. (2018). DSM-5 cannabis use disorder in the national epidemiologic survey on alcohol and related conditions- III: Gender-specific profiles. *Addictive Behaviors*, 76, 52-60 https://www.sciencedirect.com/science/article/pii/S0306460317302721?via%3Dihub

Coco, B. M. (2017). Factors that predict marijuana use and grade point averages among undergraduate college students. *ProQuest Number: 10606744* https://www-proquest-com.ezp.waldenulibrary.org/docview/1970057201?fromopenview=true&pq-origsite=gscholar

Colorado.gov. (2012). Amendment 64. *State of Colorado*. https://www.google.com/url?sa=t&source=web&rct=j&url=https://www.colorado.gov/pacific/sites/default/files/13%2520Amendment%252064%2520LEGIS.pdf&ved=2ahUKEwj_5a-N27HvAhWRdc0KHX0IBbgQFjABegQIAxAG&usg=AOvVaw2_J4ysmp4G_EwU5X7ayIXT

Conboy, L., Prasad, T., & Taylor–Swanson, L. (2019). Complex adaptive systems theory and inter-rater reliability: Proposed answers to challenging questions. *The Journal of Alternative and Complementary Medicine*, 2019 25:11, 1074-1076. https://www.liebertpub.com/doi/full/10.1089/acm.2019.0307

Corns, S., Goldschild, J., & Gude, V. (2021). SoS explore application with fuzzy-genetic algorithms to assess an enterprise architecture – a healthcare case study. *Procedia Computer Science*, 185, 55-62. https://reader.elsevier.com/reader/sd/pii/S1877050921010851?token=875C0223449A51824151D24CF89ABF20F78E86DDB6D500E9D313454F1965023ACB49F17475459DC9BCA2B3651493F133&originRegion=us-east-1&originCreation=20221022024627

Corporate Finance Institute. (2021). Cluster Sampling. *Corporate Finance Institute*. https://corporatefinanceinstitute.com/resources/knowledge/other/cluster-sampling/

Cousijn, J., Kroon, E. & Kuhns, L. (2021). The short – term and long – term effects of cannabis on cognition: Recent advances in the field. *Current Opinion in Psychology*, 38, 49-55.https://doi.org/10.1016/j.copsyc.2020.07.005

Cowan. W. B., Miller, M. A., & Rosenman, R. (n.d.). Marijuana legalization and college student use: Early evidence. *SSM - Population Health*, 3, 649-657. https://www.sciencedirect.com/science/article/pii/S2352827317300125

Daniel, E. (2016). The usefulness of qualitative and quantitative approaches and methods in researching problem–solving ability in science education curriculum. *Journal of Education and Practice*, 7, 15. https://files.eric.ed.gov/fulltext/EJ1103224.pdf

Dolowitz, D & Marsh, D. (1996) Who learns what from whom: A review of the policy transfer literature. *Political Studies*, 44, 343-357. https://onlinelibrary.wiley.com/doi/full/10.1111/j.1467-9248.1996.tb00334.x

Dundar, A, Huie, F., Hwang, Y., A., Nathan, A., Shapiro, D., Wakhungu, P., & Yuan, X.

(2017). A national view of student attainment rates by race and ethnicity – fall 2010 cohort. *National Student Clearinghouse Research Center*. https://nscresearchcenter.org/wp-content/uploads/Signature12-RaceEthnicity.pdf

Dunlop, A. C., & Radaelli, M. C. (2018). The lessons of policy learning: types, triggers, hinderances, and pathologies. *Policy & Politics*, 46(2), 255-72 https://core.ac.uk/download/pdf/195307412.pdf

Dunlop, A. C., Radalli, M. C., & Trein, P. (2018). Chapter 1 introduction: The family tree of policy learning. In *Learning in Public Policy: Analysis, Modes and Outcomes* https://www.philipptrein.com/wp content/uploads/2018/01/Intro_book.pdf

