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THE CORRELATIONS OF MARIJUANA USE AND DEPRESSION FROM ADOLESCENCE
TO YOUNG ADULTHOOD

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ABSTRACT

What comes first, marijuana use or depression? This thesis examines marijuana use and depression in adolescence and their associations with subsequent marijuana use and depression in young adulthood. Previous literature suggests alternative hypotheses for how marijuana usage and depression co-occur over time. The present study will use the public-use dataset from the National Longitudinal Study of Adolescent to Adult Health (Add Health). Waves I (adolescents) and III (young adults) are merged for the analyses. I control for race, gender, and educational achievement in adolescence and also examine the potential moderating role of race. The results suggest; (1) using marijuana as an adolescent increases the likelihood of becoming depressed as a young adult when one was not already battling depression. (2) being depressed as an adolescent increases the likelihood of marijuana use as a young adult when one was not previously using marijuana. (3) as time goes on, the relationship between marijuana use and depression grows weaker. (4) in certain circumstances there are differences in the results when dividing by race. This thesis seeks to further research in mental health and self-medication in order to help the youth.

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Chapter 1

Introduction

Emile Durkheim once said that we have to look at the past to understand the present (Durkheim, 2019). In our country, depression rates have been on the rise for years. In the United States, major depressive disorder is the leading cause of disability for ages 15 to 44 (ADAA, 2018) and depression rates are reaching crisis levels. Depression can also lead to other serious health issues, such as excessive weight gain or obesity (Mayo Clinic, 2018), heart disease (Kotz, 2007), and immune system response difficulties. Depression not only affects physical health, but also has an impact on emotional health, causing people to develop anxiety issues, panic disorders, or even social phobia (Mayo Clinic). Due to differences in treatment availability, the impacts of depression may also fall disproportionately on minority and disadvantaged populations (Alegria et al., 2015).

At the same time that depression rates have increased, the number of individuals using marijuana in America has also risen. The amount of people using marijuana has increased from 5.1 million in 2005 - 2007 to 8.1 million in 2013 (Brandt, 2017). A major reason for this increase is that the stigma associated with marijuana has shifted from being perceived as a horrible drug to something people use to relax or cope. Changing perceptions of marijuana have corresponded with changing marijuana policies over the last few decades. Between 1914 and 1925, 26 states passed laws prohibiting marijuana plants (CCNH-Highlights, 2018). Marijuana

was typically smoked by people in the lower class, minority groups, and immigrants. Due to political officials, society quickly began associating marijuana users with murderers and just overall cruel people. The government once associated heinous crimes with marijuana use (CCNH-Highlights, 2018). In 1970, under President Nixon, congress passed the comprehensive drug abuse prevention and control act. This act placed marijuana in the most restrictive category of drugs. Then in 1980, President Reagan's administration took a strong and powerful stance against all drugs. They enacted drug prevention programs that targeted children and schools. This is when things such as D.A.R.E. began. In 1996, California became the first state to legalize medical marijuana. It did not take long before Washington D.C., Guam, and 22 other states followed. In 2014, Colorado became the first state to allow marijuana dispensaries to sell marijuana for recreational use (CCNH-Highlights, 2018), followed by Alaska, California, Nevada, Oregon, and Washington. Thirteen other states decriminalized small amounts of marijuana. Marijuana use has become more popular and accepted all over the country. In 2015, 53 percent of people said that they favor the legal use of marijuana, whereas in 2006, only 32 percent of people supported it (Pew Research Center, 2015). Millennials are the driving force behind this change. They support recreational marijuana use more than any other generation.

Both marijuana and depression have spiked in recent years, but how are these two phenomena connected? Many people have looked at substance abuse and its link to depression, but have not studied which precedes the other (Deykin, et al., 1987). Additionally, there is little research about the causal relationship between marijuana use and depression, or if this association is reciprocal (Degenhardt, et al., 2003). It is important to determine the relationship between marijuana use and depression in order to find the proper way to combat both.

Theories

Depression causes Marijuana use

There are several different theoretical perspectives that could possibly explain the correlation between marijuana use and depression. Some theories state that depression causes marijuana use, such as general strain theory. This theory states that people who are strained, which causes them to experience anxiety, depression, anger, etc., will resort to crime because it allows them to release negative emotions (Brezina, 2017). This theory suggests that someone who is experiencing depression will turn to drug use because it allows them to temporarily feel better (i.e., self-medication). General strain theory also states that the absence of positive opportunities and having negative life experiences create the feeling of depression at a young age. For example, going to a school that lacks funding and is located in a bad area may result in a child feeling sad. These feelings of depression then can result in the adolescent attempting to self-medicate with substances such as marijuana. The Health Services Research journal published that many individuals who are battling mental illness find themselves abusing illicit drugs, mostly marijuana (American Addiction Centers). Many of these people are not getting the proper help and marijuana provides a temporary fix. The stress, or strain, that is created from difficulties in life can then result in negative emotions within the individual (Agnew and White, 1992). This strain makes it more likely that these individuals will experience depression. These negative emotions creates a sense of pressure for corrective action (Agnew and White, 1992). Adolescents may try to manage their negative emotions though marijuana use since it allows them a temporary fix. In sum, general strain theory posits that strain causes depressive symptoms, which in turn cause marijuana use.

