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Marijuana Legalization and Depression Effects on Marijuana Use in African American Late Adolescents

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Walden University
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Abstract

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MPH, Walden University, 2018

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Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

State medical marijuana legalization (MML) may contribute to increased cannabis use among older adolescents, especially African American youth and adolescents with depression. This quantitative cross-sectional correlational study, which utilized Smart's availability-proneness theory of drug use as a guiding framework, had a two-fold purpose: to determine if state MML status and self-reported depression were significantly related to past-month marijuana use and to assess if state MML status significantly moderated between depression and past-month marijuana use. The study utilized data from 1,391 African American late adolescents (aged 16-20) who participated in the 2018 National Survey on Drug Use and Health. Binary logistic regression analyses were conducted to address the study's three research questions. Findings showed that state MML status was not significantly related to the youth's past-month cannabis use. However, a diagnosis of depression was significantly associated with past month cannabis use. Depressed adolescents had a 73% increased probability using cannabis in the past month as compared to adolescents without depression. Findings further showed that state MML status significantly moderated between depression and past-month cannabis use. Study findings may be used for positive social change informing the development of interventions and programs aimed at preventing or treating African American youth with depression and/or heavy cannabis use, especially those residing in MML states.

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Dedication

I dedicate this paper to my wife, Justina Bosede Iroko for her untiring support all the years to make this happen. To my children, Zaneta Iroko and Antoinette Iroko, for being my inspiration. Above all, to God Almighty that gave me the strength, wisdom, and grace to make this happen. I say, thanks.

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Section 1: Foundation of the Study and Literature Review

Introduction

There are numerous public health concerns regarding the potential effects of state medical marijuana legalization (MML) status on adolescent marijuana use (Melchior et al., 2019; Sarvet et al., 2019). Even though cannabis is only legally available to adults (age 21 or older) with a physician's prescription in MML states (Pacula & Smart, 2017), MML may nonetheless make cannabis more accessible to adolescents and its use more acceptable (Ladegard et al., 2020; Wong et al., 2020). Moreover, cannabis is the most widely used drug among adolescents (Scheier & Griffin, 2020). However, the effects of state MML status on increased marijuana use in adolescents is unclear (Melchior et al., 2019; Sarvet et al., 2019), prompting the need for studies that examine the MML-marijuana use relationship among at-risk adolescent populations, including late adolescents (Paschall et al., 2017; Schmidt et al., 2019), adolescents with depression (Weinberger et al., 2020), and African American adolescents (Keyes et al., 2017). The purpose of this quantitative cross-sectional correlational study was to determine if state MML status and self-reported depression are significantly associated with past-month marijuana use and if state MML status significantly moderates between depression and past-month marijuana use in a stratified sample of African American adolescents, ages 16 to 20, who participated in the 2018 National Survey of Drug Use and Health (NSDUH) study.

This section of the dissertation provides a comprehensive review of the study. A background section summarizing the prior research offers a rationale for the problem

statement and purpose of the study. I present the study research questions and associated hypotheses, followed by a discussion of the guiding theoretical framework, Smart's (1980) availability-proneness theory of drug use. I discuss the nature of the study, including a summary of the research design, a cross-sectional correlational design. I provide a brief overview of the literature search strategy followed by sections on the literature review and definitions of key terms. The study's assumptions, scope and delimitations, and limitations are then reviewed. I discuss the significance of the study in the penultimate section. A summary concludes the first section.

Background

MML was first passed in the states of Colorado and Washington in 2012, and as of November 2020, 33 states have passed MML, with 11 of those states also passing recreational marijuana legalization (RML; Feitz, 2020; Ridgway & Hrdinova, 2020). While MML allows for the legal medicinal use of cannabis for adults aged 21 or older (Dickson et al., 2019), it may nonetheless influence adolescent cannabis use "by increasing [its] availability and access while decreasing perceptions of harm" (Ladegard et al., 2020, p. S166). As such, the increasing number of states implementing MML has led to a substantial empirical examination of legalization effects on attitudes and use of cannabis among adolescents (D'Amico et al., 2017; Derefinko et al., 2016; Melchior et al., 2019; Sarvet et al., 2018).

The extensive empirical work on the effects of MML on adolescent marijuana use has resulted in equivocal and heterogenous findings (D'Amico et al., 2017; Derefinko et al., 2016), with some studies reporting no significant effects of MML on adolescent

marijuana use (Melchior et al., 2019; Sarvet et al., 2018). The inconclusive findings concerning MML and adolescent marijuana use have shed light on the limitations of the existing literature, leading to recommendations for new avenues of research (Melchior et al., 2019; Sarvet et al., 2018). MML may impart specific risks for late adolescents aged 16 to 20, as the initiation of marijuana use most frequently occurs during late adolescence (Thorpe et al., 2020; UNICEF, 2011), and late adolescents are the most vulnerable group for marijuana use (Derefinko et al., 2016; Skehan & Davis, 2017). As there are significant bidirectional links between depression and cannabis use (Gobbi et al., 2019), adolescents with depression may be at increased risk for using cannabis in MML states. Finally, MML may be more consequential for African American youth, as African American adolescents tend to have higher levels of depression than other adolescents (King et al., 2020; Mrug et al., 2016) yet have less access to mental health services (Moore, 2018), and they may have easier access to marijuana as compared to their peers (Berg et al., 2018; Thomas & Friesthler, 2017). However, no study to date has examined the direct and moderated effects of state MML status and depression on cannabis use among African American late adolescents aged 16-20.

Problem Statement

The problem was that it is not known if state MML status and self-reported depression are significantly related to past-month marijuana use or if state MML status moderates between self-reported depression to influence past-month marijuana use in the 2018 NSDUH sample of African American late adolescents aged 16-20. Findings from studies examining the effects of state MML status on adolescent marijuana use are mixed,

leading scholars to suggest additional research into MML effects on at-risk adolescent groups (Melchior et al., 2019; Sarvet et al., 2018). The percentage of youth using cannabis doubles between the ages of 16 and 20, with 12% of youth reporting past 30-day use at 16 and approximately 25% of youth reporting past 30-day use at age 20 (Derefinko et al., 2016; Johnson & Guttmannova, 2019).

Findings on a national level have shown that the trajectory of marijuana use among late adolescents has increased in parallel with legalization efforts (Cerdá et al., 2020; Ladegard et al., 2020), with cannabis use increasing more rapidly among late adolescents with depression than those without depression (Weinberger et al., 2020). Moreover, African American youth with depression may be more likely than other adolescents to use marijuana as a coping or self-medicating mechanism and/or for social approval (King et al., 2020). Increased accessibility to marijuana due to MML may interact with depression to compound marijuana use among African American youth. Although scholars recognize drug use among adolescents as a public health concern due to its associated mental health consequences (Banks et al., 2017; Ladegard et al., 2020), there is a lack of research on the roles that MML and depression, singly and in interaction, may play in African American youth's marijuana use.

Purpose of Study

The purpose of this quantitative cross-sectional correlational study was two-fold: to determine if MML status of the state in which the adolescent lives and the adolescent's self-reported depression is significantly related to their past-month marijuana use and to assess if state MML status significantly moderates between self-reported depression and

past-month marijuana use in a national sample of African American adolescents aged 16 to 20. In this study I utilized data from the 2018 National Survey on Drug Use and Health (NSDUH), a major source of national data on substance use and mental health among Americans aged 12 or older collected yearly by the U.S. Substance Abuse and Mental Health Service Administration (SAMSHA, 2018). This study had two predictor variables: the dichotomous-coded state MML status variable and depression, measured using the 6-item interval-coded Kessler Psychological Distress Scale (K6; Kessler et al., 2002). There was one criterion variable, past-month marijuana use, which was coded as a dichotomous variable (i.e., 1 = yes, used marijuana in the past month and 0 = no, did not use marijuana in the past month). Based on findings from previous studies (Assari et al., 2018; Melchior et al., 2019; Sarvet et al., 2018), this study included specific control variables/covariates in analyses: use of marijuana in the prior year (i.e., 2016) and gender.

Research Questions and Hypotheses

This quantitative cross-sectional correlational study has three research questions, each having associated null and alternative hypotheses:

RQ1: To what degree, if any, does the MML status of the state in which the youth resides significantly relate to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20)?

$H_0$1: The MML status of the state in which the youth resides is not significantly related to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20).

H_a1: The MML status of the state in which the youth resides is significantly related to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20).

RQ2: To what degree, if any, does the level of self-reported depression significantly relate to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20)?

H_02: The level of self-reported depression is not significantly related to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (ages 16-20).

H_a2: The level of self-reported depression is significantly related to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20).

RQ3. To what degree, if any, does the MML status of the state in which the youth resides significantly moderate between the level of self-reported depression and past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20)?

H_03: The MML status of the state in which the youth resides does not significantly moderate between the level of self-reported depression and past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20).

H_a3: The MML status of the state in which the youth resides does significantly moderate between the level of self-reported depression and past-month marijuana

use in the 2018 NSDUH sample of African American late adolescents (aged 16-20).

Theoretical Framework

Smart's (1980) availability-proneness theory of drug use provided an excellent framework for this study. Simply stated, the availability-proneness theory posits that drug use is more likely to occur when an individual who is more psychologically disposed to use drugs is exposed to a higher level of availability (Smart, 1980). Smart (1980) identified depression as one psychological factor that places individuals at more risk for using drugs. The biological proneness due to depression may create "social psychological proneness" in the form of maladaptive coping (Smart, 1980, p. 48). Smart (1980) defined availability as physical/geographical (e.g., number of places to purchase drugs), social (e.g., number of peers who use or have access to drugs), and economic (e.g., cost of drugs) factors that promote the ease of drug obtainability. Smart's (1980) availability-proneness theory provided a sound theoretical argument for this study, as it was posited that African American youth were more prone to cannabis use due to depression and were more likely to use marijuana if they resided in a state where it is more available to them.

Nature of the Study

In this quantitative study I employed a cross-sectional correlational research design. The cross-sectional element refers to collecting data at one time point, which contrasts with the longitudinal design where data are collected at two or more periods over time (Spector, 2019). A correlational study is nonexperimental as it lacks the

random selection of study participants and has no study conditions (i.e., intervention or control groups). As it is not an experimental design, a correlational study cannot demonstrate causality (Reio, 2016). A correlational design is used to examine the significance, direction, and strength of the relationships between the study variables (Curtis et al., 2016; Kite & Whitley, 2018). In correlational studies, the term used for the independent variable is the *predictor* variable and the dependent variable is called the *criterion* variable (Kite & Whitley, 2018). A correlational design allows for the testing of mediation and moderation effects of variables (Hayes & Rockwood, 2017). In this study I tested the moderating effects of state MML status between African American late adolescents' level of depression and their past-month marijuana use; that is, for this study I posited that the relationship between depression and marijuana use will be more pronounced in African American late adolescents residing in MML states.

Literature Search Strategy

I selected peer-reviewed journal articles through a strategic literature search utilizing *EBSCOHost* as the primary web portal, which allowed access to key databases, including *PsycINFO*, *SOCIndex*, and *Academic Search Elite*. *Google Scholar* also provided access to peer-reviewed journal articles. The search for pertinent empirical work was limited to the years 2015 to 2020, with emphasis placed on the past three years (i.e., 2017-2020). Articles were retrieved using specific key search terms, entered singly and in combination: *public health*, *mental health*; *contextual*, *cultural*, *ecological*, *state*, *neighborhood*; *dispensary*; *marijuana*, *cannabis*; *legalization*, *regulation*, *decriminalization, medical marijuana legalization (MML), recreational marijuana*

legalization (RML); *African American*, *Black*, *adolescents/youth*; *depression*, *anxiety*, *internalizing disorders*, and *mood disorder*. The literature search yielded pertinent peer-reviewed studies, summarized below.

Literature Review

Medical Marijuana Legalization and Marijuana Use in Adolescents

Since the initiation of MML starting in 2012, there has been substantial empirical attention given to the potential effects of MML on increased cannabis use in adolescents who reside in states with MML laws. The body of literature on MML effects on adolescent marijuana use is robust, resulting in the publication of two meta-analysis studies (Melchior et al., 2019; Sarvet et al., 2018). Sarvet et al.'s (2018) meta-analysis utilized data from 11 studies published between 2013 and 2016, all of which employed cross-sectional designs to examine differences in adolescent past-month marijuana use "from pre- to post-MML passage" in MML as compared to "contemporaneous differences" in adolescent marijuana use in states without MML (p. 1008). All 11 studies utilized data from national adolescent drug use datasets (e.g., Monitoring the Future [MTF], Youth Risk Behavior Survey); 8 (73%) studies focused on adolescents between 12-13 and 18-20 years of age, while 3 studies (27%) focused on adolescents aged 15 to 17 (Sarvet et al., 2018). Analyses in all studies were conducted on combined data from five or more MML states and a comparative number of non-MML states; there were no studies that focused on just one MML, comparing data to one non-MML state (Sarvet et al., 2018).

Sarvet et al. (2018) found little evidence to support the argument that adolescent marijuana use was higher in MML states as compared to non-MML states. Results from only three (27%) of the 11 research studies showed significant increases in adolescent past-month marijuana use after MML implementation, with studies referencing seven MML states (i.e., Montana, Rhode Island, Michigan, Colorado, Maine, Nevada, and Vermont; Sarvet et al., 2018). However, these three studies also documented higher rates of marijuana use prior to legalization among adolescents in MML states as compared to non-MML states (Sarvet et al., 2018).

