Marijuana Use Among College Students:
Implications for Practice and Policy

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Abstract

Using national data from the Core Institute, which collects and maintains the largest database on

alcohol and other drug use at postsecondary institutions in the U.S, this study investigates current

marijuana use among college students attending four-year public and private institutions.

Specifically, the goals of this study are threefold: 1) to assess the extent and scope of marijuana

use among college students; 2) to describe attitudes and perceptions about marijuana use, social

perception, approval, and risk of harm; and 3) to develop a predictive model to identify factors

that relate to current marijuana use.

Marijuana Use Among College Students: Implications for Policy and Practice

According to the Substance Abuse and Mental Health Services Administration (SAMHSA), marijuana is the most commonly used illicit substance in the U.S. While the overall number of users and rate of use has been on the rise for the general population, the rate of current use among youths and young adults has been increasing. Among young adults (18-25 years old), it is estimated that 19% used marijuana in the past month (SAMHSA, 2011). Marijuana use in college is higher than the general population. About one-third of college students used marijuana in the past year and 18.8% used marijuana in the past month (Core Institute, 2014). Although the rate of marijuana use has been increasing (Core Institute, 2014; Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2014; SAMHSA, 2011), a major concern relates to the combination of behaviors and outcomes. In addition to student perception of peer use and risk of harm, research indicates a relationship between drug use and risk behavior. Hazardous activities may involve compulsive drinking, illicit substances, sexual activities, and gambling (Pedrelli et al., 2010). Previous studies report a sizeable discrepancy between use and perceived use of marijuana. College students report marijuana is easily accessible and more obtainable than other drugs (Rosenberg et al., 2012), and viewed as less risky or harmful compared to other drugs.

Given the growing concerns among educational leaders, health professionals, and parents, questions have been raised about the factors that relate to marijuana, alcohol, and other drug use among today's college students. Frequent use of marijuana is associated with negative consequences of alcohol (Keith et al., 2015) or drug use (Allen & Holder, 2014). The negative consequences are greater when marijuana is combined with alcohol use or binge drinking (Keith et al., 2015). More research is needed to determine the role of marijuana use on academic

performance and other college experiences. While some studies suggest marijuana use alone does not negatively impact grades or GPA (Keith et al., 2015; Walker, Martin, & Hussey, 2015) other studies provide evidence for marijuana use and alcohol use negatively impacting academic performance (Arria et al., 2013).

Many factors affect drug use in college including individual experiences that students bring with them as well as overall college environment (National Institute on Alcohol Abuse & Alcoholism, 2013). While illegal drug use associated problems continue to be a concern for colleges and universities, it is critical that researchers and policymakers identify and implement effective intervention strategies and programs to improve students' health and wellbeing during college. Marijuana use changes during college, and frequent users risk long-term health detriments (Caldeira, O'Grady, Vincent, & Arria, 2012). The number of states approving the use of marijuana has increased. Since 1996, marijuana laws have been changing in the United States. Legislation primarily pertains to decriminalization, recreational use, and medical marijuana. Currently, medical marijuana is legal in 23 states and Washington D.C. (White House, 2016). Evidence support the use of medical marijuana to alleviate symptoms and treat diseases. Prior to 2012, recreational use of marijuana was illegal in all 50 states. In addition, Alaska, Colorado, Oregon, and Washington legalized marijuana possession and sales distribution for adults 21 years and older. Decriminalizing marijuana and setting a legal age determination, Washington D.C. passed Initiative 71 allowing adults 21 years and older to grow and possess (but not sell) marijuana. Despite various state laws, marijuana use continues to be an offense under federal law. Considered a Schedule I by the Drug Enforcement Agency (DEA), Congress views marijuana as a dangerous drug and the Department of Justice enforces the illegal use of marijuana under the Controlled Substances Act (White House, 2016).

The topic of marijuana use among college students is a timely and important political, educational, and social issue that warrants investigation and systematic research. It is warranted to determine strategies to serve the community and connect with students through outreach, prevention, and providing education and resources for substance use. This research contributes to public scholarship and may inform policy and understanding of marijuana and other drug use in college.