Marijuana use Causes Depression

Other theories find that marijuana use leads to depression. An example would be life course theories within criminology. Life course theory focuses on the connection between life events and the actions of an individual as they continue to age. This theory suggests that using marijuana as an adolescent results in poor outcomes that leads to depression in young adulthood. Researchers have found that marijuana use in adolescence is associated with an increased rate of depression and suicidal behaviors (Fergusson, et. All 2002). Using marijuana as an adolescent is correlated with numerous negative outcomes as one continues to age. The primary one being, if one gets caught with marijuana they may face charges and fines. They will have the charge on their record, which may result in guild, shame, and lost opportunities. Those who start using marijuana earlier than their peers are likely to have lower psychological wellbeing later on in life (Green and Riter, 2000). Additionally, adolescents may not immediately realize the affect that marijuana has on their mental health, but the impact could grow as they continue to age. There have been arguments that marijuana use affects adult mental health because it limits the positive transitional process to adulthood (Green and Riter, 2000). Using marijuana makes it harder to grow into a full functioning adult who achieves conventional milestones. Marijuana creates more obstacles in life than the average person has to face. Marijuana starts to make things difficult in adolescence, then those difficulties transform into something greater in adulthood. Studies show that early marijuana users achieve less in high school (Green and Riter, 2000). Education is linked with adult occupational status. Higher education results in higher occupational status and those both are associated with lower depression rates (Green and Riter, 2000). Therefore, if people are using marijuana, then they are achieving less in high school academically, meaning that when they are older they will have less job satisfaction. Low levels of job satisfaction can

result in depression as an adult. Another monumental step into adulthood is marriage. Studies show that early marijuana users are less likely to be married than those who do not use marijuana at all. Marriage is associated with heightened mental health (Green and Riter, 2000). Good mental health means lower levels of depression (Green and Riter, 2000). In sum, using marijuana at an early age may create barriers that raise the likelihood of depression as an adult.

Marijuana use and Depression Occur Simultaneously

There are limitations with both the general strain theory and life course theory explanations of the depression-marijuana link. Prior researchers often do not examine longitudinal data, meaning that they did not use data that followed the subjects for long periods of time. This limits causal interpretations because you cannot determine if one variable causes another when only analyzing them for a brief period of time. Also, most prior research relies on older samples and thus is out-of-date. The research is typically from the 1990s and early 2000s. Due to the way marijuana was looked at during those times the findings may not generalize to today. An increase in marijuana use and depression may happen simultaneously. Social learning theory can help explain how this could happen. This theory states that criminal behavior is learned through the observation of others and an individual's surroundings (Akers, 1990). The individual also begins to associate certain rewards and punishments with their behaviors. If an action has a reward, then the action is likely to continue. As stated earlier, more people are being diagnosed with depression and more people are using marijuana. Marijuana use has become normalized in our society. Although it is illegal on the federal level, some states have made recreational use legal and many states have decriminalized it. In the media today, it is popular to see people smoking marijuana as a way to get rid of stress. Relaxing the brain and smoking pot

seem to go hand-in-hand. Someone who is battling depression may see this as an outlet. It is so normalized and may possibly give them temporary relief. Many people with “underlying mental health conditions like depression may try to treat their symptoms with drug use” (The Recovery Village, 2018). People are attempting to self-medicate which may make their depression intensify. Marijuana impacts dopamine and GABA which could lead to an increase of psychological disorders. People who use marijuana more or have used it over a long period of time have increased depression rates (The Recovery Village, 2018). Therefore, if someone is depressed and self-medicating with marijuana overtime their depression increases. Not only will their depression increase, but so will their marijuana use. Just like any other drug, a tolerance will develop as an individual continues to use. “The body adapts to the presence of the drug and its effects are diminished” (American Addiction Centers, 2018). In order for someone to achieve the desired effects from a drug the individual will need to continue to increase the amount of it they use. As they increase their marijuana use their depression will continue to rise along with it.

Present Study

The focus of this study will be looking at both marijuana use and depression in adolescence and young adulthood. Identifying if depression in adolescence is associated with marijuana use in young adulthood or if marijuana use in adolescence is associated with depression in young adulthood can help find the appropriate responses for someone dealing with substance abuse and mental health issues. I will be focusing on four primary research questions; (1) is marijuana use in adolescence associated with an increase in depression in young adults beyond their depression level in adolescence? (2) is depression in adolescence associated with an

increase in marijuana use in young adulthood beyond their adolescent usage? (3) do marijuana use and depression levels increase simultaneously? and (4) is there a difference in the findings when dividing the sample by race?