Melchior et al.'s (2019) meta-analysis was more expansive in topic than Sarvet et al.'s (2018). Melchior et al.'s (2019) study included a review of 41 studies published between 1996 and 2018, with the research differentiated by those examining the effects of marijuana decriminalization laws (n = 13, 32%), MML (n = 20, 48%), or medical and recreational marijuana legislation, MML/RML (n = 8, 20%) on cannabis outcomes (i.e., past-month, past-year, and lifetime use) in adolescents and young adults aged 25 or younger. Of the 41 studies, 21 (51%) studies focused on adolescents aged 12-17, 14 (34%) studies had samples ranging in age from 12 to 25, and 6 (14%) studies included participants aged 18-25.

Melchior et al.'s (2019) analyses focused on the 33 (80%) studies that were conducted in America using national adolescent drug use surveillance datasets (e.g., MTF, Youth Risk Behavior Survey), including tests conducted by study year (i.e., published before 2000 versus after 2000) and age group (i.e., 12-17 years or 18-25 years). When summarizing the findings from studies, Melchior et al. (2019, p. 4) noted mixed

results, reporting “high heterogeneity” in the findings from studies on MML and adolescent/young adult cannabis use. Only six (30%) studies reported significant effects of MML on past-month and past-year cannabis use; notably, three studies showed decreased past-month cannabis use in adolescents while three studies reported increased past-month cannabis use among adolescents and young adults (Melchior et al., 2019). Melchior et al. (2019) found a more pronounced effect of MML/RML on adolescent cannabis use than did Sarvet et al. (2018). Findings from four of the eight MML/RML studies were significant, and results from the meta-analysis statistics conducted by Melchior et al. (2019) suggested a “small increase in the use of cannabis following the legalization of recreational cannabis” in MML states (p. 9).

The research published since the meta-analyses by Sarvet et al. (2018) and Melchior et al. (2019) has continued to document conflicting findings regarding MML and adolescent marijuana use, summarized in systematic reviews of the literature by Hasin and Aharonovich (2020) and Hammond et al. (2020). Scholars have posited various reasons for the mixed findings in studies (Hammond et al., 2020; Hasin & Aharonovich, 2020; Melchior et al., 2019; Sarvet et al., 2018). One concern is the heterogeneity in state MML laws and their implementation; a related concern is the differences in the number of years since MML across states (Hammond et al., 2020). Scholars have noted that, when examining prelaw marijuana use among adolescents, use is typically higher in MML states, introducing a potential confound variable (Melchior et al., 2019; Sarvet et al., 2018). Other scholars have noted that equivocal findings may have resulted from the lack of examination of the relationships between state MML status

and marijuana use across adolescent age groups, with late adolescents thought to be most at risk (Schmidt et al., 2019), as well as lack of consideration of adolescents at-risk for high marijuana use due to depression (Robertson & Swartz, 2019).

Medical Marijuana Legalization and Marijuana Use in Late Adolescents

Due to the relatively new and ongoing implementation of MML in various states, the existing empirical literature on MML and marijuana use have focused on assessing and establishing relationships in adolescents, grouped in age groups from 12-17 and 19-25; studies have yet to comprehensively examine MML-use relationships across or specific to adolescent age groups (Melchior et al., 2019; Sarvet et al., 2018). Marijuana is the most widely used drug among adolescents (Scheier & Griffin, 2020), and the percentage of youth using cannabis doubles between the ages of 16 and 20, with 12% of youth reporting past 30-day use at 16, and approximately 25% of youth reporting past 30-day use at age 20 (Derefinko et al., 2016; Johnson & Guttmannova, 2019). Marijuana use among late adolescents is higher than early or middle adolescents for various reasons. The most recent MTF data from 2020 shows that the percentage of 8th graders reporting past-month marijuana use remained the same pre- (2010) to post- (2019) MML nationwide, with 1.2% of 8th graders in 2010 and 1.1% of 8th graders in 2019 reporting using marijuana in the past month (National Institute on Drug Abuse [NIDA], 2020). However, the percentages of 10th and 12th grade students using marijuana in the past 30 days increased, 3.3% for 10th graders and 6.1% for 12th graders who reported past-month use in 2010, whereas 4.4% of 10th graders and 6.9% of 12th graders reported past-month marijuana use in 2019 (NIDA, 2020). The state implementation of MML may

place late adolescents at increased risk for cannabis use, as late adolescents (a) are likely to perceive marijuana use as low risk, (b) are "more susceptible to social pressure" than early and middle adolescents, and (c) have greater access to marijuana due to their ability to drive and socializing with older peers (Schmidt et al., 2019, p. 488).

Only a few studies, all of which used national surveillance data (i.e., MTF or NSDUH), have made adolescent age groups a topic of examination (Cerdá et al., 2018; Mauro et al., 2019; Schmidt et al., 2020). Cerdá et al. (2018), utilizing MTF data from over 1 million American youth, conducted multilevel logistic difference-in-difference models to examine if there were significant pre- to post-MML changes in prevalence rates of marijuana and other drug use in 8th, 10th, and 12th graders. Results showed that, for the 21 states that enacted MML up to 2015, the prevalence rate of past-month cannabis use among 8th graders significantly decreased from 7.9% prior to the passing of MML to 5.8% after the passing of MML. There were no significant pre- to post-MML differences in the prevalence rates of marijuana use in 10th and 12th graders (Cerdá et al., 2018).

While Cerdá et al. (2018) focused on differences between adolescents in 8th, 10th, and 12th grades, Mauro et al. (2019) and Schmidt et al. (2019) focused on differences between adolescent and young adult age groups. Schmidt et al. (2019) examined the relationships between state MML status and marijuana outcomes using 10 waves (2004-2013) of NSDUH data from over 450,000 adolescents, with analyses conducted separately for three age groups (i.e., 12-14 years, 15-17 years, and 18-24 years). Findings showed no significant effects of state MML status on marijuana use in

the three age groups (Schmidt et al., 2019). However, there was a significant effect of state MML status on initiating marijuana use among participants ages 18-24 (Schmidt et al., 2019). Mauro et al. (2019) also utilized 10 waves of NSDUH data (2004-2013) to examined MML effects on marijuana use among participants in age groups of 12-17, 18-25, and 26+. Mauro et al. (2019) found no significant pre- to post-MML changes in marijuana use in participants ages 12-17 or 18-25; however, there were significant increases in both past-month and past-year use of marijuana in persons ages 26+ (Mauro et al., 2019).

Findings from these studies (Cerdá et al., 2018; Mauro et al., 2019; Schmidt et al., 2020) are mixed. One reason may be that they did not focus on adolescents ages 16-20, instead using age 18 as the cutoff age between age groups (Cerdá et al., 2018; Mauro et al., 2019; Schmidt et al., 2020). Moreover, adolescents with depression may be at increased risk for high cannabis use (Scheier & Griffin, 2020).

Depression and Marijuana Use in Adolescents

There has been extensive examination of the relationships between depression and marijuana use among adolescents, evidenced by over 10 systematic reviews of the literature published before 2016 (Scheier & Griffin, 2020) and more current reviews by Esmaeelzadeh et al. (2018) and Gobbi et al. (2019). Esmaeelzadeh et al. (2018) conducted a meta-analysis using 36 studies published between 2000 and 2017 that examined the associations between alcohol, tobacco, and marijuana use and in samples of adolescents. Results from their meta-analysis statistical tests showed that adolescents with depression were 29% more likely to use marijuana than were adolescents without

depression. Depressed adolescents were also more likely to use tobacco and alcohol as compared to nondepressed adolescents (Esmaeelzadeh et al., 2018). The directionality of the relationship between marijuana use and depression was also examined longitudinally, and results showed significance for depression predicting marijuana use and marijuana use predicting depression (Esmaeelzadeh et al., 2018).

The relationships between cannabis use in adolescence and depression, anxiety, and suicidality in young adulthood were the topics of Gobbi et al.'s (2019) comprehensive systematic review and meta-analysis study. Reviewing empirical studies published between the early 1990s and 2017, Gobbi et al. (2019) reviewed findings from 11 quantitative studies. The authors conducted statistical tests for meta-analysis using data from the 11 quantitative studies, which were further divided into those focusing on depression (n = 7), anxiety (n = 3), or suicidal ideation/attempts (n = 6). Pooling data from the seven depression studies, Gobbi et al. (2019) reported significant effects, with cannabis use in adolescence significantly predicting depression in young adulthood. Similar results were found for anxiety and suicide ideation/attempts.

Depression and Marijuana Use Among Late Adolescents

There is sound empirical evidence of significant links between depression and marijuana use in adolescents (Gobbi et al., 2019), and it is well established that depression and marijuana use both increase from early to late adolescence (University of Oxford, 2019). There is, however, minimal examination of trajectories in the marijuana use and depression relationship across adolescent age groups. Wilkinson et al. (2016) examined changes in the depression-marijuana relationship from middle adolescence

(ages 14 to 15) to young adulthood (ages 32 to 34) using national Add Health data. Linear mixed-effects model analyses revealed that marijuana use was lowest during middle adolescence (ages 14-15) but increased during emerging adulthood (ages 20-22), and again decreased at young adulthood (ages 32-34; Wilkinson et al., 2016). In contrast, depression risk was highest during middle adolescence, decreased during emerging adulthood, and increased again in young adulthood (Wilkinson et al., 2016). Analyses further showed significant concurrent and predictive relationships between depression and marijuana use in middle adolescence, emerging adulthood, and young adulthood stages (Wilkinson et al., 2016).

Weinberger et al. (2020) utilized 2004-2016 NSDUH data on over 14,000 youth, aged 12-17, to examine the trajectories of cannabis use among adolescents with and without depression. Averaging 30-day cannabis use in youth across all years, Weinberger et al. found a significantly higher percentage of depressed youth who reported past 30-day cannabis use (12.9%) as compared to nondepressed youth who reported past 30-day use (6.4%). Moreover, the percentage of depressed youth reporting past 30-day cannabis use significantly increased over the years, from 8.5% in 2004 to 11.7% in 2016, while the percentage of nondepressed youth reporting 30-day cannabis use remained relatively stable during this same period (Weinberger et al., 2020).

Medical Marijuana Legalization, Depression, and Marijuana Use: A Focus on African American Adolescents

MML may impart more negative consequences for African American youth. African American adolescents tend to initiate cannabis use at an earlier age, have more

accepting attitudes toward cannabis use, and have higher marijuana use rates as compared to their European American and ethnic peers (Banks et al., 2017; King et al, 2020). In fact, African American adolescents may have unique profiles of drug use (Banks et al., 2017). Banks et al. (2017), using 2011-2014 NSDUH data from over 14,000 adolescents between the ages of 12 and 18, calculated alcohol, marijuana, and tobacco use typologies across five ethnic groups: African American, European American, Hispanic, Asian American, and Native American. Their results showed that African American youth were most likely to be classified as marijuana-only users, and they comprised almost 25% of all marijuana users (Banks et al., 2017).

There is also empirical evidence of a significant association between depression and marijuana use in African American adolescents (King et al., 2020). King et al. (2020), in their correlational study of 141 African American youth in Alabama (aged 16 to 24, 52% male) were examined if depression and PTSD were linked to motives for using marijuana and for subsequent continuing use. King et al. (2020) tested their hypotheses using path analysis, controlling for gender, age, and income. King et al. (2020) found that higher levels of depression (but not PTSD) were significantly associated with using marijuana as a coping mechanism, which in turn, led to significant increases in 12-month marijuana use.

The link between depression and marijuana may be stronger for African American adolescent males (Assari et al., 2018). Assari et al. (2018) conducted a longitudinal study, examining the bidirectional pathways between depression and marijuana use at three time-points, with a focus on gender. Theirs was a secondary

analysis of the Flint Adolescent Study, using data from 681 (49% male, 51% female) African Americans aged 16 to 19 over the 3 years. Results from a latent growth curve modeling showed differences in the significance of pathways across gender groups. For African American males only, marijuana use at baseline predicted depression at times 2 and 3; findings were not significant for females (Assari et al., 2018). These findings suggest that African American males may be more vulnerable to depression resulting from marijuana use than African American females. Other factors may play a role. Kogan et al. (2017) conducted a two-wave longitudinal study to determine the predictive bidirectional pathways between marijuana use and depression in a sample of 505 African American young adult men (aged 19-20 at baseline and aged 21-22 at the 1-year follow-up). Results from a cross-lagged structural equation modeling showed that marijuana use at baseline significantly predicted depressive symptoms at follow-up; this relationship was more pronounced for men reporting adverse childhood experiences (Kogan et al., 2017).

The magnitude in use pre- to post-MML is significantly higher for African Americans as compared to European American adolescents (Johnson et al., 2015; Keyes et al., 2017). As cannabis dispensaries are disproportionately located in African American communities, marijuana may be potentially more accessible to African American youth (Berg et al., 2018; Thomas & Friesthler, 2017). The psychological consequences of marijuana use may be more severe for African American youth (Assari et al., 2018). African American adolescents tend to have higher levels of depression than other adolescents (King et al., 2020; Mrug et al., 2016). However, in comparison to their peers,

African American adolescents have less access to mental health services (Moore, 2018), and they are less likely to seek mental health treatment when it is available (Wahby et al., 2019). African American youth with depression may be more likely than other adolescents to use marijuana as a coping or self-medicating mechanism and/or for social approval (King et al., 2020). Increased accessibility to marijuana due to marijuana legalization may interact with depression to compound marijuana use among African American youth. While scholars recognize drug use among adolescents as a public health concern due to its associated mental health consequences (Banks et al., 2017; Ladegard et al., 2020), there is a lack of research on the roles that MML and depression, singly and in interaction, may play on African American youth's marijuana use.