Literature Review

The literature on alcohol studies and college student use has been documented and continues to be a research topic of interest. The background on alcohol use, associated problems, assessment, and interventions provide insight on marijuana use among college students (Correia, Murphy, & Barnett, 2012). The study of reported use of alcohol and drugs has been systematically investigated by key research groups using different types of survey instruments including: College Alcohol Studies (CAS) by Harvard University School of Public Health (Wechsler group); National College Health Assessment (NCHA) by American College Health Association (ACHA) and *Journal of American College Health* (JACH) (2013), Monitoring the Future (MTF) (Johnston, O'Malley, Bachman, & Schulenberg, 2011); National Survey on Drug Use and Health (NSDUH) by Substance Abuse and Mental Health Administration (SAMHSA) (2011; 2014), and College Alcohol and Other Drug Use by Core Institute (2014).

Since 1993, the College Alcohol Study (CAS) at Harvard School of Public Health has collected data on alcohol use and is often considered as the "father of all drinking studies." With this study, Wechsler and colleagues brought attention to the college binge drinking problem in America (1994; 1995). Conducting a national study of over 140 four-year institutions of 14,000 undergraduates, the researchers found heavy drinking behavior widespread among college

students. Slightly less than half (44%) were binge drinking, while one-fifth reported frequently

binge drinking. A majority of students who used marijuana and other illicit substances also

smoked cigarettes or were binge drinkers. Mohler-Kuo, Lee, and Wechsler (2003) studied trends

in drug use in a large sample of college students from 1993-2001 and found increasing rates of

marijuana use along with most students who use marijuana also use alcohol or another substance.

Arguably, marijuana use is increasing among college students. Based on reported rates

of use, there is a discrepancy in perception. That is, students think more students are using

marijuana than actually use it. Young adults and college students report marijuana is easily

accessible and it is easier to obtain than other drugs (Rosenberg et al., 2012). Marijuana is also

viewed as less risky or harmful compared to other drugs (Core Institute, 2014; Rosenberg et al.,

2012). Emerging research suggests that marijuana use combined with alcohol use or binge

drinking leads to more negative consequences (McChargue, Klanecky, & Anderson, 2012).

Frequent use of marijuana is associated with frequency and likelihood of binge drinking

(Keith et al., 2015; Montauti & Bulmer, 2014). Frequent use of marijuana is also associated with

the negative consequences of drinking (Keith et al., 2015) or drug use (Allen & Holder, 2014). In

their studies on associated problems or negative consequences of poly-drug use, Allen and

Holder (2014) reported marijuana as the most harmful contributor to negative consequences.

The impact of marijuana and other drug use on academic performance has also been studied;

however, the evidence is mixed. In some studies, marijuana use does not seem to carry the

negative impact on grades (Keith et al., 2015; Walker, Martin, & Hussey, 2015). Other findings

show evidence for negative impact on attending class (Arria et al., 2015; Arria et al., 2013).

Long-term effects may include cognitive declines in IQ or verbal memory (Meier et al., 2012,

Auer et al., 2016). Auer et al. studied long-term impact of marijuana on cognitive functioning

and found current marijuana use associated with worse verbal memory and processing speed; lifetime use was only associated with verbal memory; executive functioning had no association (2016). Mental health has also been studied. Keith et al. (2015) found marijuana associated with depression and anxiety, but not stress.

Rates of Marijuana Use

In a recent report by the Core Institute (2014), about one-third (32.4%) of students have used marijuana in the past year (referred to as "annual prevalence") and 19% of students report current marijuana users (referred to as "30-day prevalence"). Montauti and Bulmer (2014) reported 28% using marijuana in the past 30 days, and 13% reporting marijuana use on average 3 times per week or more. Keith et al. (2015) reported frequencies and defined groups based on marijuana use in the past month. Researchers found about one-fourth (23.8%) used marijuana in the past month. Other categories of marijuana use include occasional users (1-2 days) (10.2%), regular users (3-9 days) (7.1%), and frequent users (more than 10 days) (8.5%). Other statistics reported about college students' marijuana use in the past year at 30.2%, and daily use at 4.3% (McChargue, Klanecky, and Anderson, 2012).

While considering rates of use, there is literature abut rates of first use and non-use. The likelihood of first-time use of marijuana and alcohol occurs in the summer months prior to the student's first time in college (SAMHSA, 2014). Rosenberg et al. (2012) studied abstinence from illicit substances. Students reported the following reasons as less influential on their abstinence from marijuana compared to other drugs: difficulty acquiring the drug, lack of knowledge about the substance, and fear of overdose. Major reasons for abstaining from marijuana and other drugs included: fear of getting caught, reduced control of their emotions and behavior, drug use being contrary to their self-image, and perceived lack of benefits from drug use.