My first focus is if depression in adolescence is associated with an increase of marijuana use in adulthood. Studies show that depression in adolescence is a strong predictor of eventual substance abuse (Diego et al., 2003). Depressive mood is an important factor in the use of other illicit drugs among adolescents who already use marijuana (Deykin et al., 1987). This suggests that teens are looking to self-medicate with marijuana, and that marijuana may act as a “gateway” for other drugs. Indeed, some research suggests that depression abates with the use of marijuana (Kandel and Yamacuchi, 1984) and that young people, particularly women, who use drugs such as marijuana are more likely to be prescribed mood-changing psychoactive drugs by physicians (Kandel and Yamacuchi, 1984). When marijuana is no longer strong enough, adolescents may also move on to something that is considered more dangerous. These substances help individuals relieve pain and/or help them experience or control their emotions (Khantzian, 1996). In sum, there is strong evidence that adolescent depression will lead to an increase in marijuana usage in adulthood.

My next research aim focuses on marijuana use in adolescence being associated with an increase in depression in adulthood. There is an association between early marijuana use and later depression when controlling for potential confounding variables (Degenhardt et al., 2003). Other studies found that substance abuse in general led to depression (Hallfors et al., 2004). Such results suggest that marijuana may increase the levels of depression within adolescent users as they age. Adolescent marijuana use also results in poor performance academically (Balka et al., 1999), and academic performance is directly associated with levels of happiness (Hartog and

Oosterbeek, 1998). Therefore, smoking marijuana as an adolescent can increase the chances of not being as happy as one's peers. Marijuana users also tend to have lower educational expectations, higher dropout rates, lower job expectations, higher levels of work dissatisfaction, and a greater likelihood of being fired (Hartog and Oosterbeek, 1998). Education and work satisfaction are associated with higher levels of happiness. Smoking marijuana reduces the chance of both being happy and being satisfied with work. In summary, using marijuana as an adolescent can result in an increase in depression levels as a young adult.

The third focus will be figuring out if an increase in marijuana use and depression occur at the same time. As an individual continues to use marijuana they will build up a tolerance, unless the user increases the amount. Tolerance means that the body has adapted to having marijuana in its system and does not react to its chemicals the same way (Addiction Blog, 2013). Smoking marijuana also increases depression levels. Marijuana appears to help ease depression until the chemicals wear off. Once the high is gone, marijuana may make depression worse (University of Washington, 2013). Marijuana only provides temporary relief from depression symptoms, but afterwards it ultimately makes depression worse. An individual may use more marijuana to deal with their depression, they then build up a tolerance which results in more marijuana use, and lastly their depression levels will increase because they are not getting the same relief from marijuana and they are dealing with the aftermath of using the marijuana.

The fourth focus of this study will be to test if the associations between marijuana and depression are moderated by race. A study that looked at adolescent depression scores found that depression among black youth declined more over a three-year period than they did for whites (Garrison et al., 1990). The same study found in general that blacks had higher depression scores than whites in adolescences and in adulthood (Garrison et al., (1990). Thus, although African

Americans' scores may have decreased more over time, this group still had higher depression levels throughout their lives. This could be due to multiple factors, including socio-economic issues, education, etc. Blacks show elevated depressive symptoms early in life when compared to whites (Adkins et al., 2009). When dividing by race, blacks may show a greater increase in those who used marijuana as an adolescent and it resulted in higher levels of depression as a young adult.

Chapter 2

Data and Methods

Study Population

I will be using data from the National Longitudinal Study of Adolescent to Adult Health (Add Health). Add Health researchers selected 80 schools out of a 26,666 sampling frame. From those 80 schools, 52 agreed to participate. In order to make up for the other 28 schools the researchers found high schools that were similar when sorting for eight variables: size, type, grade span, percent black, percent white, census region, census division, and level of urbanization. The researchers administered a questionnaire to students in seventh through twelfth grade throughout 80 school all over the United States during the 1994-1995 school year. They also oversampled for minority groups. The schools were required to have over 30 students and an eleventh grade. There were four waves of in-home interviews, Wave I was during 1995, Wave II was in 1996, Wave III was in 2001 – 2002, and Wave IV was in 2007 – 2008. I will be analyzing Waves I and III. The in-home interviews I will be looking at were completed in 1994 – 1995 and in 2001 – 2002. The study looked at respondents social, mental, and physical health thought out the entire time frame. The original sample size was 20,745 people. 10,480 of those students were girls and 10,265 of the respondents were boys. For my sample, I will only be using subjects who participated in Wave I and Wave III, were part the sample released for public use, and also had a valid sampling weight, lowering my sample size to 4,882 participants.

The first Wave's subjects were between the ages of 12 and 18 at the time of the survey. The median age for the sample during Wave I was 15.8 years. During Wave III, the participants

were between the ages 18 and 27, with a median age of 22 years. Both Waves contain information about the primary variables of interest to this study: respondents' depression level, race, gender, and drug use.