Definitions

Depression

Depression is a mood disorder exemplified by symptoms such as (a) feelings of persistent sadness, hopelessness, and guilt; (b) fatigue and/or decreased activity; (c) difficulty concentrating; (d) changes in appetite and/or weight; (e) restlessness and/or irritability; (f) insomnia or hypersomnia; and (g) thoughts or death or suicide (National Institutes of Mental Health [NIMH], 2016). Depression, a predictor variable in this study, was assessed using a single item as to whether the adolescent had received a formal diagnosis of major depressive disorder.

Late Adolescence

Late adolescence is the developmental period between the ages of 16 and 20 years of age (UNICEF, 2011). Late adolescents have the capacity for analytical and critical

thought but may not consistently employ it; they are in a period of neurological and psychosocial immaturity (Monahan et al., 2013). While risk-taking in general may decline in late adolescence, due to the use of critical thought and conscious decision-making, experimentation with drugs and drug use increases during late adolescence (UNICEF, 2011). This study will utilize 2018 NSDUH from a sample of African American late adolescents, ages 16 to 20.

Marijuana

Marijuana is the dried flower of the plant *cannabis sativa* that contains tetra-hydrocannabinol (THC) and cannabinoids (CBD). THC and CBD affect areas of the brain associated with memory, concentration, movement, coordination, sensation, and pleasure (NIDA, 2018). Despite MML, marijuana remains a Schedule 1 drug, defined as a drug having "no currently accepted medical use and a high potential for abuse" (Drug Enforcement Agency [DEA], 2020, p. 4).

Past-Month Marijuana Use

Marijuana use refers to the use of marijuana for medical or recreational reasons in the past 30 days. Past-month marijuana use was the criterion variable of this study. It was assessed as a dichotomous variable, as a large percentage of youth in the 2018 NSDUH study did not use marijuana in the past month. The NSDUH past-month marijuana use variable was coded where 1 = *did use marijuana in past month (past 30 days)* and 0 = *did not use marijuana in past month (past 30 days)*.

Marijuana Decriminalization

Marijuana decriminalization refers to the implementation of policies and laws that "replace criminal sanctions with … fine-only penalties" for the possession of marijuana and/or reduced marijuana possession from a felony offense "to a fine-only misdemeanor" (Drug Policy Alliance, 2018, p. 2).

Medical Marijuana Legalization

MML refers to the implementation of policies and laws that allow for the medical use of marijuana among adults, age 21 or older, for the treatment of specific mental health (e.g., depression, anxiety, and PTSD) and health problems (e.g., chronic pain, cancer, multiple sclerosis) (Drug Policy Alliance, 2018). As of August 2020, medical marijuana use is legal in 33 states (Feitz, 2020). MML was one of the predictor variables for this study. It was measured using one dichotomous variable, coded where 1 = *the participant resides in a state where marijuana is approved for medical use* or 0 = the *participant does not reside in a state where marijuana is approved for medical use.*

Recreational Marijuana Legalization

MML refers to the implementation of policies and laws that allow for the recreational use of marijuana among adults, age 21 or older (Feitz, 2020). As of August 2020, recreational marijuana use was legal in 11 states (Feitz, 2020).

Assumptions

Assumptions are foundational elements of the study that the researcher accepts as true "without concrete proof" (Ellis & Levy, 2009, p. 115). This study had a few assumptions. There was an assumption that the adolescents in the 2018 NSDUH study

understood the questions presented to them and were honest and truthful in their responses. There was an assumption that the NSDUH (2018) study participants were knowledgeable as to whether their state had or had not passed MML and accurately reported as such. It was further assumed that the study participants were representative of the target population of African American late adolescents (ages 16-20) residing in America. NSDUH (2018) data collection processes included d multi-stage stratified sampling, a type of probability sampling, and sample weighting, which likely enhanced the representativeness of the study sample and thus the generalizability of study findings.

Scope and Delimitations

Empirical studies must have a scope, or "parameters under which the study [is] be operating" and delimitations, or study constraint set by the researcher characteristics from "arise from" the study scope and "define the boundaries" of a study (Simon & Goes, 2013, p. 2-3). The scope and delimitations of a study may limit its generalizability to other samples or settings/contexts (Simon & Goes, 2013; Theofanidis & Fountouki, 2018). The scope of this study was limited to understanding if MML state status and adolescent depression were significantly related to past-month marijuana use and if MML state status moderated between depression and past-month marijuana use in a sample of African American late adolescents, ages 16-24, who participated in the 2018 NSDUH.

Based on recommendations for future research on the effects of MML on adolescent marijuana use (Hammond et al., 2020; Melchior et al., 2019; Sarvet et al., 2018), this study was delimited to African American late adolescents, ages 16-24, who resided in MML and non-MML states and who participated in the 2018 NSDUH study.

Study findings are not generalizable to African American early or middle adolescents, ages 10 to 14, or young adults, ages 21 to 24, who can legally purchase marijuana for medical reasons in MML states and/or for recreational reasons in MML/RML states. Study findings cannot be generalized to samples of non-African American adolescents or young adults. The study utilized specific operational definitions for the study variables. As such, study findings may differ from other studies that utilize different operational definitions and/or instruments to measure the constructs of MML, depression, or past-month marijuana use.

Limitations

Empirical studies have limitations, or aspects of the study of which the researcher has no control (Theofanidis & Fountouki, 2018). As limitations are often associated with the selected methodology and design, they may reduce the internal and statistical conclusion validity of the study (Theofanidis & Fountouki, 2018). The nonexperimental correlational design used in this study presented a limitation in that findings could not be said to be causative; causality can only be determined in experimental studies (Reio, 2016).

Correlational studies are prone to the *self-selection bias*, in which persons who choose to participate in a study qualitatively differ from those who choose not to participate (Cochran, 2007). However, the use of multi-stage stratified sampling, a non-probability sampling design, when collecting 2018 NSDUH data eliminated the self-selection bias. The data may have been influenced by the *social desirability bias*, which is a threat common to correlational studies (Cochran, 2007; Krumpal, 2013). The social

desirability bias refers to participants providing socially acceptable but not necessarily truthful responses to questions, especially those on sensitive topics (Krumpal, 2013). The social desirability bias is a concern for studies with adolescents, as they may over- or under-report their drug use and minimize their mental health issues (Krumpal, 2013). The complex data cleaning, weighting, and organization process conducted by SAMHSA (2018) researchers likely reduced the social desirability bias.

There were other limitations to the study pertaining to the dataset and measurements. This study was limited to data collected on the 2018 NSDUH. The study furthermore used a single item assessing state MML status at one point in time, during the year 2018. This study did not delineate between states that implemented MML across different years (i.e., 2011-2017). As such, findings are limited to adolescents' perceptions as measured during the year 2018.

Significance

This study had theoretical, empirical, and practical significance. This study was guided by Smart's (1980) availability-proneness theory. Because of its emphasis on psychological and geographical/social risk factors for drug use, Smart's (1980) availability-proneness theory was especially fitting for a study examining the effects of state MML status and depression on marijuana use among African American youth (Krauss et al., 2017). However, Smart's (1980) availability-proneness theory has not been extensively used as a guide for cannabis research (Krauss et al., 2017). As such, this study enhanced understanding of the theoretical applicability of Smart's (1980)

availability-proneness theory to marijuana use and among African American adolescent samples.

This study had empirical significance by addressing numerous gaps in the empirical literature on MML, African American adolescents, and the mental health of youth. While the empirical work on MML and its influence on adolescent marijuana use is extensive (Melchior et al., 2019; Sarvet et al., 2018), findings have been equivocal. Moreover, few studies examining the effects of MML on adolescent cannabis use have focused on high-risk groups, including older adolescents, African American youth, and adolescents with depression (Melchior et al., 2019; Sarvet et al., 2018). The literature published since 2015 on depression and marijuana use among African Americans has been limited to studies with young adult males (Kogan et al., 2017) or adolescents residing in Alabama (King et al., 2020); no study has been national in scope. Importantly, no study to date has examined the interactive effects of state MML status and adolescent depression on marijuana use in African American youth. This study contributed to the body of work on MML and adolescent cannabis use.

This study had numerous implications for practice. Study findings can increase understanding of the societal implications of MML specific to African Americans and may inform adjustments or revisions in MML policies and legislation. Findings may also help to inform the development of interventions and programs aimed at preventing or treating African American youth with depression and/or substance use, especially those residing in MML states.

Summary and Conclusions

The relationship between state policy for marijuana legalization and public health is something that is just beginning to receive much attention (Robertson & Swartz, 2019). Even though MML applies to adult use only, this legislation may nonetheless make cannabis more accessible and acceptable among youth (Ladegard et al., 2020), potentially contributing to its increased use among adolescents (Wong et al., 2020). Findings on a national level have shown that the trajectory of marijuana use among adolescents has increased in parallel with legalization efforts (Cerdá et al., 2020; Ladegard et al., 2020), with cannabis use increasing more rapidly among adolescents with depression than those without depression (Weinberger et al., 2020).

MML may impart more consequences for African American youth. While adolescent marijuana use has increased overall since MML (Cerda et al., 2020), the magnitude in use pre- to post-MML is significantly higher for African Americans as compared to White adolescents (Cerdá et al., 2020; Keyes et al., 2017). As cannabis dispensaries are disproportionately located in African American communities, marijuana may be potentially more accessible to African American youth (Berg et al., 2018; Thomas & Friesthler, 2017). The psychological consequences of marijuana use may be more severe for African American youth (Assari et al., 2018). African American adolescents tend to have higher levels of depression than other adolescents (King et al., 2020; Mrug et al., 2016). However, in comparison to their peers, African American adolescents have less access to mental health services (Moore, 2018), and they are less likely to seek mental health treatment when it is available (Wahby et al., 2019). African

American youth with depression may be more likely than other adolescents to use marijuana as a coping or self-medicating mechanism and/or for social approval (King et al., 2020). Increased accessibility to marijuana due to marijuana legalization may interact with depression to compound marijuana use among African American youth.

While scholars recognize drug use among adolescents as a public health concern due to its associated mental health consequences (Banks et al., 2017; Ladegard et al., 2020), there is a lack of research on the roles that MML and depression, singly and in interaction, may play on African American youth's marijuana use. This section provided a summary of the guiding theory, Smart's (1980) availability-proneness theory, background information, and a comprehensive review of the literature. The gaps in the literature identified in the literature review concerned the lack of examination of MML effects on marijuana use among at-risk adolescent samples (Melchior et al., 2019; Sarvet et al., 2018). This study addressed the identified gaps by exploring if state MML status directly influences past-month cannabis use and interacts with self-reported depression to contribute to past-month cannabis use in African American late adolescents, ages 16-20. The next section provides a review of the study methodology and design.

Section 2: Research Design and Data Collection

Introduction

The purpose of this quantitative correlational (predictive) study was to determine if state MML status and depression were significantly related to past-month marijuana use and to assess if state MML status significantly moderated between depression and marijuana use in a national sample of African American adolescents aged 16 to 20 using 2018 NSDUH data. The study had two predictor variables, both dichotomous: state MML status variable and a diagnosis of depression. The one criterion variable was past-month marijuana use, also a dichotomous variable.

This section provides information on the study methodology, inclusive of the research design, sampling, data collection, and data analysis. A discussion on the research design and the rationale for its use is first presented. I then comprehensively review the methodology of the study, with information on the population, sampling and sampling procedures, sample size justification, and study instruments and operationalization of study variables. I restate the research questions and hypotheses. The section continues with a presentation of the data analysis plan and discussions of the threats to validity and ethical procedures of the study. The section concludes with a summary.

Research Design and Rationale

This was a quantitative study for which I utilized a cross-sectional correlational research design. Cross-sectional designs are employed when data are collected at one time point (Spector, 2019). This study was cross-sectional as I utilized data from the 2018 NSDUH. This study was also correlational in design. The correlational design is one type

of nonexperimental design, defined as such as it lacks the random selection of study participants and has no study conditions (i.e., intervention or control groups; Curtis et al., 2015, 2016). As it is nonexperimental, a correlational design cannot be used to determine causality (Reio, 2016; Kite & Whitley, 2018).

A correlational study "is concerned with establishing relationships between two or more variables" (Curtis et al., 2015, p. 2), and it provides information on the significance, direction, and strength of the relationships between the study variables (Curtis et al., 2016; Kite & Whitley, 2018). The correlational design requires different nomenclature for study variables: the independent variable is termed the predictor variable and the dependent variable is called the criterion variable (Kite & Whitley, 2018). The correlational examination of the relationships among naturally occurring (i.e., nonmanipulated) variables is increasingly becoming "a significant part of healthcare research" (Curtis et al., 2015, p. 2), and findings from correlational studies can be used to inform both future experimental research and evidence-based practices in public health (Curtis et al., 2016; Kite & Whitley, 2018).

There were benefits to using a cross-sectional correlational design. The study was not time- or resource-intensive, as data used in this study had already been collected. The methodological and analytical benefits of using the correlational design are numerous. The correlational design allows for the use of both categorical and continuous variables, with the coding of the variables determining the appropriate statistical analysis (Field, 2013). The statistics used in correlational studies can range from the more simplistic, such as the phi coefficient for nominal predictor and criterion variables to advanced

analyses such as path analysis and structural equation modeling (Field, 2013; Kite & Whitley, 2018). Moreover, the testing of mediation and moderation effects is a common aspect of correlational studies (Kenny, 2018; Memon et al., 2019). For this study I used phi coefficients for covariate testing, and I performed binary logistic regression analyses for hypothesis testing.