Marijuana Studies and Alcohol

Montauti and Bulmer (2014) found that after controlling for background characteristics, using marijuana and smoking cigarettes increased predictability of heavy episodic drinking. This study confirmed past research on binge drinking association with being white, male, 23 or younger, participating in athletics, and using cigarettes or marijuana. In another study by Keith et al. (2015), students who reported marijuana use also reported episodic drinking over the past two weeks compared to those who did not use. Specifically, the researchers examined marijuana use, binge drinking, and mental health among undergraduate students. The authors found that marijuana use was related to other substance use, alcohol-related negative consequences, anxiety, and depression. Marijuana was not related to perceived stress.

Marijuana Studies and Academic Performance

There is a body of evidence that suggest that alcohol use, marijuana use, and negative consequences of alcohol use are hazardous to academic performance. Arria et al. (2013) found both marijuana and alcohol use were associated with missing class and showed similar results when evaluating marijuana use and class attendance as a separate model from alcohol use and class attendance. Researchers reported that marijuana use did not seem to negatively impact academic performance (Keith et. al, 2015; Walker, Martin, Hussey, 2015). For example, in a study by Keith et al. (2015), 95% of the students maintained a GPA average of B or better. Another study reported overall GPAs at 3.27-3.50 (Walker, Martin, & Hussey, 2015). McChargue, Klanecky, and Anderson (2012) studied alcohol use, marijuana, and college functioning (GPA and legal problems) and reported findings that problematic drinking was a mediator for the frequency of marijuana use and relationship to lower grades and higher legal problems. "Binge drinking explains (mediates) association between the frequency of cannabis

use within a 6-month time frame and college functioning (p. 611)." This study supported the

literature that the association between marijuana and college functioning "may depend on the

severity of alcohol use problems (p. 611)"

Marijuana use may have negative impact on academic outcomes through poorer class

attendance in college (Arria et al., 2015). Arria, Caldeira, Bugabeee, Vincent, and O'Grady

(2015) studied academic consequences of marijuana use during college. Researchers reported

marijuana use served as a barrier to academic achievement. This longitudinal study used

structural equation modeling with a path from marijuana use to skipping class to lower first

semester GPA to longer time to graduation. In addition, over time the rate of change in

marijuana use was negatively associated with the rate of change in GPA; however, it did not

account for any additional variance in graduation time.

Addressing substance use in addition to components of prominence of drugs and alcohol,

social characteristics, and Greek organization involvement, Walker, Martin, and Hussey (2015)

found that students involved with a fraternity or sorority reported "a more prominent role of

alcohol and drugs to their enjoyment of campus life" (p. 218). Researchers also found that these

"prospective Greek members arrive on campus placing greater prominence on alcohol and drugs

and greater emphasis on being a social person" (p. 219). Researchers found that "fraternity or

sorority membership leads to more time spent socializing and partying, greater satisfaction with

campus social life, and higher graduation rates" (p. 219). The variable of prominence of alcohol

and drugs included scales combining responses for the importance of alcohol and drugs to

campus life and the frequency they are present at campus social events.

Marijuana Studies and Negative Consequences

Alcohol related negative consequences associated with marijuana explored by Keith et al. (2015) included trouble with police, regret, memory loss (forgot an action), and unprotected sex. The authors found injuring oneself or others was not associated with marijuana use after controlling for demographics. Other studies explored drug related negative consequences as the number of times missing school/work or getting into a fight with other people due to drinking or drug use, (Allen & Holder, 2014) or as defined by associated problems like lower GPA and legal problems (McChargue, Klanecky, & Anderson, 2012). Allen and Holder (2014) studied marijuana use and wellbeing among university students. Males used marijuana more frequently and in greater amounts than females, and frequency was not associated with wellbeing. Negative consequences of drug use were correlated with negative wellbeing. Researchers found no benefit for marijuana users; although low agreeableness and low conscientiousness attributes increased likelihood of using marijuana and experiencing negative consequences of drug use. Although alcohol was not considered, for poly-drug users in the study, marijuana was best predictor of negative consequences compared to other drugs used in past month.

As we consider commonly reported themes – rate and perception of use, risk of harm, ease of accessibility, combination with alcohol, negative consequences, and increase use, it is important to consider impact and study academic, social, legal, and health areas in the theoretical and conceptual frameworks to make sense of knowledge for greater understanding and implications for education.