Dependent and Independent variables

Depression

Depression will be measured by a nine-question scale from the in-home interview. The questions asked the interviewee if he or she have experienced a certain symptom, where 0 = never or rarely, 1 = sometimes, 2 = a lot of the time, and 3 = most of the time or all of the time. The questions come from the Center for Epidemiological Studies Depression Scale (CES-D). CES-D is a "self-report measure of cognitive, affective, and physiological symptoms of depression" (Mendal et al., 2017). Originally in Wave I the respondents were asked 20 questions in order to gather their depression scores. I found the nine questions both Waves I and III had in common and created a smaller scale. The nine-item scale is just as accurate as the 20 item (Arcury et al., 2006). After the respondent answered the questions, a sum, ranging from 0 to 27, is created and that is the subject's depression score. Those who scored above 11 will be considered depressed (Nkansah-Amankra and Tettey, et al., 2015). Depression will then be coded to either "0" or "1". "0" will indicate that the person is not considered depressed and "1" indicating that the person is considered depressed.

Table 1: Descriptive Statistics for Depression Scores in Wave I (W1) and Wave III (W3)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
SMEAN(DepressionScoreW1)	4876	.00	25.00	5.6636	4.19896
SMEAN(DepressionScoreW3)	4876	.00	25.00	4.4729	4.03967
Valid N (listwise)	4876				

Marijuana

Marijuana use will be measured by looking at one specific question in Wave I and Wave III of the in-home interview. The respondents were asked several questions about their drug use, but I will be focusing on the one that asks how many times the respondent used marijuana within the last 30 days. Anything above “0”, that is not missing, will be coded as “1”. For this study purposes, the focus will become whether the respondent has used marijuana within the last 30 days or not, instead of how many times they may have used it. The “1” will indicate yes and “0” will indicate no, but they do use marijuana. For Wave I the value of “997” will indicate that the respondent has never tried marijuana. For Wave III the value of “9997” will indicate that the respondent has never tried marijuana. Those who have never tried marijuana will be coded as “0”. The number of people who answered “yes” in Wave I will be compared to the number of people who answered “yes” in Wave III.

Table 2: Frequency Distribution for Marijuana Use Wave I

PAST 30 DAYS USED MARIJUANA-W1					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	(0) No	4199	86.1	87.5	87.5
	(1) Yes	598	12.3	12.5	100.0
	Total	4797	98.4	100.0	
Missing	(996) Refused	36	.7		
	(998) Don't know	41	.8		
	(999) Not applicable	2	.0		
	Total	79	1.6		
Total		4876	100.0		

Table 3: Frequency Distribution for Marijuana Use Wave III

PAST 30 DAYS USED MARIJUANA-W3					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	(0) No	3798	77.9	78.2	78.2
	(1) Yes	1061	21.8	21.8	100.0
	Total	4859	99.7	100.0	
Missing	(9996) Refused	3	.1		
	(9998) Don't know	12	.2		
	(9999) Not applicable	1	.0		
	System	1	.0		
	Total	17	.3		
Total		4876	100.0		

Control Variables

Race

During Wave I the respondents were asked their race. They were given the option of choosing more than one answer. For the purpose of this study, the races will be separated into the following categories: “White”, “Black”, and “Other”. American Indian, Asian, and others will be grouped into one overall category titled “Other”. For those who marked more than one race I will look at the question that asked them to choose the overall race that they claim. Also, those who stated that they did not know their race and/or refused to answer will be included in the “Other” race category.