Methodology

Population

A target population is defined as the group of individuals that is a subset of the general population or the group of persons to which findings can be generalized, who meet study criteria and are accessible and available to the researcher and are willing to participate in the study (Asiamah et al., 2017). According to SAMHSA (2019, p. i-11), the criteria for the target population for the NSDUH was "the same as has been defined since the 1991 survey: civilian, noninstitutionalized [American persons] … who were 12 years of age or older at the time of the survey." For this study, the target population, which was also the study sample, was the 1,391 African American late adolescents (ages 16-20) who completed the 2018 NSDUH.

Sampling and Sampling Procedures

For this study I utilized archival data from the 2018 NSDUH in which stratified multistage probability sampling was employed to obtain study participants (SAMHSA, 2019). Stratified multistage probability sampling is one type of random sampling and involves dividing the population under examination into smaller groups (strata), with the sampling carried out in stages so that smaller and smaller units are selected (Pitard,

2019). The multistage stratification process in collecting the NSDUH was complex, with researchers first partitioning states into smaller state sampling regions (SSRs) "so that each area in the state would yield roughly the same number" of eligible participants (SAMHSA, 2019, p. 3). The SSRs were further divided into selected census tracts and then census block groups, with 49 blocks selected per SSR (SAMHSA, 2019). For the 2018 NSDUH, a total of 6,000 blocks within 750 SSRs were selected (SAMHSA, 2019). From these 6,000 randomly selected blocks, census information was retrieved and utilized by the researchers to randomly select dwelling units and determine if these randomly selected households had family members who met the study criteria (i.e., the person is a civilian, noninstitutionalized, and 12 years of age or older; SAMHSA, 2019). Researchers recorded eligible participant information in a roster, and roster information from all researchers was then entered into a computer program that allowed the investigators to randomly select study participants using "different rates based on state and age" (SAMHSA, 2019, p. 3). Researchers then contacted the selected eligible persons in each block by phone, initiating the data collection process (SAMHSA, 2019).

Use of the 2018 NSDUH dataset (see Appendix) requires no permission for use. NSDUH data for 2018 are in the public domain and can be downloaded as an SPSS file at https://www.datafiles.samhsa.gov/study-dataset/national-survey-drug-use-and-health-2018-nsduh-2018-ds0001-nid18758. The 2018 NSDUH dataset was selected for this study for various reasons. The NSDUH has a 50-year history, first implemented in 1971, and it is recognized as a comprehensive national survey that measures substance use/abuse, mental health, and mental health treatment use in a national sample of civilian,

noninstitutionalized Americans ages 12 and older (McCance-Katz, 2019; SAMHSA, 2019). The NDSUH is implemented to enhance understanding of "the state of substance use and mental health issues in the United States" and guides public policy in the areas of public health and mental health (McCance-Katz, 2019, para. 2). A primary benefit of using NSDUH data is that it is the only national substance use/abuse dataset that includes a question about state MML status, which has allowed scholars to conduct studies examining the effects of state MML status on adolescent cannabis attitudes and use and adolescent mental health (Mauro et al., 2019; Schmidt et al., 2019).

Power Analysis

The study sample was the 1,391 African American late adolescents (ages 16-20), who participated in the 2018 NSDUH. To determine if this sample size was large enough to achieve adequate power, I conducted power analysis for logistic regression using G*Power (Faul et al., 2009). For the power analysis, the odds ratio was set to $OR = 1.5$, a small effect size (Field, 2013), significance was set to $p < 0.05$ (two-tailed), and power was set to $1\text{-}\beta = 0.80$. To account for the multiple predictor variables, the R^2 other X was computed and set to 0.15. As seen in Figure 1, the power analysis results indicated that a sample size of $N = 362$ was necessary to achieve power. The sample size of $N = 1{,}391$ African American late adolescents far exceeded the required sample size of $N = 362$.

Figure 1

Power Analysis Findings

***z* tests -** Logistic regression		
Options:	Large sample z-Test, Demidenko (2007) with var corr	
Analysis:	A priori: Compute required sample size	
Input:	Tail(s)	= Two
	Odds ratio	= 1.5
	Pr(Y=1|X=1) H0	= 0.2
	α err prob	= 0.05
	Power (1-β err prob)	= 0.80
	R^2 other X	= .15
	X distribution	= Normal
	X parm μ	= 0
	X parm σ	= 1
Output:	Critical z	= 1.9599640
	Total sample size	= 362
	Actual power	= 0.8007483

Instrumentation and Operationalization of Constructs

The 2018 NSDUH was the instrument used in this study. The NSDUH has received extensive psychometric attention and validation (Hedden et al., 2012; Kennet & Gfroerer, 2005; Morton et al., 2006; SAMHSA, 2019). There is empirical evidence that the prevalence rates of drug use, including cannabis use, found in the NSDUH correspond with those reported in the MTF study data (Alshaarawy, & Anthony, 2017; Boyd et al., 2015; Chen et al., 2015; Dutra et al., 2018). NSDUH data findings concerning drug and mental health issues and mental health care utilization have also been shown to align with those reported in the Behavioral Risk Surveillance Systems, the Medical Expenditure Panel Survey, and the National Epidemiologic Survey on Alcohol and Related Conditions (Hedden et al., 2012; Pemberton et al., 2013). The NSDUH has sound inter-rater reliability, with kappas ranging from 0.75 (fair) to 0.90 and higher

(excellent; Kennet & Gfroerer, 2005; Morton et al., 2006) and test-retest reliability, evidenced by low gross discrepancy rates between 0.01 and 0.13 (Tourangeau et al., 2019). Furthermore, the individual questionnaires used to measure support, coping, anxiety, and depression, including the 6-item Kessler Psychological Distress Scale (K-6; Kessler, 2002), contained in the NSDUH were selected for their psychometric strengths (SAMHSA, 2010, 2019).

The 2018 NSDUH dataset contains the study variables used in this study, namely, state MML status, adolescent report of depression, and adolescent 30-day use (see Appendix). The study included the NSDUH variables of gender, grade (inclusive of college status), socioeconomic status, and alcohol and cigarette use for descriptive information or in statistical analyses as covariates. The operationalization of the study variables is presented in the following subsections.

Predictor and Moderating Variable: State MML Status

The predictor/moderating variable of state MML status was assessed by the single variable that measures whether the participants reside in a state that has legalized medical marijuana use at the time of the interview, one of the study predictors (see Appendix A). The state MML variable is dichotomous, coded where 1 = *the participant resides in a state where marijuana is approved for medical use* or 0 = the *participant does not reside in a state where marijuana is approved for medical use.*

Predictor Variable 2: Depression

The predictor variable of depression was assessed using the K-6 (Kessler et al., 2002), which is comprised of six questions that inquire about the individual's emotional

distress and depression in the past 30 days (see Appendix A). Example questions are "During the past 30 days, about how often did you feel hopeless?" and "During the past 30 days, about how often did you feel so depressed that nothing could cheer you up?" The six items have Likert-type responses ranging from 0 = *none of the time* to 4 = *all of the time* (Kessler et al., 2002). The K-6 composite scale score is derived by summing the item scores; composite scores can range from 0 to 24, with a higher score denoting higher levels of depression (Kessler et al., 2002).

There is consistent and strong empirical evidence of the validity and reliability of the K-6 in adult and adolescent samples (Bessaha et al., 2017; Ferro, 2019; Kessler et al., 2002; Mewton et al., 2016; Staples et al., 2019). The K-6 scale has emerged as a single factor in exploratory and confirmatory factor analyses (Bessaha et al., 2017; Kessler et al., 2002; Mewton et al., 2016), providing evidence of its construct validity. There is evidence of the discriminant validity of K-6, with scores differentiating between males as compared to female adolescents with psychiatric histories (Ferro, 2019) and adults with or without clinical diagnoses of depression and/or anxiety (Kessler et al., 2002; Stolk et al., 2014). The K-6 has demonstrated criterion-related validity, showing significance (i.e., *r*s = .15 to .65, *p*s < .05 to < .001) with measures of depression, anxiety, bipolar disorder, and psychological distress (Ferro, 2019; Kessler et al., 2002; Mewton et al., 2016; Staples et al., 2019; Stolk et al., 2014). The 4-week test-retest reliability of the K-6 is sound (i.e., *r*s in the .80s, p < .001; Kessler et al., 2002; Staples et al., 2019), and the K-6 has excellent inter-item reliability, with Cronbach's alphas ranging from the low .80s to mid-.90s (Ferro, 2019; Kessler et al., 2002; Mewton et al., 2016; Staples et al., 2019; Stolk et

al., 2014). As stated by Ferro (2019, p. 647), "the K-6 is a valid and reliable measure of psychological distress among youth."

Criterion Variable: Past 30-Day Marijuana Use

The criterion variable, past 30-day marijuana use, will be measured using a single item that inquires as to the average number of days the individual used marijuana in the past month. As 50-60% of the respondents reported not using marijuana at all in the past month (SAMHSA, 2019), this variable will be coded as a dichotomous measure, where 1 = *Yes, used marijuana in the past 30 days* and 0 = *No, did not use marijuana in the past 30 days*.

Descriptive Variable 1: Gender

The descriptive variable of gender will be assessed using a single item on the participant's gender. This is a dichotomous variable measured where 1 = *male* and 2 = *female*.

Descriptive Variable 2: Grade

The descriptive variable of grade will be assessed using a single item that query about the participant's grade level. Grade is an ordinal variable coded where 1 = *5th grade or lower,* 2 = *6th grade,* 3 = *7th grade,* 4 = *8th grade,* 5 = *9th grade,* 6 = *10th grade,* 7 = *11th grade,* 8 = *12th grade,* 9 = *college or university, 1st year,* 10 = *college or university, 2nd or 3rd year,* and 11 = *college or university, 4rd year or higher.*

Descriptive Variable 3: Socioeconomic Status

The descriptive variable of socioeconomic status will be assessed using an annual family income item. Family income is an ordinal variable coded where 1 = *less than $20,000,* 2 = *$20,000-$49,000,* 3 = *$50,000-$74,999, and* 4 = *$75,000 or higher.*

Descriptive Variable 4/Covariate 1: Lifetime Alcohol Use

The descriptive variable of lifetime alcohol use will be measured using a single item. This item inquires as to whether the individual has ever had a drink of alcohol in his/her lifetime. It is a dichotomous variable, coded where 1 = *Yes* and 0 = *No*.

Descriptive Variable 5/Covariate 2: Lifetime Cigarette Use

The descriptive variable of lifetime cigarette use will be measured using a single item. This item inquires as to whether the individual has ever used cigarettes in his/her lifetime. It is a dichotomous variable, coded where 1 = *Yes* and 0 = *No*.

Data Analysis Plan

The data analysis plan is structured to best address the study's three research questions, which are informed by Smart's (1980) availability-proneness model. Each of the research questions has associated null and alternative hypotheses. The research questions and hypotheses are:

RQ1: To what degree, if any, does the MML status of the state in which the youth resides significantly relate to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20)?

$H_0$1: The MML status of the state in which the youth resides is not significantly related to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20).

H_a1: The MML status of the state in which the youth resides is significantly related to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20).

RQ2: To what degree, if any, does the level of self-reported depression significantly relate to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20)?

$H_0$2: The level of self-reported depression is not significantly related to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20).

H_a2: The level of self-reported depression is significantly related to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20).

RQ3. To what degree, if any, does the MML status of the state in which the youth resides significantly moderate between the level of self-reported depression and past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20)?

$H_0$3: The MML status of the state in which the youth resides does not significantly moderate between the level of self-reported depression and past-

month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20).

H_a3: The MML status of the state in which the youth resides does significantly moderate between the level of self-reported depression and past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20).

The 2018 NSDUH dataset was downloaded from SAMHSA (https://www.datafiles.samhsa.gov/study-dataset/national-survey-drug-use-and-health-2018-nsduh-2018-ds0001-nid18758) into an SPSS 27.0 data file. SPSS 27.0 will be used for the calculation of statistical analyses (see Appendix). The data analysis plan was sequential and conducted in steps; it is presented in Table 1. A discussion of these steps follows Table 1.

Table 1.

Data Analysis Steps

Data analysis step	*Activities*	*Tests*
1. Data cleaning and organization	• Check for missing data • Determine inter-item reliability of K-6 (Kessler et al., 2002) • Compute KS composite score	• Missing data already imputed by SAMHSA • Compute Cronbach's alpha of K-6 • Sum K-6 items to derive total K-6 score
2. Descriptive statistics	• Compute descriptive statistics for study variables	• Compute frequencies and percentages for state MML status, 30-day marijuana use, gender, grade, family income, alcohol use, and cigarette use • Compute mean, median, standard deviation, and standard error for K-6
3. Covariate testing	• Compute statistics to test for covariates	• Compute chi-square tests of independence to examine if there are significant lifetime cigarette and alcohol use effects on 30-day marijuana use
4. Assumption testing	• Test for data assumptions for logistic regression	• **No significant outliers**: Compute Mahalanobis distance values for each case (participant). Cases that have Mahalanobis distance values > 13.82 should be removed (Fields, 2013). • **Lack of multicollinearity between predictor variables**: compute variance inflation factors (VIFs). Multicollinearity is absent if VIF < 4.00 (Garson, 2012). • **Linearity between the predictor and the logit of the criterion**: conduct Box-Tidwell test
5. Hypothesis testing	• Conduct one moderated logistic regression	• Compute interaction term by (1) centering (standardizing) the K-6 variable, (2) multiplying the state MML status by the K-6 variable, and (3) using the interaction variable to determine moderation effects. • Enter any covariate first, followed by the state MML status variable, the K-6 variable, and the interaction term • Utilize Hayes process macro to determine interaction effects (Newsom, 2016)

The first step in the data analysis is data cleaning and organization, and it will involve computing the Cronbach's alpha for the K-6 and computing the K-6 composite scale. The second step will involve computing the descriptive statistics for study variables (See table for specific statistics). The third step will be covariate testing. As the covariates are nominal (i.e., gender, lifetime alcohol use, lifetime cigarette use) or ordinal (i.e., grade, family income), and the criterion variable of past 30-day marijuana use is dichotomous, the best approach would be to conduct a series of chi-square tests of independence. The chi-square test of independence "is designed to analyze group differences when the dependent variable is nominal;" predictor variables are most commonly nominal but can be ordinal (McHugh, 2013, p. 143).