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Theoretical and Conceptual Framework

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The Health Belief Model (HBM) provides a useful framework to understand and predict health behavior among college students. Specifically, HBM is an expectancy-value theory

grounded in health psychology that involves perceived benefits and perceived barriers as

contributors to the likelihood of a behavior. Additional components predicting health behavior

include self-efficacy and cues to action (Penhollow, 2013) as well as whether or not a person

engages in a preventative health behavior (Maisto, Bishop, & Hart, 2012). This framework

informs this study by considering perceptions of marijuana use and internal beliefs that drive

decision-making regarding marijuana use and other behaviors. Furthermore, as college students

face peer pressure and adapt to cultural norms, this may impact attitudes and perception of drug

use (Gleason, 1994). HBM is applicable by predicting health behaviors through outcome

expectations (Penhollow, 2013). In other words, this study examines changes in behavior

(marijuana use) due to health. Beliefs about consequences, costs, barriers of alcohol and drug use

along with beliefs about benefits of use informs the desire to change behavior due to beliefs

about possible outcomes. The expectancy and perception of risk and social contributors along

with perception of current marijuana use (marijuana use in the past 30 days). Perceived benefits

of close friends who do not disapprove of regular marijuana use along with perceived barriers

such as perceived risk of harm or living on-campus may lead to marijuana use. This study

informs the Health Belief Model by suggesting that whether a student used marijuana in the past

30 days can be understood by knowing the perception of health practices. Because health beliefs

play a role in determining intentions to exercise health behaviors (Taylor, 2006), it is relevant for

understanding marijuana perceptions, attitudes, and beliefs among college students.

The conceptual framework for this study is Astin's (1997) Input-Environment-Outcome

(IEO) model. Considering that peers influence student values and behaviors (Astin, 1997), it is

important to recognize the temporal order of influences in college student marijuana use. The

IEO model provides the opportunity to examine the impact of various experiences and

environments on outcomes with the opportunity to control for preexisting differences (Astin & antonio, 2012). This study considers background characteristics and experiences students bring with them to college (input), beliefs and experiences during college (environment), and outcomes of involvement in marijuana use (output).

This study adds to work by O'Malley and Johnston (2002) by providing an update to the reported data from recent surveys in the Core Institute national database. This study adds to the Core Institute Executive Summary (2014) through analysis and application of theoretical frameworks for greater depth to how these variables may be understood in the college population; in addition to marijuana use, comparison by institutional type and control. Additionally, this study expands on the marijuana literature by considering contexts for moderate drinking such as social enhancement and coping (Beck et al., 2013) apply to moderate marijuana use.

Objectives

The objectives of this study are threefold: 1) to assess the extent and scope of marijuana use among college students; 2) to describe attitudes and perceptions about marijuana use, social perceptions, approval, and risk of harm; and 3) to develop a predictive model to identify factors that relate to current marijuana use. The research questions guiding this study include:

- What are the marijuana use rates among college students by institutional control? To what extent do students differ by background characteristics (gender, ethnic origin, age, classification, family history, alcohol use, residential status, living arrangements, permanent residence, region, and institutional control)?

- How are different levels of current marijuana use related to academic performance, personal behaviors, and other consequences?

- What are the unique effects of background characteristics, perceptions, attitudes, beliefs, and environmental factors that predict current marijuana use in college?

Data Sources and Methods

The data for this study were drawn from the 2011-2013 Alcohol and Drug Survey – Long Form from the Core Institute. The Core Institute is a department housed at Southern Illinois University Carbondale Student Health Center that collects and maintains the largest database on alcohol and other drug use at postsecondary institutions in the U.S. The survey instrument is an assessment tool, which was developed from a FIPSE grant from the U.S. Department of Education, used to examine the nature, scope, and consequences of the use of alcohol and other drugs among college students (Presley, Meilman, & Cashin, 1996). The survey instrument includes 39 closed-ended questions that cover four major areas: 1) alcohol and other drug use rates on college/university campuses; 2) perceptions, beliefs, and attitudes of college students; 3) environmental factors influential to alcohol and drug use; and 4) student background characteristics.

The sample for this study includes 110,149 full-time college students attending public (n=56,568) and private (n=53,581) four-year institutions classified as freshman, sophomore, junior, or senior.

Variables

The variables included in the study are described in this section. Complete details on coding schemes for all variables are provided in Appendix A.