Egan, L. T., Reboussin, A. B., Spangler, J., Suerken, K. C., Sutfin, L. E., Wagoner, G. K., & Wolfson, M. (2016). Marijuana use and trajectories and outcomes among college students. *Drug and Alcohol Dependence*, 162, 137–145. http://doi.org/10.1016/j.drugalcdep.2016.02.041

Ensminger, E. M. & Green, M. K. (2006). Adult social behavioral effects of heavy adolescent marijuana use among African Americans. *Developmental Psychology*, 42(6), 1168 – 1178. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5784847/

Finn, K.V. (2012). Marijuana use at school and achievement-linked behaviors. *The High School Journal* 95(3), 3-13. doi:10.1353/hsj.2012.0005.

Fisher, S. T. (2018). Students attitudes toward marijuana legalization and law enforcement. In *Learning in Public Policy: Analysis, Modes, and Outcomes*. https://ir.ua.edu/bitstream/handle/123456789/3668/file_1.pdf?sequence=1&isAllowed=y

Flemming, CB., Haggerty, KP., Hanson, K., Mason, WA., & Ringle, JL. (2015), Washington State recreational marijuana legalization: Parent and adolescent perceptions, knowledge, and discussions in a sample of low–income families. *Substance Use & Misuse*, 50(5), 541–545. https://www.ncbi.nlm.nih.gov/pubmed/25671633

Frey, B. B. (2018). Cluster sampling. *The SAGE Encyclopedia of Educational Research, Measurement, and Evaluation*, 299, SAGE Publications, Inc. https://methods.sagepub.com/reference/the-sage-encyclopedia-of-educational-research-measurement-and-evaluation/i4962.xml

Gabrys, R. & Porath, A. (2019), Clearing the smoke on cannabis regular use and cognitive functioning. *Canadian Centre on Substance Use and Addiction*. https://www.ccsa.ca/sites/default/files/2019-04/CCSA-Cannabis-Use-Cognitive-Effects-Report-2019-en.pdf

Geyer, A. M., Minassian, A., Perry, W., Pocuca, N., Walter, J. T., & Young, W. J. (2020). The effects of cannabis use on cognitive function in healthy aging: A systematic scoping review. *Archives of Clinical Neuropsychology : The Official Journal of The National Academy of Neuropsychologists, 36*(5), 673–685. https://academic.oup.com/acn/advance-article/doi/10.1093/arclin/acaa105/5960018

Gur, C. R., Jones, D. J., Moore, M. T., Rosen, F. G. A., Scott, C. J., & Slomiak, T. S. (2018). Association of cannabis with cognitive functioning in adolescents and young adults a systematic review and meta – analysis. *JAMA psychiatry, 75*(6),

585–595. doi:10.1001/jamapsychiatry.2018.0335

Hasin, S. D., Sarvet, L. A., & Shmulewitz, D. (2019). Time trends in U.S. cannabis use and cannabis use disorders overall and by sociodemographic subgroups: A narrative review and new findings. *The American Journal of Drug and Alcohol Abuse, 45*(6), 623–643. https://doi.org/10.1080/00952990.2019.1569668

Hartney, E. (2020). Characteristics of recreational marijuana use. *VeryWell Mind*. https://www.verywellmind.com/recreational-marijuana-use-22302#:~:text=Recreational%20marijuana%20use%20involves%20using,symptoms%20of%20some%20medical%20conditions.