Logistic regression has three key statistical assumptions of the data. The first assumption is the lack the interval predictor variables have no significant outliers (Field, 2013; Garson, 2012). Mahalanobis distances, which are measures of the distance of each cases' scores are from the average distribution of scores, or centroid (Field, 2013; Garson, 2012), will be computed to test for the lack of significant outliers. The Mahalanobis distance critical value for two predictors is χ^2 ($df = 2$) > 13.82, $p < .001$ (Garson, 2012). As the sample size is robust, if case outliers are detected, they will be removed from the dataset. The second assumption of lack of multicollinearity, or exceedingly high correlations among predictor variables (Field, 2013) will be assessed by computing variance inflation factors (VIFs) among the two predictor variables. The assumption of lack of multicollinearity is met if the VIFs < 4.00 (Field, 2013; Garson, 2012).

The third assumption, linearity between the predictor variable and the logit of the criterion variable, will be tested by conducting a Box Tidwell test, per recommendations (Field, 2013; Garson, 2012). The Box Tidwell test is a two-step procedure, with an interaction variable computed for each predictor variable (i.e., by multiplying the predictor variable by its log; Garson, 2012) and then these two interaction variables will be entered as predictors of the criterion variable in a logistic regression (Field, 2013; Garson, 2012). If the logistic regression nonsignificant (i.e., $p > 0.05$), the assumption of linearity is met (Field, 2013; Garson, 2012). A violation of the linearity assumption will result in transformation (e.g., exponential, logarithmic, or square root transformations) of the predictor variables, per recommendations (Field, 2013; Garson, 2012).

Hypothesis testing will entail conducting one moderated logistic regression. As noted in Table 1, the first step for the logistic regression is computing an interaction term by centering (standardizing) the K-6 variable, multiplying the state MML status by the K6 variable, and using the interaction variable to determine moderation effects. For the moderated logistic regression, any significant covariate will be entered first, followed by the state MML status variable, the K6 variable, and the interaction term. Per recommendations (Memon et al., 2019; Newson, 2016), the Hayes process macro will be conducted to determine, and verify interaction, or moderation, effects.

The statistical findings reported for the moderated logistic regression model will include the overall logistic regression model chi-square (χ^2), with significance set at $p < 0.05$, the model Nagelkerke R^2, an indicator of effect size (Field, 2013) and the classification table, which denotes the percentage of cases correctly classified into the 30-

day marijuana use categories. The statistical findings reported for each covariate-criterion and predictor-criterion variable relationship will be the Wald statistic, with significance set at $p < .05$ and the odds ratio, with a 95% confidence interval. Chi-square tests of independence may be computed to clarify the moderated logistic regression findings.

Threats to Validity

Quantitative studies must demonstrate sound internal, external, and statistical conclusion validity (Onwuegbuzie, 2000). A study has sound internal validity when a relationship can be established between the predictor and criterion variables and cannot be explained by other factors between variables, whereas external validity is demonstrated by the generalizability of the study (Onwuegbuzie, 2000). Statistical conclusion validity of a study is demonstrated when the findings are "justified … as far as statistical issues are concerned" (García-Pérez, 2012, p. 1). The internal, external, and statistical conclusion validity of a study all have associated threats, or elements of the study methodology or design that introduce bias into the study and reduce the quality and trustworthiness of findings (Gray, 2013). The validity of a study is enhanced by the reduction of associated threats (Onwuegbuzie, 2000).

Internal Validity Threats

Many of the internal validity threats pertain to experimental studies (i.e., history, maturation, testing, instrumentation, regression to the mean, attrition) and are not applicable to correlational studies (Onwuegbuzie, 2000). Two threats to internal validity for a correlational study are the *self-selection bias* (i.e., participants and non-participants differ on key characteristics; Heckman, 1990) and the *social desirability bias* (i.e.,

participants provide favorable, but not necessarily truthful, survey responses; Chung & Monroe, 2003). The self-selection and social desirability biases were minimized if not removed in the 2018 NSDUH data using stratified multistage sampling, a type of random sampling (SAMHSA, 2019). An additional threat to internal validity for correlation research is causal ambiguity, where temporal precedence (i.e., that the predictors preceded or came before the criterion variables) cannot be established (Onwuegbuzie, 2000). Temporal precedence cannot be determined in this study. However, this study is less concerned about precedence and more concerned about determining if significant relationships exist among variables.

External Validity Threats

There are external validity threats in this study. One external validity threat is the *threat of population validity*, or the inability to apply study findings to other samples (Onwuegbuzie, 2000). This threat increases in likelihood when the study utilizes a highly specific and defined sample (Onwuegbuzie, 2000), which will be used in this study. Study findings cannot be generalized to other samples that include African Americans less than age 16 and older than 20 and non-African American adults and adolescents. It also should be noted that findings from this study cannot be generalized to other NSDUH samples. Another threat to external validity is the *threat of specificity of variables*, where findings cannot be generalized to studies that utilized other data collection instruments (Onwuegbuzie, 2000). The variables are operationalized in specific ways in this study, and as such, study findings may differ from other research that utilizes different instruments.

Statistical Conclusion Validity Threats

The primary threats to statistical conclusion validity are *low statistical power*, *violations of statistical assumption*, and *poor reliability of study instruments* (García-Pérez, 2012). These threats have been minimized in this study. The threat of low power is not a concern in this study, as the sample size of 1,137 far exceeds the required sample size of 362 determined by the power analysis. The testing and addressing of assumptions for logistic regression will eliminate the threat of violations of statistical assumptions. The threat of poor instrument reliability is not a concern in this study. Most variables are single items, and the K6 (Kessler et al., 2002) has sound inter-item reliability. Moreover, a Cronbach's alpha will be computed for the K6 to ensure that they display adequate inter-item reliability. Threats to statistical conclusion validity are unlikely to occur in this study.

Ethical Procedures

Ethical procedures were followed by the NSDUH researchers (SAMHSA, 2019) and will be followed in this study. Institutional Review Board approval was sought prior to downloading the NSDUH data and analyzing the data. The NSDUH study researchers required that participants provided informed consent, and they collected no identifying information (SAMHSA, 2019). The 2018 NSDUH dataset, being in the public domain, contains no identifiers; the participants are completely anonymous to the student investigator. The investigator will maintain the NSDUH dataset on an encrypted and password-protected jump-drive, kept in a locked file cabinet in the investigator’s home office. All other study materials (e.g., printouts, SPSS output) will be kept in a separate

locked file cabinet in the investigator's home office. All study materials will be maintained for five years, after which they will be destroyed.

Summary

This quantitative correlational (predictive) study will utilize the 2018 NSDUH dataset to examine if state MML status and depression significantly contributed to marijuana use and to assess if state MML status significantly moderates between depression and marijuana use, in a national sample of African American adolescents, ages 16 to 20. The purpose of this section of the proposal was to provide a detailed overview of the methodology of the study, implemented to best address the study purpose. In this section, the research design was identified as a cross-sectional correlational design, augmented by a rationale for its use. The section continued with discussions on the target population, sampling, and sample. In this study, the target population and sample are the same: 1,137 African American adolescents, ages 16 to 20, who completed the 2018 NSDUH. The NSDUH study instrument was discussed in relation to its validity and reliability, and the operationalization of all study variable was then presented. The data analysis section included a restatement of the research questions and hypotheses and the steps in the data analysis process. The penultimate subsections pertained to the study threats to validity and ethical procedures of the study. The section's clear and organized discussions of the methodology add clarity to the steps used to collect and analyze data, the findings of which are discussed in the next section.

Section 3: Presentation of the Results and Findings

Introduction

The purpose of this quantitative cross-sectional correlational study was two-fold: to determine if the MML status of the state in which the adolescent resides and the adolescent's depression was significantly related to their past-month marijuana use and to assess if state MML status significantly moderated between depression and past-month marijuana use in a national sample of African American adolescents aged 16 to 20. For this study I utilized data from the 2018 NSDUH, a national dataset on substance use and mental health among Americans aged 12 or older collected yearly by SAMHSA (2018). This quantitative cross-sectional correlational study had three research questions, each having associated null and alternative hypotheses:

RQ1: To what degree, if any, does the MML status of the state in which the youth resides significantly relate to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20)?

$H_0$1: The MML status of the state in which the youth resides is not significantly related to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20).

H_a1: The MML status of the state in which the youth resides is significantly related to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20).

RQ2: To what degree, if any, does the level of self-reported depression significantly relate to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20)?

$H_0$2: The level of self-reported depression is not significantly related to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20).

H_a2: The level of self-reported depression is significantly related to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20).

RQ3. To what degree, if any, does the MML status of the state in which the youth resides significantly moderate between the level of self-reported depression and past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (ages 16-20)?

$H_0$3: The MML status of the state in which the youth resides does not significantly moderate between the level of self-reported depression and past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20).

H_a3: The MML status of the state in which the youth resides does significantly moderate between the level of self-reported depression and past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (aged 16-20).

Organization of Chapter

Study results and findings are the topics of this section. The section opens with a summary on accessing the secondary data used in the study (i.e., NSDUH 2018), followed by a discussion on the necessary changes made to the data analyses concerning the testing of assumptions and hypothesis testing using binary logistic regression. The section continues with a presentation of the study results, the largest and most comprehensive subsection. Included in the Results subsection are descriptive statistics on the study variables, findings from the testing of assumptions for binary logistic regression, and the results for hypothesis testing. The section concludes with a summary.

Accessing the Dataset for Secondary Analysis

For this study I utilized data from the most current version, the 2018 NSDUH dataset, which is in the public domain and was downloaded as an SPSS file from the SAMHSA website at https://www.datafiles.samhsa.gov/dataset/national-survey-drug-use-and-health-2018-nsduh-2018-ds0001. The NSDUH, implemented for 50 years, is recognized as a comprehensive annual national survey that measures substance use/abuse, mental health, and mental health treatment use in a national sample of civilian, noninstitutionalized Americans aged 12 and older (McCance-Katz, 2019; SAMHSA, 2019). The NSDUH has guided public policy in the areas of public health and mental health for 50 years (McCance-Katz, 2019). There were benefits to using the NSDUH 2018 archival dataset. The NSDUH is implemented using stratified multistage probability sampling, allowing researchers to randomly select study participants using “different rates based on state and age” and ensuring for sample representativeness (SAMHSA,

2019, p. 3). A primary benefit of using NSDUH data is that it is the only national dataset to include a question about state MML status, which has allowed scholars to conduct studies examining the effects of state MML status on adolescent cannabis attitudes and use and adolescent mental health (Mauro et al., 2019; Schmidt et al., 2019).

I downloaded the NSDUH dataset from the SAMHSA website as a SPSS 27.0 data file and saved it on an encrypted and password-protected USB drive. Using SPSS 27.0 data selection tools, I reduced the dataset to the specific sample for the study (i.e., deleting data from non-African Americans and those not between the ages of 16 and 20) so that the dataset contained data from only African American youth between the ages of 16 and 20. The sample of African Americans was larger than expected: $N = 1{,}391$. A *post hoc* power analysis indicated that the power exceeded .99. All analyses were conducted using SPSS 28.0.

Discrepancies in the Data Analysis Plan

There were a few changes from the initial data analysis plan. A review of the dataset revealed that only the adult (i.e., 18-20 years of age) participants completed the K-6 (Kessler et al., 2002); K-6 data were completely missing for the participants ages 16 to 17 years of age. The NSDUH 2018 did have a single item inquiring as to whether the participant had received a diagnosis for major depressive disorder, and data were available for all 1,391 participants. This was an improvement to the study for various reasons. The K-6 variable for the 18- to 20-year-old participants was highly skewed, having a *z* skewness value of 11.04 (a *z* skewness value of +/-1.96 violates the normality assumption; Garson, 2012). The use of the K-6 would have required variable

transformation (e.g., loglinear or square root; Garson, 2012), complicating the statistical analysis for hypothesis testing. Moreover, a diagnosis of depression from a physician is a more objective indicator of depression as compared to a self-report, especially from youth, who are prone to the social desirability bias (Chung & Monroe, 2003). Finally, the depression diagnosis variable was dichotomous, simplifying the moderated binary logistic regression analysis and allowing for a more accessible statistical interpretation of the state MML status-depression interaction effect on adolescents' marijuana use in the past month.

The use of two dichotomous predictor variables necessitated changes in the data analyses for assumption and hypothesis testing. A Box Tidwell regression could not be conducted to test for the linearity assumption, as it uses the log of an interval or ratio variable (Field, 2013). As such, two phi (ϕ) coefficients were conducted to examine if the relationships between the predictor variables of state MML status and depression and the criterion variable of past-month marijuana use were linear. The phi (ϕ) coefficient is a nonparametric correlation, which denotes the relationship between two dichotomous variables; values range from -1 to +1, with a higher value denoting higher variable correlation (Field, 2013).