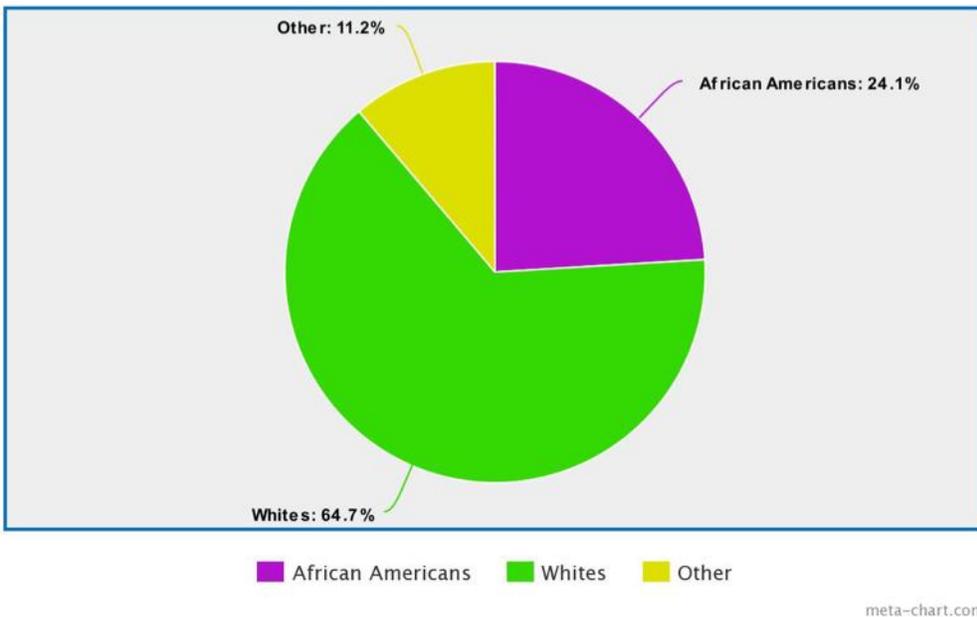


Figure 1: Racial Composition of Respondents

Education

In Wave I, the respondents had several questions to determine how well they were doing in school. The participants were asked what their most recent grades in English/language arts, mathematics, history, and science are. The possible grades received ranged from an A to an F. The grades will then be reversed coded, giving an “A” a score of four and giving an “F” a score of one. Using those scores, a grade point average, “GPA”, is calculated on a 4.0 scale by adding them all together and then dividing the total by four.

Table 4: Descriptive Statistic for Grade Point Averages

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
GPA	3715	1.00	4.00	2.8816	.73986
Valid N (listwise)	3715				

Gender

At the beginning of the in-home interview in both Waves, the interviewer was told to mark which race the respondent was and if they did not know they were told to ask. Everyone answered except one person who refused. Males will be coded as (0) and Females will be coded (1).