The dependent variable is students' level of marijuana (pot, hash, hash oil) use. This is measured through students' level of use with the statement, "*During the past 30 days on how*

many days did you have marijuana (pot, hash, hash oil)." Students responded to this question

using a 7-point scale from "0 days" to "all 30 days."

Analyses

Preliminary analyses using descriptive statistics describe student background

characteristics by institutional control (public vs. private).

A second set of analysis using crosstabulation analyzed the dependent variable.

Specifically, the dependent variable was recoded from the 7-point scale to a 4-point scale: non-

use (0 days); 1-2 days (occasional use); 3-9 days (regular use); and 10+ days (frequent use). This

approach was informed from previous research (Keith et al., 2015).

Finally, hierarchical multiple regression analysis was conducted for each group of

students included in the study. Using Astin's input-environment-outcome conceptual model, the

independent variables were added to the regression equation in blocks according to the temporal

order in which they may influence students' use of marijuana during the past 30 days: 1)

background characteristics; 2) perceptions and beliefs; 3) self-efficacy; 4) beliefs on

consequences; 5) beliefs on benefits; and 6) cues to action. The rationale for running the same

regression equation for students attending public and private institutions allowed the researchers

to control for the same sets of variables within each group. This analytical approach allows to

accurately compare the unique effects of each independent variable across the two groups.

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Limitations

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A chief limitation of this study is the cross-sectional design. Data about students'

attitudes, perceptions and behaviors were collected at one time point. As a result, this study is

not able to assess marijuana use over time as well as the determining factors that may contribute

to drug use. Another limitation is the generalizability of the results specific to race/ethnicity.

The ethnic origin variable was recoded to be a dichotomized variable (white and non-white). The non-white group is comprised of different racial/ethnic origins (e.g., American Indian, Hispanic, Asian/Pacific Islander, Black). Caution is warranted in terms of generalizing the results due to the heterogeneity of the non-white group. Finally, given the survey research design, students' ability to recollect experiences and the extent to which self-reporting are accurate raises methodological issues. Although the Core Alcohol and Drug Survey probes important and timely questions about college students, the nature and content of the survey may influence the level of honesty and accurate reporting by students.

Results

Descriptive Analyses

Table 1 compares background characteristics of students attending public and private institutions indicating frequency and percent difference. Results indicated similarities between public and private institutions across most variables. The final sample (n=110,149) comprised 37.8% male at public institutions (n=21,396) and 62.2% female at public institutions (n=35,172) compared to 35.8% male at private institutions (n=19,182) and 64.2% female at private institutions. About three-fourths of the sample included white students with 72.9% at public institutions and 76.8% at private institutions. Public institutions had a higher percentage of Black students with 13.3% (n=7,425) compared to 6.6% at private institutions (n=3,466). Slightly higher percentages of Hispanic (6.4%) and Asian/Pacific Islander (5.9%) students attended private institutions compared to public institutions at 5.7% Hispanic and 4.3% Pacific Islander. More students had an out-of-state permanent residence (43.9%) at private institutions (n=22,904) than public institutions at 13.1% (n=7,211).

Interestingly, the largest differences in public and private institutions are evident in living arrangements, residency, campus size, and region. For living arrangements, the main differences between public and private are in house/apartment (29.1%) and residence hall (27.7%). Living in a house/apartment had a 29.1% difference with a higher percentage of students in public institutions living in house/apartment (61.3%) compared to private institutions (32.2%). In addition, living in a residence halls had a 27.7% difference with a higher percentage of students in private institutions living in residence halls (62.8%) compared to public institutions (35.1%).

At the same time when comparing institutional control, residence had a 31.2% difference for on-campus residence and a 21.2% difference for off-campus residence. On-campus residence had a 31.2% difference between public and private institutions with a higher percentage at private (74.3%) compared to public (43.1%). Off-campus residence had a higher percentage for public (56.9%) compared to private (35.7%).

Campus size was another variable with sizable differences by institutional control (39.8%) with a higher percentage of smaller campus size at private institutions (42.6%) compared to public (2.8%). While public institutions dominated at larger campus sizes with 30.7% public and 0.0% private. Region indicated higher percentage of public institutions in the South (62.9%) compared to private (38.9%). While private institutions showed a higher percentage for the North Central (24.3%) and North East (31.7%) compared to public institutions at 11.3% and 21.6%, respectively. There were similarities for the West region (4.2% public, 5.1% private, -0.9% difference).