The three categorical variables (i.e., state MML status, depression, and the state MML status by depression interaction variable) introduced mathematical issues for moderated binary logistic regression, the planned analysis for hypothesis testing. When continuous (i.e., interval or ratio) variables are used in moderated binary logistic regression, they must be standardized (i.e., mean of 0 and standard deviation of 1) and

multiplied with the other predictor variable(s) to compute an interaction variable, which tests for moderation (Field, 2013). A different process is used for categorical variables (Field, 2013). Instead of centering and multiplying the two predictor variables (as was initially planned), a new categorical variable was computed for the interaction term or moderator. The interaction variable was coded where 1 = youth lives in a MML state and has depression diagnosis, 2 = youth lives in a MML state and does not have a depression diagnosis, 3 = youth lives in a non-MML state and has depression diagnosis, and 4 = youth lives in non-MML state and does not have a depression diagnosis (the reference group in analyses). However, the interaction variable could not be used in a moderated binary logistic regression as it would violate the assumption of independence of observations and lack of multicollinearity (Field, 2013). As such, two binary logistic regressions were conducted for hypothesis testing. The first binary logistic regression addressed the first and second research questions as to whether state MML state and depression were significantly related to past-month marijuana use (controlling for covariates); the second analysis addressed the third research question as to whether state MML status moderated between depression and past-month marijuana use (controlling for covariates).

Results

Descriptive Statistics

Included in this study analysis were the descriptive variables on participant demographics (i.e., age group, gender, grade level, family income), the two covariates of lifetime cigarette and alcohol use, and the key variables: the predictor/moderator of state

MML status, the predictor of adolescent depression, and the criterion variable of past-month marijuana use. As all study variables were either dichotomous (e.g., age group, gender, lifetime cigarette and alcohol use, state MML status, depression diagnosis, past-month marijuana use) or ordinal (i.e., grade level, family income), the descriptive statistics reported were frequencies and percentages. The following sections provide descriptive information on the study variables.

Descriptive Statistics: Participant Demographics and Lifetime Cigarette/Alcohol Use

Table 2 provides the frequencies and percentages regarding the participant demographics of age group, gender group, grade level, and family income level. There was a relatively equal number of participants across the two age groups, with 667 (48.0%) participants aged 16 to 17 years and 624 (52.0%) aged 18 to 20 years. The sample was also equally split between male (n = 697, 50.1%) and female participants (n = 694, 49.9%). Few (n = 29, 1.9%) participants were in middle school/junior high (5^{th}-8^{th} grade); the majority (n = 808, 58.1%) were in high school (9^{th}-12^{th} grade). Almost a quarter of the participants (n = 340, 24.4%) were high school graduates, and 217 (15.6%) participants were attending college. Most participants were of low- to low-to-middle income status: 525 (37.7%) had an annual family income of less than $20,000 and 508 (36.5%) reported an annual family income that was between $20,000 and $49,999. One hundred thirty-six (9.8%) participants had an annual family income of between $50,000 and $74,999, while the family income was $75,000 or higher for 222 (16.0%) participants.

Table 2

Descriptive Statistics: Participant Age Group, Gender Group, Grade Level, and Family Income

Variable		Frequency (n)	Percentage (%)
Age group			
	16-17	667	48.0
	18-20	724	52.0
Gender group			
	Male	697	50.1
	Female	694	49.9
Grade level			
	Middle school/junior high (5th-8th grade)	26	1.9
	High school (9th-12th grade)	808	58.1
	High school graduate	340	24.4
	Attending college	217	14.6
Family Income			
	Less than $20,000	525	37.7
	$20,000-$49,999	508	36.5
	$50,000-$74,999	136	9.8
	$75,000 or more	222	160

Note. (N = 1391).

Table 3 provides the descriptive statistics for the covariates of lifetime cigarette and alcohol use for the 1391 study participants. Lifetime cigarette use was low, with 1184 (85.1%) youth never having smoked and 20 (14.9%) having smoked cigarettes in their lifetime. In contrast, 787 (56.6%) participants reported never having drunk alcohol in their lifetime while 604 (43.4%) youth stated that they had drunk alcohol in their lifetime. A higher percentage of male participants (60.9%) as compared to female participants (39.1%) smoked cigarettes in their lifetime ($\chi^2[1, 1391] = 11.27$, $p < .001$); however, a relatively equal percentage of males (49.5%) and females (50.5%) drank alcohol their lifetime ($\chi^2[1, 1391] = 0.16$, $p = .693$).

Table 3

Descriptive Statistics: Lifetime Cigarette and Alcohol Use

Variable		Frequency (n)	Percentage (%)
Smoked cigarettes in lifetime			
	No	1184	85.1
	Yes	20	14.9
Drank alcohol in lifetime			
	No	787	56.6
	Yes	604	43.4

Note. (N = 1391).

Descriptive Statistics: Predictor/Moderator of State MML Status, Predictor of Depression, and Criterion Variable of Past-Month Marijuana Use

Table 4 provides descriptive data on the predictor/moderating variable of MML state status, the predictor variable of depression diagnosis, and the criterion variable of past 30-day marijuana use. Most participants (n = 873, 62.8%) resided in a state that has passed MML; 518 (37.2%) did not. A high number of participants (n = 1192, 85.7%) never received a diagnosis of depression from a physician; 199 (14.3%) participants had received a formal diagnosis of depression. Past-month marijuana use was relatively high: while 894 (64.2%) of the youth did not use cannabis in the past month, over a third of participants (n = 498, 35.8%) reported past-month use. Past-month marijuana use was relatively equal across gender groups (χ^2[1, 1391] = 2.62, p = .106): 47% of female participants and 53% of male participants reported using marijuana in the past month.

Table 4

Descriptive Statistics: MML State Status, Depression Diagnosis, and Past-Month Marijuana Use

Variable	Frequency (n)	Percentage (%)
MML state status		
Yes, reside in a MML state	873	62.8
No, do not reside in a MML state	518	37.2
Depression diagnosis		
No, never diagnosed with depression	1192	85.7
Yes, diagnosed with depression	199	14.3
Used marijuana in past month		
No	893	64.2
Yes	498	35.8

Note. (N = 1391).

Testing of Covariates

The study covariates of lifetime alcohol and cigarette use and the criterion variable of past-month marijuana use were dichotomous. As such, chi-square (χ^2) tests of independence were conducted for covariate testing, as were phi (ϕ) coefficients, which are a type of non-parametric correlation used to determine the relationship between two dichotomous variables (Sharpe, 2015). The results from the chi-square (χ^2) tests of independence and the phi (Φ) coefficients are presented in Table 5. Both lifetime cigarette and alcohol use were related to past-month marijuana use, $\chi^2(1, 1391) = 199.53$, $\Phi = .38$, $p < .001$ and $\chi^2(1, 1391) = 301.00$, $\Phi = .47$, $p < .001$, respectively. Results showed that 67.1% of youth who smoked cigarettes in their lifetime and 74.3% of youth who drank alcohol in their lifetime reported using marijuana in the past month. Due to their significance with past-month marijuana use, lifetime cigarette use, and lifetime alcohol use were included as covariates in the moderated binary logistic regression.

Table 5

Chi-Square Tests of Independence and Phi Coefficients: Lifetime Cigarette Use, Lifetime Alcohol Use, and Past Month Marijuana Use

Variable	Categories	% Used marijuana in past month		Chi-square	Phi coefficients	Significance (p)
		No	Yes			
Lifetime cigarette use				χ^2 (1, 1391) = 199.53	Φ = .38	<.001
	No	95.2	32.9			
	Yes	4.8	67.1			
Lifetime Alcohol use				χ^2 (1, 1391) = 301.00	Φ = .47	<.001
	No	73.8	25.7			
	Yes	26.2	74.3			

Note. (N = 1391).

Testing of Assumptions for Binary Logistic Regression

Logistic regression has three key statistical assumptions of the data. The first assumption is no significant multivariate outliers, or cases (participants) whose variable scores are far higher or lower than average (Field, 2013; Garson, 2012). The assumption of no significant outliers was tested by computing case Mahalanobis distances, which are measures of the distance of each cases' scores are from the average distribution of scores, or centroid (Field, 2013; Garson, 2012). None of the case Mahalanobis distance values exceeded the critical value of 13.82 (p < .001) for two predictors (Garson, 2012). The assumption of no significant outliers was met.

The second assumption for binary logistic regression is lack of multicollinearity, or exceedingly high correlations among predictor variables (Field, 2013). As stated previously in this section, the lack of multicollinearity among the predictor variables assumption would be violated if the interaction variable was introduced into the

regression model. As such, two binary logistic regression were conducted for hypothesis testing. Variance inflation factors (VIFs) were calculated for the two predictor variables (i.e., state MML status, depression). The VIFs for state MML status and depression diagnosis were both 1.00 (Field, 2013; Garson, 2012), indicating no correlation between the two variables. Indeed, descriptive findings showed that the percentages of youth diagnosed with depression in non-MML states and MML states was remarkably similar, 13.7% and 14.7%.

The third assumption, linearity between the predictor variable and the logit of the criterion variable. A Box Tidwell regression could not be conducted to test for the linearity assumption, as it utilizes the log of an interval or ratio variable; the log of a categorical variable cannot be computed (Field, 2013). As such, two phi (ϕ) coefficients were conducted to examine the relationship between the predictor variables of state MML status and depression and the criterion variable of past-month marijuana use. The phi (ϕ) coefficient is a non-parametric correlation, which denotes the relationship between two dichotomous variables; values range from -1 to +1, with a higher value denoting higher variable agreement (Field, 2013). There was a linear albeit non-significant relationship between state MML status and past-month marijuana use, $\phi(1391) = .05$, $p = .074$. There was a linear and significant relationship between adolescent depression diagnosis and past-month marijuana use, $\phi(1391) = .11$, $p < .001$. The assumption of linearity was met.

Hypothesis Testing: Binary Logistic Regression

Hypothesis testing involved two binary logistic regressions. The first binary logistic regression addressed the first and second research question as to whether state

MML status and depression were significantly related to past-month marijuana use. The second binary logistic regression was conducted with the state MML status/depression interaction variable, comprised of four categories, to address the third research question as to whether state MML status significantly moderated between depression and past-month marijuana use. The binary logistic regression findings are presented first and then discussed in relation to the null hypotheses.

Binary Logistic Regression: State MML Status and Depression Predicting Past-Month Marijuana Use

Table 6 presents the results from the first binary logistic regression. The overall logistic regression model was significant, $\chi^2(4, 1391) = 408.39$, $p < .001$. The Nagelkerke R^2 was .35, a large effect size (Field, 2013), and the classification of groups had an accuracy of 75.3%, higher than the expected 64.2% in the null model. With regard to the predictor variables, the state MML status in which the youth resides was not significant related to past-month marijuana use, *Wald* $\chi^2(1) = 2.55$, $p = .111$ (*OR* = 1.25; *95% CI*: 0.95-1.63). However, depression was significantly related to past-month marijuana use, *Wald* $\chi^2(1) = 5.93$, $p = .015$ (*OR* = 1.56; *95% CI*: 1.09-2.24). Youth with a depression diagnosis had a 56% increased probability of using marijuana in the past month than youth without a depression diagnosis. Lifetime cigarette and alcohol use were also significantly related to past-month marijuana use, *Wald* $\chi^2(1) = 5.80$, $p < .001$ and *Wald* $\chi^2(1) = 6.12$, $p < .001$, respectively.

Two chi-square (χ^2) tests of independence confirmed the binary logistic regression results. There was not a significant effect of state MML status on past-month marijuana

use, $\chi^2(1) = 3.20$, $p = .074$. The percentage of youth who resided in states with MML who used marijuana in the past month (37.6%) was slightly higher than the percentage of youth who resided in non-MML states (32.8%), but not significantly so. In contrast, there was a significant effect of depression on past-month marijuana use, $\chi^2(1) = 15.64$, $p < .001$. Findings showed that almost half (48.2%) of youth with a depression diagnosis used marijuana in the past month as compared to 33.7% of youth without depression.

Table 6

Binary Logistic Regression: State MML Status and Depression Predicting Past-Month Marijuana Use, Controlling for Lifetime Cigarette and Alcohol Use

	B	*SE B*	*Wald* χ^2	*P*	*OR*	*OR 95% CI*	
						Lower	*Upper*
Lifetime cigarette use	*-1.76*	*.20*	*78.45*	*<.001*	*5.80*	*3.93*	*8.55*
Lifetime alcohol use	*-1.81*	*.13*	*184.86*	*<.001*	*6.12*	*4.72*	*7.95*
State MML status	-0.22	.14	2.55	.111	1.25	0.95	1.63
Depression diagnosis	*-0.45*	*.18*	*5.93*	*.015*	*1.56*	*1.09*	*2.24*

Note. (N = 1391). Significant findings are in italics.

Research Question 1. The first research question was as follows:

RQ1: To what degree, if any, does the MML status of the state in which the youth resides significantly relate to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (ages 16-20)?

Results from the binary logistic regression showed that the state MML status in which the youth resides was not significantly related to past-month marijuana use, *Wald* $\chi^2(1) = 2.55$, $p = .111$ (*OR* = 1.25; *95% CI*: 0.95-1.63). Due to the lack of a significant relationship between state MML status and past-month marijuana use, the null hypothesis

(i.e., state MML status in which the youth resides is not significantly related to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents [ages 16-20]), was retained for the first research question.