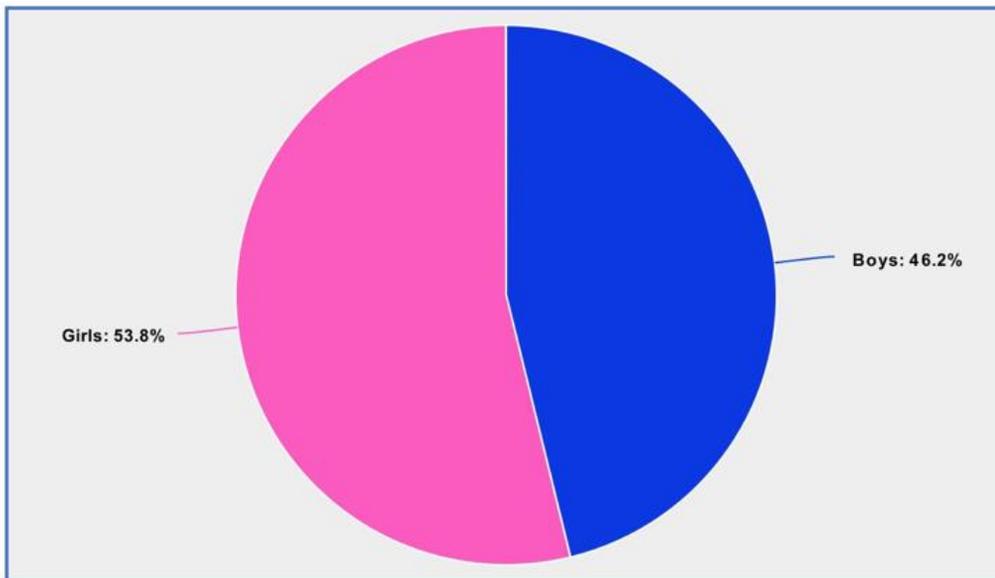


Figure 2: Gender Composition of Respondents

Overall Concept Map

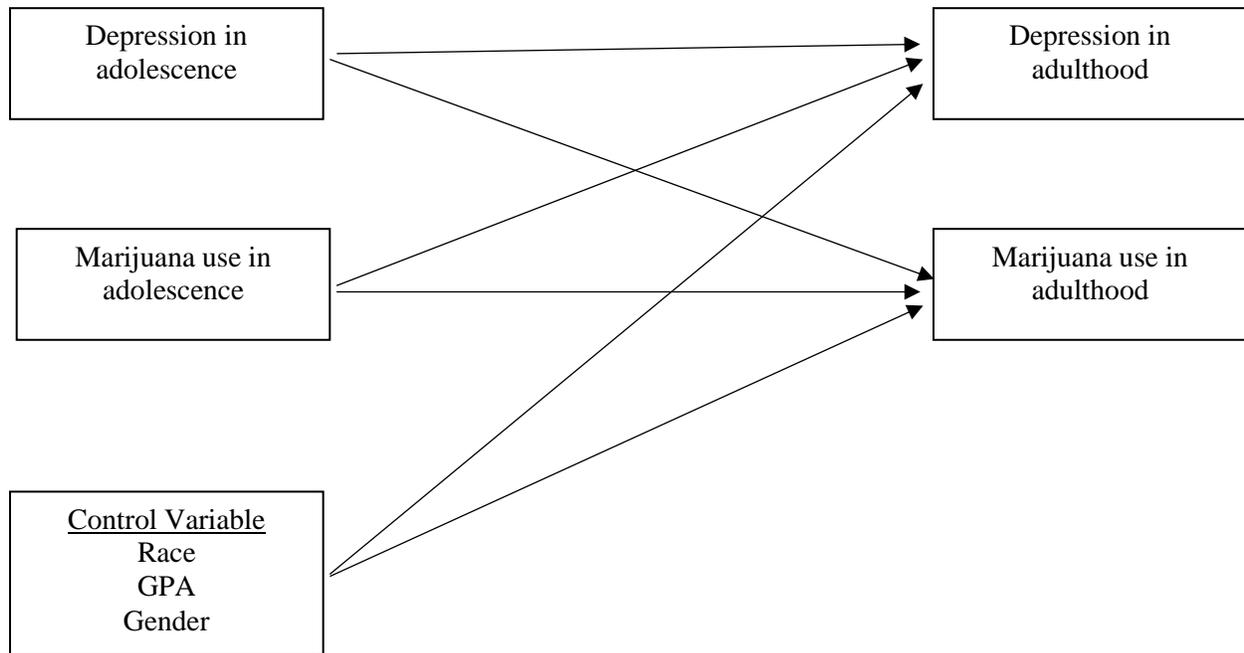


Figure 3: Conceptual Diagram

Chapter 3

Results

The first thing I did in order to analyze the data was create a correlation table which is found in Table 5. Correlation analyses helps determine if bivariate relationships are statistically significant and the strength of those relationships. The numbers range from -1 to 1. The correlation table shows that “Depression Wave I” and “Marijuana Wave I” use have a positive correlation of .122 that is significant at the $p < .01$ level. “Depression Wave III” and “Depression Wave I” also have a positive correlation, .197, that is significant at the $p < .01$ level. “Wave III Depression” and “Marijuana Wave I” have a positive correlation of .067 that is significant at the $p < .01$ level. “Marijuana Wave III” has a correlation of .03 with “Depression Wave I” and significant at the $p < .05$ level. “Marijuana Wave III” has a .244 correlation with “Marijuana Wave I” that is significant at the $p < .01$ level. “Marijuana Wave III” has a positive correlation of .048 with the significance of $p < .01$. The race category of “White” had a negative correlation with “Depression Wave I” ($-.06, p < .01$). It also displayed a correlation that was not significant with “Marijuana Wave I”. White also had a negative correlation with “Depression Wave III” ($-.052, p < .05$). Lastly, “White” had a positive correlation with “Marijuana Wave III” ($.066, p < .01$). The race category of “Black” had a positive correlation with “Depression Wave I” ($.043, p < .01$) and “Depression Wave III” ($.035, p < .05$) and a negative correlation with “Marijuana Wave I” ($-.044, p < .01$) and “Marijuana Wave III” ($-.043$). The race category of “Other” had a positive correlation with “Depression Wave I” ($.033, p < .05$), “Marijuana Wave I” ($.032, p < .05$), and “Depression Wave III” ($.033, p < .05$). The only negative correlation “Other” had was with “Marijuana Wave III” ($-.042, p < .01$). The next control variable was grade-point-average (GPA). “GPA” had negative correlations with “Depression Wave I” ($-.149, p < .05$), “Marijuana Wave I” ($-.17, p < .01$), “Depression Wave III” ($-.134, p < .05$), and “Marijuana Wave III” ($-.107, p < .01$). “GPA” had no positive correlation with any of my main variables. The final control variable was sex. Sex was coded as 0 being male and 1 being female, therefore female

would be the actual category being referenced. “Female” had a positive correlation with “Depression Wave I” (.127, $p < .01$) and “Depression Wave III” (.099, $p < .01$) and negative correlations with “Marijuana Wave I” (-.029, $p < .05$) and “Marijuana Wave III” (-.119, $p < .01$).

Table 5: Bivariate Correlations

	1	2	3	4	5	6	7	8	9
1. Depression Wave I	--								
2. Marijuana Wave I	.122**	--							
3. Depression Wave III	.197**	.067**	--						
4. Marijuana Wave III	.030*	.244**	.048**	--					
5. White	-.060**	.021	-.052**	.066**	--				
6. Black	.043**	-.044**	.035*	-.043**	-.759**	--			
7. Other	.033*	.032*	.033*	-.042**	-.479**	-.199**	--		
8. GPA	-.149**	-.170**	-.134**	-.107**	.109**	-.110**	-.012	--	
9. Female	.127**	-.029*	.099**	-.119**	-.021	.029*	-.010	.167**	--
** . Correlation is significant at the 0.01 level (2-tailed).									
* . Correlation is significant at the 0.05 level (2-tailed).									

Binary Logistic Regression Models

Binary logistic regression is used when the dependent variable is dichotomous. Logistic regression predicts the relationship between the independent variables and the dependent variables. In order to use multivariate logistic regression, there must be two or more independent variables. For the purpose of this study, I used the race category of “White” as my reference group, which is why it is not included in any of the models or tables.