The Health Dynamic Institute (2021). Complex adaptive system. *Human Systems Dynamic Institute*. https://www.hsdinstitute.org/resources/complex-adaptive-system.html

The Health Foundation. (2010). Evidence scan: Complex adaptive systems. *The Health Foundation.* https://www.health.org.uk/sites/default/files/ComplexAdaptiveSystems.pdf

Jones, J., Jones, N. K., & Peil, J. (2018). The impact of the legalization of recreational marijuana on college students. *Addictive Behaviors,* (77), 255-259, https://doi.org/10.1016/j.addbeh.2017.08.015

Johnston, M., Shrivastava, A., & Tsuang, M. (2011). Cannabis use and cognitive dysfunction. *Journal of Psychiatry*, *53*(3), 187–191. https://doi.org/10.4103/0019-5545.86796

Kam, D. C., and Mikos, A. R., (2019). Has the “M” word been framed? Marijuana,

cannabis, and public opinion. *PLoS ONE 14*(10): e0224289. https://doi.org/10.1371/journal.pone.0224289

Kerr, C. W. & Subbaraman, S. M. (2016). Marijuana policy opinions in washington state since legalization: Would voters vote the same way?. *Contemporary Drug Problems, 43*(4), 369–380. https://doi.org/10.1177/0091450916667081

Libassi, C. (2018). The neglected college race gap: Racial disparities among college completers. *Enter for American Progress.* https://www.americanprogress.org/issues/education-postsecondary/reports/2018/05/23/451186/neglected-college-race-gap-racial-disparities-among-college-completers/

Marijuana Policy Project. (2021). The impact of legalization in Colorado. *Marijuana Policy Project*. https://www.mpp.org/issues/legalization/regulationworks/

Mandelbaum, E. D. & de le Monte, M. S., (2017). Adverse structural and functional effects of marijuana on the brain: Evidence reviewed. Pediatric *Neurology, 66*, 12-20. https://www.sciencedirect.com/science/article/pii/S0887899416304787

Marwaha, R and Patel, J. (2020). Cannabis Use Disorder. Treasure Island (FL): *StatPearls Publishing*. https://www.ncbi.nlm.nih.gov/books/NBK538131/#_NBK538131_pubdet_

Merriam-Webster. (n.d.). Decriminalization. In *https://www.merriam-webster.com/*. https://www.merriam-webster.com/dictionary/decriminalize

Merrium-Webster. (n.d.). Marijuana. In *https://www.merriam-webster.com/*. https://www.merriam-webster.com/dictionary/marijuana

Moyson, S., Scholten, M., & Weible, M. C. (2017). Policy Learning and Policy Change: Theorizing Their Relations from Different Perspectives. *Policy and Society, 36*(2), 166-177. http://doi.org//10.1080/14494035.2017.1331879

McCombes, S. (2019). An introduction to sampling methods. *Scribbr.* https://www.scribbr.com/methodology/sampling-methods/

May, J. P. (1992). Policy learning and failure. *Journal of Public Policy, 12* (4). https://www.jstor.org/stable/4007550?seq=3#metadata_info_tab_contents

Moyson, S. & Scholten, P. (2018). Theories on policy learning: Existing approaches and future challenges. Preprint. https://dial.uclouvain.be/pr/boreal/object/boreal%3A189419/datastream/PDF_01/view

Moyson, S., Scholten, M., & Weible, M. C. (2017). Policy learning and policy change: Theorizing their relations from different perspectives. *Policy and society, 36*(2), 166-177. http://doi.org//10.1080/14494035.2017.1331879

National Center for Drug Abuse Statistics. (2019) Marijuana addiction: Rates and usage statistics. *National Center for Drug Abuse Statistics*. https://drugabusestatistics.org/marijuana-addiction/

National Center for Education Statistics. (2019). Indicator 23: Postsecondary graduation rates. *National Center for Education Statistics*. https://nces.ed.gov/programs/raceindicators/indicator_red.asp

National Center for Education Statistics. (2020). College Enrollment Rates. *National Center for Education Statistics*. https://nces.ed.gov/programs/coe/pdf/coe_cpb.pdf

National Conference of State Legislatures. (2021). Cannabis overview. *National Conference of State Legislatures*. https://www.ncsl.org/research/civil-and-criminal-justice/marijuana-overview.aspx