Research Question 2. The second research question was as follows:

RQ2: To what degree, if any, does the level of self-reported depression significantly relate to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (ages 16-20)?

Results from the binary logistic regression showed that adolescents with a diagnosis of depression had a 56% higher probability of past-month marijuana use as compared to adolescents without a depression diagnosis, *Wald* $\chi^2(1) = 5.93$, $p = .015$ (*OR* = 1.56; *95% CI*: 1.09-2.24). Due to the significant relationship between depression and past-month marijuana use, the null hypothesis (i.e., depression is not significantly related to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents [ages 16-20]), failed to be retained for the second research question.

Binary Logistic Regression: State MML Status Moderating between Depression and Predicting Past-Month Marijuana Use

Table 7 presents the results from the second binary logistic regression, conducted to determine if state MML status moderated between depression and past-month marijuana use. The overall logistic regression model was significant, $\chi^2(5, 1391) = 411.01$, $p < .001$. The Nagelkerke R^2 was .35, a large effect size (Field, 2013), and the classification of groups had an accuracy of 75.3%, higher than the expected 64.2% in the null model. Results showed that state MML status significantly moderated between

depression and past-month marijuana use, *Wald* $\chi^2(3) = 11.11$, $p < .011$. The reference group was youth residing in non-MML states who did not have a depression diagnosis. In comparison to this reference group, youth who resided in states with MML and had depression diagnosis had a 73% higher probability of using marijuana, *Wald* $\chi^2(1) = 5.12$, $p = .024$ (*OR* = 1.73; *95% CI*: 1.08-2.77). In contrast to youth living in non-MML states and who did not have depression, the youth who did reside in MML states but did not have a depression diagnosis had a 37% higher probability of using marijuana in the past month, *Wald* $\chi^2(1) = 4.36$, $p = .037$ (*OR* = 1.37; *95% CI*: 1.02-1.84). Finally, youth who did not reside in states with MML and had depression diagnosis were 2.37 times more likely to use marijuana in the past month than youth who resided in states without MML and did not have depression, *Wald* $\chi^2(1) = 7.49$, $p = .006$ (*OR* = 2.37; *95% CI*: 1.28-4.38). Lifetime cigarette and alcohol use were also significantly related to past-month marijuana use, *Wald* $\chi^2(1) = 77.32$ $p < .001$ and *Wald* $\chi^2(1) = 184.70$, $p < .001$, respectively. A chi-square test of independence confirmed these findings, $\chi^2(1) = 23.86$, $p < .001$: 29.3% of participants who resided in non-MML states and did not have depression used marijuana in the past month, as compared to 44.5% of youth who resided in MML states and had depression, 36.4% of youth who resided in MML states and did not have depression, and 54.9% of youth who lived in non-MML states and had depression.

Table 7

Binary Logistic Regression: The Interaction of State MML Status and Depression Predicting Past-Month Marijuana Use, Controlling for Lifetime Cigarette Use and Lifetime Alcohol Use

	B	*SE B*	*Wald* χ^2	*P*	*OR*	*OR 95% CI*	
						Lower	*Upper*
Lifetime cigarette use	*1.75*	*0.20*	*77.32*	*<.001*	*5.75*	*3.89*	*8.49*
Lifetime alcohol use	*1.81*	*0.13*	*184.70*	*<.001*	*6.13*	*4.72*	*7.97*
State MML status			*11.11*	*.011*			
NMML/NDep : MML/Dep	*0.55*	*0.24*	*5.12*	*.024*	*1.73*	*1.08*	*2.77*
NMML/NDep : MML/NDep	*0.31*	*0.15*	*4.36*	*.037*	*1.37*	*1.02*	*1.84*
NMML/NDep : NMML/Dep	*0.86*	*0.32*	*7.40*	*.006*	*2.37*	*1.28*	*4.38*

Note. (*N* = 1391). NMML/NDep = Reference Group: Reside in a state without MML and do not have depression; MML/Dep = Reside in state with MML and have depression; MML/NDep = Reside in state with MML and do not have depression; NMML/Dep = Reside in state without MML and have depression. Significant findings in italics.

Research Question 3. The third research question was as follows:

RQ3: To what degree, if any, does the MML status of the state in which the youth resides significantly moderate between the level of self-reported depression and past-month marijuana use in the 2018 NSDUH sample of African American late adolescents (ages 16-20)?

Results from the binary logistic regression showed that the state MML status in which the youth resides was significantly related to past-month marijuana use, *Wald* $\chi^2(1) = 11.11$, $p = .011$. Due to the significant relationship between the state MML status/depression interaction (moderation) variable and past-month marijuana use, the

null hypothesis (i.e., the MML status of the state in which the youth resides does not significantly moderate between the level of self-reported depression and past-month marijuana use in the 2018 NSDUH sample of African American late adolescents [ages 16-20]), failed to be retained for the third research question.

Summary

The purpose of this quantitative cross-sectional correlational study was to determine if state MML status and depression were directly and significantly related to past-month marijuana use and if the interaction (moderation) of state MML status by depression significantly affected past-month marijuana use in a 2018 NSDUH national sample of African American adolescents ages 16 to 20. The sample was comprised of 1391 youth (50.1% male, 49.9% female), 58.1% of whom were high school students, who participated in the NSDUH 2018 study. Few participants (14.9%) had smoked cigarettes in their lifetime; alcohol use was higher, with 43.4% of youth reporting having drunk alcohol in their lifetime. Most participants (62.8%) resided in a state with MML. The percentage of youth with a diagnosis of depression was 14.3%.

The NSDUH 2018 contained much information on marijuana use. Findings from this study showed that past-month marijuana use in the sample of late adolescent African American youth (ages 16-20) was relatively high, with over a third (35.8%) reporting past-month marijuana use. Use by gender group was relatively equivalent: slightly over half (53%) of males and almost half (47%) of females used marijuana in the past month. Lifetime cigarette and alcohol use had significant effects on past-month marijuana use: 67.1% of youth who smoked cigarettes in their lifetime and 74.3% of youth who drank

alcohol in their lifetime reported using marijuana in the past month. More males (60.9%) than females (39.1%) used cigarettes in their lifetime but the percentage of males and females who drank in their lifetime was equivalent, 49.5% and 50.5% respectively.

Two binary logistic regressions were conducted for hypothesis testing. Results from these analyses showed that state MML status was not significantly related to past-month marijuana use. However, a depression diagnosis did have a significant effect on marijuana use: youth with a depression diagnosis were 1.56 times more likely to use marijuana in the past month than youth without a depression diagnosis. Due to these findings, the null hypothesis for the first research question (i.e., state MML status in which the youth resides is not significantly related to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents [ages 16-20]) was retained while the null hypothesis for the second research question (i.e., depression is not significantly related to past-month marijuana use in the 2018 NSDUH sample of African American late adolescents [ages 16-20]) failed to be retained.

The findings from the second binary logistic regression showed that state MML status significantly moderated between depression and past-month marijuana use. Youth with and without depression who resided in MML states and youth with depression residing in non-MML states were more likely to use marijuana in the past month as compared to youth who resided in non-MML states and did not have a depression diagnosis. Due to the significant findings, the null hypothesis for the third research question (i.e., the MML status of the state in which the youth resides does not significantly moderate between the level of self-reported depression and past-month

marijuana use in the 2018 NSDUH sample of African American late adolescents [ages 16-20]), failed to be retained.

Study findings showed the depression played a significant role in past-month marijuana use among African American late adolescents (ages 16-20); moreover, the MML status of the state in which the youth lived compounded the likelihood to use marijuana in the past 30 days. Indeed, just 29.3% of non-depressed participants residing in non-MML states used marijuana in the past month, as compared to 44.5% of depressed youth and 36.4% of non-depressed youth who resided in MML states and 54.9% of depressed youth who lived in non-MML states. Results further showed that lifetime cigarette and alcohol use significantly correlated with past-month marijuana use in this sample of African American late adolescents. Study findings suggest that African American youth (ages 16-20) with a depression diagnosis are at risk for marijuana use; and residing in a state with MML may compound this use. The study findings are intriguing, and they are discussed in detail in the last section, Section 4. The last Section 3 is devoted to a comprehensive review of study findings vis-a-vis theory and prior research, and it includes suggestions for public health practice and future empirical work.

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

Introduction

As of 2020, 33 states in America have MML, which allows for the legal medicinal use of cannabis for adults aged 21 or older (Dickson et al., 2019). As MML may influence adolescent cannabis use "by increasing [its] availability and access while decreasing perceptions of harm" (Ladegard et al., 2020, p. S166), substantial empirical examination has been devoted to understanding the effects of MML on adolescent attitudes and use of cannabis (D'Amico et al., 2017; Melchior et al., 2019; Sarvet et al., 2018). Empirical findings have been, however, equivocal, leading scholars to suggest that certain adolescents, including those who are in late adolescence (Derefinko et al., 2016), have depression (Gobbi et al., 2019), and are African American (King et al., 2020), may be more vulnerable to the effects of MML. The purpose of this quantitative cross-sectional correlational study was two-fold: to examine if state MML status and self-reported depression were significantly related to past-month marijuana use and to assess if state MML status moderated between self-reported depression to influence past-month marijuana use in a sample of African American late adolescents (aged 16-20) utilizing data from the 2018 NSDUH.

This final section of the dissertation provides a comprehensive overview and discussion of the study findings, leading to suggestions for further research and practical applications. After a summary of the study findings, interpretations of the study findings are then offered, with results discussed in relation to prior research and the guiding theory, Smart's (1980) availability-proneness model. The study did have its limitations,

which are presented in the following subsection. I then offer recommendations for further research and implications for practice and positive social change. The section concludes with a summary.

Summary of Findings

This study utilized 2018 NSDUH data from 1,391 African American late adolescents (aged 16-20, 58.1% in high school, 50.1% male, 49.9% female). Most participants (62.8%) resided in a state that had passed MML. They were, in general, of low- to middle-income status: 74.2% reported an annual family income of $49,999 or less. The percentage of participants who reported lifetime cigarette and alcohol use was relatively low, 14.9% and 43.4%, respectively. In contrast, 35.8% of the youth reported past-month cannabis use. The percentage of participants who received a diagnosis of depression was 14.3%.

One binary logistic regression was conducted to address the first two research questions, which inquired as to whether state MML status and a diagnosis of depression were directly and uniquely related to past-month cannabis use among the participants. Results from the first binary logistic regression showed that state MML status had no significant effect on adolescents' past-month marijuana use. As such, the null hypothesis was retained for the first research question. In contrast, findings showed that a diagnosis of depression was significantly associated with past-month cannabis use. Participants with a depression diagnosis had an 56% increased probability of using marijuana in the past month as compared those who had not received a depression diagnosis. This

significant finding resulted in the failure to retain the null hypothesis for the second research question.

A second binary logistic regression was performed for the third research question, which concerned whether state MML status significantly moderated between depression and past-month marijuana use among participants. Findings from the binary logistic regression, conducted with the referent group being adolescents who resided in non-MML states and who did not have a depression diagnosis, were significant. In comparison to the referent group of participants, the participants who resided in MML states and who had depression had a 73% higher probability and participants residing in MML states but who did not have a depression diagnosis had a 37% higher probability of using marijuana in the past month. Moreover, adolescents residing in non-MML states but who did have depression were over twice as likely to use cannabis in the past month in comparison to youth residing in non-MML states and who did not have depression. Due to the significant interaction effects of state MML status and depression on adolescent past-month cannabis use, the null hypothesis for the third research question failed to be retained. The findings further showed that lifetime cigarette and alcohol use, the study's two covariates, were significantly related to an increased likelihood of past-month cannabis use, with adolescents who used cigarettes and alcohol in their lifetime being over 5 times more likely to use cannabis in the past month.

Interpretation of the Findings

This study addressed the gap in the empirical literature on state MML status and its effect on past-month marijuana use among high-risk adolescents (e.g., older, African

American, and having a diagnosis of depression) with Smart's (1980) availability-proneness theory used as the guiding theory. There were some similarities and differences to the results seen in previous studies, and the study findings can be discussed in relation to the Smart's (1980) availability-proneness theory, which is the purpose of this subsection. Findings are first discussed in relation to previous empirical work, followed by the theoretical relevance of study results.

Interpretation of the Findings: Prior Research

Since the initiation of MML starting in 2012, there has been substantial empirical attention given to the potential effects of MML on increased cannabis use in adolescents (Melchior et al., 2019; Sarvet et al., 2018). Findings however have largely been equivocal (Hasin & Aharonovuch, 2020; Hammond et al., 2020; Melchior et al., 2019; Sarvet et al., 2018). In this study, results showed that there was not a direct significant effect of state MML status on past-month cannabis use. The lack of a significant relationship between state MML status and adolescent cannabis use corresponded to those reported in the meta-analyses by Sarvet et al. (2018), who found little evidence to support the argument that adolescent marijuana use was higher in MML states as compared to non-MML states, and Melchior et al. (2019), who noted that only three out of 33 studies reported significant effects of state MML status on adolescent cannabis use.