Marijuana Use in Adolescence and Depression in Young Adulthood

Table 6 displays the three different models for marijuana use in adolescence (WI) and depression in young adulthood (WIII). Model one in **Table 6** indicates that those who use marijuana as an adolescent are 1.5 ($p < .05$) times more likely to be depressed in young adulthood. Model one also suggests that if someone is a female, then they are 2.88 ($p < .01$) times more likely than a male to be depressed when they become an adult. The only category that was not statistically significant in model one is the race category of African American. According to model one, as GPA increases the likelihood of being depressed in young adulthood decreases. The odds ratio for GPA and young adulthood depression is .49 to 1.0 ($P < .01$). Model two for **Table 6** takes into account if the participant was already depressed in adolescence. Model two yielded slightly different results. Marijuana use as an adolescent was no longer statistically significant. Being a female was still statistically significant with a p-value that was less than .01 and an odds ratio of 2.475 to 1.0. Meaning that a female was roughly 150 percent times more likely to have depression in young adulthood compared to a male. Being African American is still not statistically significant. Being of a race different than white or black has similar results

as it did in model one. Those who are a race other than black or white were roughly 55 percent more likely to battle depression as a young adult. GPA has a slight increase in model two, about .05. The odds ratio of GPA is now .539 ($p < .01$). The strongest likelihood in model two came from if the participant experience depression as an adolescent. If someone was depressed in Wave I then they were approximately 3 times more likely to be depressed as a young adult. For model three an interaction was added. An interaction tests the relationship among three or more variables. An interaction test to see if one variable depends on the outcome of another. The interaction term, "African American x Marijuana (W1)", is statistically significant (2.156, $p < .05$). Indicating that African Americans have a stronger positive relationship with depression in young adulthood when they use marijuana as an adolescent, compared the same association for Whites. Marijuana use during Wave I was still not statistically significant nor was being African American. The strongest likelihoods came from being female (2.497, $p < .01$) and having depression during Wave I (3.177, $p < .01$).

Table 6: Odds Ratios from Logistic Regressions of Wave 3 Depression (N=4,876)

<u>Variable</u>	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>
Marijuana Use (W1)	1.472*	1.254	1.025
Female	2.880**	2.475**	2.497**
African American	1.254	1.220	1.095
Other Race	1.654**	1.548*	1.556*
GPA	.490**	.539**	.540**
Depression (W1)	--	3.127**	3.177**
African American x Marijuana (W1)	--	--	2.156*

** . Coefficient is significant at the $p < 0.01$ level

* . Coefficient is significant at the $p < 0.05$ level (2-tailed).

Depression in Adolescence and Marijuana Use in Young Adulthood

Table 7 shows the three models for Wave I depression and Wave III marijuana use. Every variable in model one was statistically significant. If someone was depressed as an adolescent then they were 1.33 times more likely to use marijuana as an adult ($p < .05$). If the respondent was a female then the odds ratio for them using marijuana in young adulthood is .59 to 1.0 ($p < .01$). Which means that females were sixty-percent less likely to smoke marijuana in young adulthood. Being African American (.686, $p < .01$), a race other than black or white (.610, $p < .01$), or having a high GPA (.742, $p < .01$) all had a negative impact on marijuana use in young adulthood. Marijuana use in adolescence was added in for model two. This had the largest

impact on the “Depression Wave I” independent variable, making it no longer statistically significant. All of the other variables had roughly the same results as they did in model one. They all still show a decline in likelihood and are statistically significant. The strongest relationship in model two is “Marijuana Wave I” and “Marijuana Wave III”. If someone used marijuana in Wave I, as an adolescent, then they were 250 percent times more likely to use marijuana as a young adult ($p < .01$). For model three the interaction of “African American x Depression (W1)” was added. Every variable had similar results as it did in model two. Also, the interaction was not statistically significant. Therefore, the interaction is not important.

Table 7: Odds Ratios from Logistic Regressions of Wave 3 Marijuana Use (N=4,876)

<u>Variable</u>	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>
Depression (W1)	1.329*	1.143	1.035
Female	.590**	.589**	.589**
African American	.686**	.727**	.689**
Other Race	.610**	.579**	.583**
GPA	.742**	.813**	.811**
Marijuana Use (W1)	--	3.525**	3.555**
African American x Depression (W1)	--	--	1.440

** . Coefficient is significant at the $p < 0.01$ level

* . Coefficient is significant at the $p < 0.05$ level (2-tailed).

Chapter 4

Discussion

The focus of this study was to determine the longitudinal association between marijuana use and depression ranging from adolescence to young adulthood. Finding out this information could help understand the causal pathways for those who battle substance abuse and/or mental illness. I had four main foci; (1) is marijuana use in adolescence associated with an increase in depression in young adulthood? (2) is depression in adolescence associated with an increase in marijuana use in young adulthood? (3) does marijuana and depression levels increase simultaneously? and (4) is there a difference in the findings when dividing by race, primarily focusing on African Americans?