Regarding the availability of drugs and alcohol, a large percentage indicated compared to alcohol, students do not have drugs available (81.4% public and 79.1% private). On the other

hand, 69.3% of public and 73.4% of private students indicated alcohol availability at parties or other social settings.

Alcohol use. Slightly less than one-third (31.1% of public) and over one-fourth (29.2% of private) of students did not use alcohol in the past 30 days. However, for both groups, one out of four students used alcohol between 6-9 days.

Marijuana use. Marijuana use in the past month and marijuana use in the past year were comparable for public and private institutions. About four-fifths (79.8% at public institutions; 80.3% at private institutions) of college students reported not using marijuana in the past month; while about two-thirds (65.9% public, 65.8% private) reported not using marijuana in the past year. Strikingly similar results were found for monthly (current) and yearly (annual) rates of reported marijuana use. The percent differences between public and private ranged from 0.2% to 1.4%.

Table 2 presents the crosstabulation results of reported marijuana use by institutional control by demographics (region, gender), academic outcomes (missed class, performed poorly on a test or project, GPA), and associated problems (binge drinking, memory loss, regrettable action) in addition to trouble (trouble with authorities, damaged property, arrested for DWI/DUI), and sexual behavior (been taken advantage, taken advantage of another). The dependent variable for this analysis, *in the past 30 days how many days used marijuana,* was recoded using the Keith et al. (2015) approach. The original 7-point Likert scale was recoded to a 4-point scale: non-use (0 days), 1-2 days (occasional used), 3-9 days (regular use), and 10+ days (frequent use).

Academic performance for class, tests, and grades. The results indicated similarities between public and private institutions for current marijuana use and academic outcomes.

Occasional marijuana use was associated with missing class 3-5 times at public (12.4%) and private (15.7%). Regular marijuana use was associated with missing class 3-5 times at public (11.3%) compared to private (13.6%). Students who reported grades/GPA of an "A" were associated with occasional use (6.0%), regular use (4.0%), and frequent use (5.1%) at public institutions as well as regular use (7.5%), occasional use (4.5%), and frequent use (4.1%) at private institutions. Frequent marijuana use was associated with B average (9.1%) and C average (11.1%) grades at public institutions. While frequent marijuana use at private institutions for B average (6.8%) was slightly lower compared to C average (9.2%). Notably, for both public and private institutions, the difference in students who reported missing class for 10+ times as well as performing poorly on a test or project was not a particularly large difference. For instance, more non-users (40.9% public; 41.3% private) than frequent users (35.2% public; 32.6% private) reported missing class 10+ times. And, more non users (43.7% public; 39.6%) than frequent users (38.0% public; 36.9% private) reported performing poorly on a test or project due to drinking or drug use. Although a higher percentage of frequent users had failing grades at private institutions (37.9%) compared to public (26.7%).

Associated problems for binge drinking, regret actions, trouble, and sexual behavior. The results revealed associations between marijuana in the past 30 days and binge drinking, memory loss, and regret actions. Overall, the experiences due to drinking or drug use that occurred 10 or more times for frequent marijuana users accounted for slightly less than one-third of the sample. Frequent users at public institutions reported 10 or more times for binge drinking (30.5%), memory loss (32.8%), and regret action (26.8%). While frequent users at private institutions reported similarly at 27.8%, 27.7%, and 19.9%, respectively.

   Binge drinking. In the survey, binge drinking is defined as 5+ drinks in the past two weeks. The results suggest that there is a relationship between binge drinking and increased use of marijuana. At public institutions students who engaged in binge drinking 6-9 times in the past month consisted of 46.2% non-users, 14.5% occasional users, 13.1% regular users, and 26.2% frequent users. Similarly, at private institutions 44.5% nonusers, 15.6% occasional users, 17.1% regular users, and 22.9% frequent users also reported binge drinking 6-9 times in the past month.

   Regret actions. Interestingly, even non-users regret their actions due to drinking and drug use. Among non-users at public and private institutions was a higher percentage for experience of regretted action. Students who did not use marijuana (non-users) at public institutions reported regretting action 3-5 times (60.4%), 6-9 times (56.7%), and 10+ times (50.1%). Students who did not use marijuana (non-users) at private institutions had similar results of 59.7%, 51.7%, and 48.3%, respectively. Frequent users did not regret their actions as many times. Regretting actions at 10+ times for frequent users was only 26.8% at public institutions and 19.9% at private institutions.