The inconsistent empirical findings concerning state MML status and adolescent cannabis use has led to scholars suggesting that certain adolescent groups may be more influenced by state MML status to use cannabis (Robertson & Swartz, 2019; Schmidt et al., 2019). One of the most consistent findings in the literature is the significant

association between adolescent depression and cannabis use (Esmaeelzadeh et al., 2018; Gobbi et al., 2019), which was also found in this study. There is sound empirical evidence of significant links between depression and marijuana use in adolescents (Esmaeelzadeh et al., 2018; Gobbi et al., 2019); for example, results from Esmaeelzadeh et al.'s (2018) meta-analysis found that adolescents with depression were 29% more likely to use marijuana than were adolescents without depression. It has also been established that depression and marijuana use both increase from early to late adolescence, hence the study's focus on older adolescents (Gobbi et al., 2019).

The study findings also align with the minimal work conducted with African American youth, which has suggested that MML may impart more negative consequences for African American youth as compared to youth of other ethnicities (Banks et al., 2017; King et al, 2020). African American adolescents tend to initiate cannabis use at an earlier age, have more accepting attitudes toward cannabis use, and have higher marijuana use rates as compared to their European American and other ethnic peers (Banks et al., 2017; King et al, 2020). The significant association between depression and past-month cannabis use corresponds to the findings reported by King et al. (2020) in their study with 141 African American youth (aged 16-24) and Kogan et al. (2017) in their study with 505 African American young adult men (aged 19 to 22).

Interpretation of Findings: Theoretical Framework

This was the first study to examine the interactive (moderating) effects of state MML status and depression on past-month cannabis use among African American older adolescents, which prevented comparisons to prior work. As such, the study was

informed by the guiding theory, Smart's (1980) availability-proneness theory, which posited such an interaction. Simply stated, the availability-proneness theory posits that drug use is more likely to occur when an individual who is more psychologically disposed to use drugs is placed in a situation where drugs are readily available (Smart, 1980). One psychological predisposition is depression; biological proneness due to depression may create "social psychological proneness" in the form of maladaptive coping (Smart, 1980, p. 48). The results of this study provide empirical evidence for Smart's (1980) availability-proneness theory. In comparison to adolescents who resided in non-MML states and who did not have depression, adolescents in MML states with depression were 73% more likely, adolescents in MML states without depression were 37% more likely, and adolescents living in non-MML states with depression were over twice as likely to use marijuana in the past month.

Limitations of the Study

This study had both strengths and limitations. One strength was that the study included a larger than expected sample size (i.e., $N = 1{,}391$), resulting in excellent power. There were also strengths related to the use of the 2018 NSDUH. The NSDUH and the instruments contained therein are psychometrically sound (Kennet & Gfroerer, 2005; Tourangeau et al., 2019), and the multistage stratified probability sampling technique used for the 2018 NSDUH reduced the likelihood of threats to internal validity, including the self-selection and social desirability biases. Finally, this was the only study to date to focus on African American older adolescents and to examine the moderating effect of

state MML status between adolescent depression and past-month marijuana use, greatly contributing to the empirical literature.

The study had some limitations. The study was correlational in nature, and as such, findings cannot be said to be causative. There were other limitations to the study pertaining to measurement, analyses, and the dataset. The study utilized single items as measures of state MML status, depression, and past-month marijuana use; more robust measures may have resulted in different findings. It cannot be confirmed that the adolescents were truthful when providing responses that they resided in MML/non-MML states, had a diagnosis of depression, and used/did not use marijuana in the past month. The adolescents may not have known the MML status of their state. Moreover, adolescents often over- or under-report their drug use and minimize their mental health issues (Krumpal, 2013). While the variables of lifetime cigarette and alcohol use were included as covariates in the logistic regressions, there are likely other covariates that were not measured. This study was limited to data collected on the 2018 NSDUH; the study did not delineate between states that implemented MML across different years (i.e., 2011-2017). As such, findings are limited to adolescents' perceptions as measured during the year 2018. Findings cannot be generalized to non-African American youth or to African American children or adults older than 20.

Recommendations

The results of this study can be used to inform future research studies. The foundation of the scientific method is replication; the literature would benefit from additional studies that examine the effects of state MML status and depression, singly and

interaction, among African American older adolescents (ages 16-20). The research can be further extended to examine these pathways among older African Americans as well as to compare pathways between African Americans and other racial groups. This study focused only on 2018 NSDUH data; the year in which the state implemented MML was not considered nor assessed. Additional research is needed to assess if the relationships among variables differ when considering the time at which MML was implemented in states. Studies have showed that MML contributes to increased tobacco, alcohol, and opioid use among adolescents (Cerda et al., 2018; Wong & Lin, 2019), but this research has not been extended to African American adolescents. Studies that examine the effects of state MML on tobacco, alcohol, and other drug use among African American adolescents are needed. In alignment, longitudinal studies that examine the relationships among state MML status, depression, and marijuana use among African American youth specifically and American youth in general would be beneficial.

Study findings can prompt additional research work. The percentage of youth who reported past-month cannabis use was relatively high (35.9%); however, it remains unclear if there are ethnic group differences in marijuana use in MML and non-MML states. The body of research on MML would greatly benefit from comparative studies assessing differential effects on African American youth versus youth from other ethnic groups residing in MML and non-MML states. Studies focusing on different gender and age groups would add much to the existing body of work. Additional research, both quantitative and qualitive, is needed to delve into how depression and other mental health issues contribute to not only marijuana use but other substance use. This is especially

needed, as findings showed that lifetime cigarette and alcohol use were significantly linked to past-month marijuana use. The body of literature would be enhanced by, for example, by phenomenological studies that explore African American youths' lived experiences regarding residing in states with MML, their depression and mental health, and their substance use. Finally, robust correlational studies that utilize advanced statistics (e.g., structural equation modeling, path analysis) to incorporate various covariates related to youth demographics (e.g., income level, education level), cognitive strengths and weaknesses, personality traits, coping mechanisms, and family and peer group factors are needed to further enhance understanding of the effects of state MML status and depression on youth's marijuana use.

Implications for Professional Practice and Social Change

There are empirical and theoretical implications of the study. The findings also have numerous implications for professional practice as well as social change. Implications are discussed in the following subsections.

Implications for Theory and Research

The guiding theory for this study was Smart's (1980) availability-proneness theory, which, because of its emphasis on psychological and geographical/social risk factors for drug use, was a good theoretical fit for this research. The study findings provided empirical support for Smart's (1980) availability-proneness theory: state MML status and adolescent depression interacted to influence increased past-month marijuana use. Despite its long history, Smart's (1980) availability-proneness theory has not been extensively used as a guide for cannabis research (Kazmer et al., 2019; Krauss et al.,

2017). To date, only Kazmer et al.'s (2019) study and this study have applied Smart's (1980) availability-proneness theory to increased cannabis use among Czech youth, and both studies have confirmed its theoretical applicability. Moreover, Smart's (1980) theory has only been used in this study concerning the interactive effects of state MML status and adolescent depression on marijuana use in African American youth. While this study contributed to the body of work on MML and African American adolescent cannabis use, additional research is recommended to test the theoretical relevance of Smart's (1980) availability-proneness theory as it pertains to MML.

Implications for Professional Practice

The findings from this study can be used to inform professional practice. Depression emerged as a significant contributor to past-month marijuana use. African American adolescents tend to have higher levels of depression than other adolescents (King et al., 2020; Mrug et al., 2016) and yet are often reluctant to receive and/or have access to mental health services (Moore, 2018). Study findings strongly suggest that community/access/structural changes are needed to increase African American youth's access to mental health services; moreover, there is a need within the African American community to reduce the stigma associated with the receipt of therapy and counseling. African American youth would benefit from drug prevention and mental health initiatives, which can be implemented in school, in churches, in the community, and via social media. There is also a need for public health campaigns and programs on a community level that increase awareness of the mental health needs of African American youth, most notably those who reside in MML states.

Implications for Positive Social Change

There are many implications for positive social change that result from the study findings. Macrosystem-level exploration of the effects of MML on African American late adolescents specifically and adolescents in general is needed. While the study findings showed that state MML status had no direct influence on the youth's past-month marijuana use, when considered in interaction with a diagnosis of depression, it did. Indeed, just 29.3% of youth who resided in non-MML states and did not have depression reported past-month marijuana use as compared to 44.5% of late adolescents who resided in MML states and who did have depression. Moreover, 35.8% of all participants used marijuana in the past month, suggesting that marijuana was relatively easy to obtain and use. As cannabis dispensaries are disproportionately located in African American communities, marijuana may be potentially more accessible to African American youth (Berg et al., 2018; Thomas & Friesthler, 2017). Furthermore, there is evidence that African American youth with depression may be more likely than other adolescents to use marijuana as a coping or self-medicating mechanism and/or for social approval (King et al., 2020). There is a need for community-level public health initiatives that track, collect data on, and follow the consequences of MML on adolescent marijuana and other drug use, with emphasis placed on communities of color, most notably those having with a high number of dispensaries. There is an additional need to create initiatives in the African American community that build youth's emotional and mental health resilience against marijuana use.

Conclusion

This study was the first to examine if state MML and depression, singly and in interaction with one another, were significantly related to past-month marijuana use in a sample of 1391 African American adolescents (ages 16-20) utilizing data from the 2018 NSDUH. In alignment with previous research, depression was found to be significantly related to past-month marijuana use. Participants with a depression diagnosis had a 56% increased probability of using marijuana in the past month than youth without a depression diagnosis. Findings showed that, while state MML status did not have a direct effect on past-month cannabis use, it did influence use indirectly: the lowest percentage of participants (29.3%) reporting past month marijuana use were those who resided in non-MML states and did not have depression, as compared to 44.5% of youth who resided in MML states and had depression, 36.4% of youth who resided in MML states and did not have depression, and 54.9% of youth who lived in non-MML states and had depression. Lifetime cigarette and alcohol use were also significantly related to past-month marijuana use, with participants who reported such use having five times the odds of using marijuana in the past month.

While the impact of state MML on adolescent cannabis use has received extensive empirical attention, few studies have specifically focused on African American late adolescents (ages 16-20), including those with depression (Banks et al., 2017; King et al, 2020). It is hoped that this study will prompt additional research and applied work, which will enhance understanding of the best way to support African American youth at risk for depression and cannabis use. African American youth have numerous strengths, which

need to be built upon and strengthened. Public health initiatives that focus on the health and wellbeing of African American late adolescents now will help to create a future of strong and resilient African American adults.

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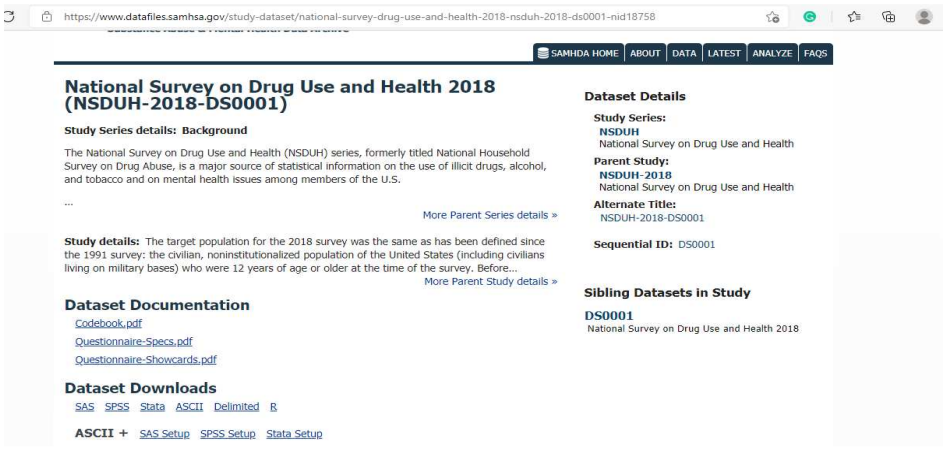
Appendix: 2018 National Survey on Drug Use and Health Website and Variables



al Health

(Questions administered only to respondents 18 or older.)

ITRO [IF CURNTAGE = 18 OR OLDER] These questions ask how you have been feeling during the **past 30 days.**

Press [ENTER] to continue.

/E30 [IF CURNTAGE = 18 OR OLDER]
During the past 30 days, how often did you feel nervous?

1 All of the time
2 Most of the time
3 Some of the time
4 A little of the time
5 None of the time
DK/REF
PROGRAMMER: SHOW 30 DAY CALENDAR

E30 [IF CURNTAGE = 18 OR OLDER]
During the past 30 days, how often did you feel hopeless?

1 All of the time
2 Most of the time
3 Some of the time
4 A little of the time
5 None of the time
DK/REF
PROGRAMMER: SHOW 30 DAY CALENDAR

30 [IF CURNTAGE = 18 OR OLDER]
During the past 30 days, how often did you feel restless or fidgety?

1 All of the time
2 Most of the time
3 Some of the time
4 A little of the time
5 None of the time
DK/REF
PROGRAMMER: SHOW 30 DAY CALENDAR

HR30 [IF CURNTAGE = 18 OR OLDER]
During the past 30 days, how often did you feel so sad or depressed that nothing could cheer you up?

1 All of the time
2 Most of the time
3 Some of the time
4 A little of the time
5 None of the time
DK/REF
PROGRAMMER: SHOW 30 DAY CALENDAR

:FFORT30 [IF CURNTAGE = 18 OR OLDER]
During the past 30 days, how often did you feel that everything was an effort?

1 All of the time
2 Most of the time
3 Some of the time
4 A little of the time
5 None of the time
DK/REF
PROGRAMMER: SHOW 30 DAY CALENDAR

OWN30 [IF CURNTAGE = 18 OR OLDER]
During the past 30 days, how often did you feel down on yourself, no good or worthless?

1 All of the time
2 Most of the time
3 Some of the time
4 A little of the time
5 None of the time