National Conference of State Legislatures. (2020a). Marijuana overview. *National Conference of State Legislatures*. https://www.ncsl.org/research/civil-and-criminal-justice/marijuana-overview.aspx

National Conference of State Legislatures. (2020b). State medical marijuana laws. *National Conference of State Legislatures*. https://www.ncsl.org/research/health/state-medical-marijuana-laws.aspx

National Institute on Drug Abuse. (2020a). Marijuana report: How does marijuana use affect school, work, and social life. *National Institute on Drug Abuse*. https://www.drugabuse.gov/publications/research-reports/marijuana/how-does-marijuana-use-affect-school-work-social-life

National Institute on Drug Abuse. (2020b). Vaping & cannabis trends among young adults (19-22). *National Institute on Drug Abuse*. https://www.drugabuse.gov/drug-topics/trends-statistics/infographics/vaping-cannabis-trends-among-young-adults-19-22

National Institute on Drug Abuse. (2019). Marijuana use at historic highs among college-age adults. *National Institute on Drug Abuse*. https://www.drugabuse.gov/news-events/news-releases/2019/09/marijuana-use-at-historic-highs-among-college-age-adults

Oregon State University. (2020). College students use more marijuana in states where it's

legal, but they binge drink less. *Science Daily*. https://www.sciencedaily.com/releases/2020/01/200113131637.htm

Rose, R. (1991). What is lesson drawing? Journal of public policy. *Journal of Public Policy, 11*(1), 3-30. doi:10.1017/S0143814X00004918

Sherburne, M. (2018). Marijuana use among US college students remains at highest level in three decades. *Institute for Social Research, The University of Michigan*, 454. http://www.monitoringthefuture.org//pubs/monographs/mtf-vol2_2017.pdf

Swartz, M. S., Wu, L., & Zhu, H. (2016). Trends in cannabis use disorders among racial/ethnic population groups in the United States. *Drug and Alcohol Dependence, 165*, 181-190 https://doi.org/10.1016/j.drugalcdep.2016.06.002

The Hamilton Project. (2017). A distribution of undergraduate students, by type of institution. *The Hamilton Project*. https://www.hamiltonproject.org/charts/age_distribution_of_undergraduate_students_by_type_of_institution#:~:text=While%20the%20plurality%20of%20students,over%20the%20age%20of%2024.

The Journal of Blacks in Higher Education. (2019). The gender gap in African American educational attainment. *The Journal of Blacks in Higher Education*. https://www.jbhe.com/2019/03/the-gender-gap-in-african-american-educational-attainment-2/

The University of Southern California. (2021). Organizing your social sciences research paper. *The University of Southern California*. https://libguides.usc.edu/writingguide/quantitative

University of Rochester Medical Center. (2021). Understanding the teen brain. In *University of Rochester Health Encyclopedia*. https://www.urmc.rochester.edu/encyclopedia/content.aspx?ContentTypeID=1&ContentID=3051

U.S. Department of Health and Human Services. (2018). 2018 National survey on drug use and health: African Americans. *Substance Abuse and Mental Health Services Administration.* https://www.samhsa.gov/data/sites/default/files/reports/rpt23247/2_AfricanAmerican_2020_01_14_508.pdf

U.S. Department of Justice. (2017). What you should know about marijuana use among college students. *United States Drug Force Agency*. https://www.campusdrugprevention.gov/sites/default/files/Marijuana%20Use%20among%20College%20Students%20%28Final%29%20%285-23-17%29.docx.pdf

U.S. Department of Justice. (2018). Preventing marijuana use among youth & young adults. *United States Drug Force Agency*. https://www.dea.gov/sites/default/files/2018-07/DEA-Marijuana-Prevention-2017-ONLINE.PDF

Washington State Liquor and Cannabis Board. (2020). Know the law. *Washington State Liquor and Cannabis Board*. https://lcb.wa.gov/mj-education/know-the-law