Is Marijuana Use in Adolescence Associated with an Increase in Depression in Young Adulthood?

Model one of **Table 6** suggests that if someone was using marijuana as an adolescent then they were 47 percent more likely to be depressed as a young adult ($p < .05$). **Table 5** shows the similar results with the positive correlation between the two variables, “Marijuana Wave I” and “Depression Wave III” (0.67, $p < .01$). The issue with model one is that it did not take into account if the respondent was already depressed as an adolescent. Model two adds adolescent depression into the equation. When adolescent depression was added smoking, marijuana as an adolescent was no longer statistically significant, suggesting that the association between adolescent marijuana use and young adult depression was spurious and explained by adolescent

depression. The strongest predictors were gender and if they were previously depressed. From these results it can be concluded that from the variable that were used in this study, the only way marijuana use in adolescence would increase the likelihood of someone becoming depressed in young adulthood is if they were not already depressed as an adolescent. The strongest indicator of depression in young adulthood is having depression as an adolescent.

In addition, I found that African American race moderated the association between adolescent marijuana use and young adult depression. The positive interaction suggests that the association between adolescent marijuana smoking and young adult depression was stronger for African Americans than Whites. This is an interesting finding that suggests resources to prevent long-term mental health consequences of marijuana use may be better targeted toward Black adolescents than their White peers.

Is Depression in Adolescence Associated with an Increase in Marijuana Use as a Young Adult?

Model one of **Table 7** indicated that someone who was depressed as an adolescent was approximately 33 percent more likely to use marijuana as a young adult. Model one did not take into account people who were already previously using marijuana. The same pattern is shown in Model 1 of **Table 5**, “Marijuana Wave III” and “Depression Wave I” has a significant correlation of .03 ($p < .05$). When marijuana use in adolescence was added to the equation (Model 2), having depression as an adolescent was no longer statistically significant. The association between adolescent depression and young adult marijuana appears spurious and explained by prior marijuana use. Prior marijuana use was the strongest predictor of young adult marijuana use. Those who used marijuana in adolescence had an odds ratio of 3.5 to 1.0 when it came to using marijuana in young adulthood. This means that the biggest predictor of someone using

marijuana in young adulthood was if the used marijuana in adolescence. Indicating that in this study the only time depression during adolescence causes a rise in marijuana use as a young adult is if the person was not already using marijuana.

Additionally, there was not a significant interaction between African American race and adolescent depression in predicting young adult marijuana use. It appears that, regardless of race, there is a similar insignificant association between adolescent depression and later marijuana use.

Does Marijuana and Depression Levels Increase Simultaneously?

Table 5 shows that for Wave I the correlation between marijuana use and depression was .122 ($p < .01$). In Wave III the correlation between marijuana use and depression became .048 ($p < .01$). Showing that the strength of the relationship between the two variables actually weakened over time.

Is There a Difference in the findings When Focusing on African Americans?

The first focus was looking at marijuana use as an adolescent and depression as a young adult. In models, one two, and three of **Table 6**, being African American was not statistically significant. It did not help predict if someone would be depressed in young adulthood. Being of the race category “Other” was statistically significant in all three models. “Other” was typically 50 to 65 percent more likely to be depressed as a young adult. When the interaction between being African American and using marijuana in Wave I was added in then being African American became a predictor. It showed that if you were African American and used marijuana as an adolescent you were 116 percent more likely to battle depression in young adulthood ($p < .05$). The next focus was on depression in adolescence and marijuana use in young adulthood.

In all three models of **Table 7**, being African American was statistically significant. Also, all three models showed that if the respondent was African American then they were approximately 30 percent less likely to use marijuana in young adulthood ($p < .01$). Model three of **Table 7** took into account if the respondent was African American and depressed as an adolescent. The results showed that this indicator does not assist with predicting if someone will use marijuana as a young adult.

Limitations

There were several limitations with this study. One being that people could have overemphasized or been modest with their answers. For example, during Wave I one respondent stated that they used marijuana over 500 times within the last 30 days. Meaning that they would have had to use marijuana about 17 times a day for 30 days. Respondents may have felt the need to impress other, may have felt embarrassed, or many other things that could have contributed to them not being completely truthful. Another Limitation with this study is that it is out of date. Marijuana use is way more accepted now than it has ever been. The mindset of the nation is different now than it was when this study began.

Further Research

A larger, more recent sample may help determine the potential causal association between depression and drugs. Also, harsher drugs should be added in the analysis. Finally, the interaction between African American race and marijuana use in predicting young adult

depression deserves greater attention and investigation of potential mechanisms. Given persistent racial inequality in economic, education, and other socioeconomic outcomes, a greater understanding of how adolescent drug use contributes to such inequality and mental health is important. Policies that target this inequality would then change the stigma around mental health, race, and drug use in order to actually help those in need.

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