   Trouble or consequences. This question probes the consequences of drinking and drug use during the last year on experiences such as "trouble with policy, residence halls, or other college authorities; damaged property, pulled fire alarm; and arrested for DWI/DUI. Non-users got into trouble with authorities once (59.2% public; 61.1% private) or twice (45.2% public; 44.7% private). Although occasional users got into trouble once (12.3% public; 14.7% private) or twice (15.1% public; 17.8% private) which is comparable to regular users who got into trouble once (10.7% public; 11.6% private) or twice (12.4% public; 15.4% private). Frequent users were arrested 10+ times more at public institutions (62.1%) compared to private

institutions (57.1%). Frequent users of marijuana reported damaging property 6-9 times (41.2% public, 32% private), 10+ times (43% public; 48.5% private). Frequent users of marijuana reported high rates of being arrested for DWI/DUI. Students reported being arrested 6-9 times (31.3% public, 20% private), and 10+ times (67.5% public, 62.5% private).

Sexual behavior. Students who reported the experience that they had been taken advantage of sexually 10+ times included 50.0% non users and 39.7% frequent users at public institutions. At private institutions, 37.2% of non-users and 38.1% of frequent users reported being taken advantage of sexually 10+ times. While frequent users reported having taken advantage of another sexually 10+ times at public (53.8%) and private (52.1%). Still, non-users also reported having taken advantage of another sexually 10+ times at public (29.9%) and private (25.7%) institutions.

Regression Analyses

The descriptive results provide an overviews of students attending public and private institutions and their rate of marijuana use. A major objective of this study was to investigate the effects of other variables (e.g., background characteristics, alcohol use, perceptions and beliefs, self-efficacy, beliefs on consequences and benefits, and cues to action). For both groups, students' marijuana use in the past 30 days was regressed on the set of 32 independent variables. Table 3 reports the simple correlations between each independent variable and the dependent variable along with final standardized regression coefficients (betas).

Appendix A and B illustrate the standardized regression coefficients (betas) for the two separate regression models. Appendix A illustrates the results for students at public four-year institutions; Appendix B describes the results of students at private four-year institutions. Seven models were used in the analyses. Model 1 includes the background characteristics and family

history in the equation. Model 2 adds alcohol use; Model 3 includes perceptions and beliefs;

Model 4 includes self-efficacy; Model 5 includes beliefs on consequences, costs, and barriers;

Model 6 includes beliefs on benefits of alcohol; and Model 7 includes cues to action.

Background Characteristics. For both groups, simple correlations reveal significant

relationships with marijuana use in the past 30 days. At the final step in the equation, being

male, non-white, and having a mother with a history of alcohol and/or drug problem were

positive predictors of marijuana use for both groups.

Alcohol use. Two items were related to alcohol use were entered in the equation.

Consuming five or more drinks in one sitting (or binge drinking) and alcohol use in the last 30

days were positively associated with marijuana use. Interestingly, for students attending public

and private institutions, both variables were significant predictors at the final model.

Perceptions and beliefs. Simple correlations revealed significant relationships for both

groups between marijuana use and perceptions and beliefs. Of the six variables in this block,

three were significant. The two negative associations and predictors relates to risk harm and how

close friends feel about smoking marijuana. In other words, students who indicated there is no or

low risk harm of smoking marijuana were more likely to use marijuana in the last 30 days. Also,

students who perceive that their close friends do not disapprove smoking marijuana regularly are

likely to use marijuana. The only positive predictor relates to the perception that students who

have higher levels of caring about problems associated with alcohol and other drug tend to have

use of marijuana in the last 30 days.

Self-efficacy. Of the six variables entered in the equation, four simple correlations for

public and six correlations for private reveled significant relationships. For both groups, students

who had increased personal use of illegal drugs use changed within the last 12 months, had

disagreement of university policy and regulations that concern alcohol and other drug use, did not experience peer pressure to drink or use drugs, or refused on an offer of alcohol or other drugs were positive predictors of marijuana use. Interestingly, students attending private institutions who indicated they were not involved in efforts to prevent drug and alcohol use problems on campus were more likely to use marijuana compared to their counterparts.

Beliefs on consequences, costs, and barriers. For both groups, simple correlations revealed one negative and three positive significant relationships among beliefs related to consequences, costs, and barriers. Students who did not experience a hangover due to drinking or drug use during the last year were more likely to use marijuana. Conversely, students who got nauseated or vomited or experienced a memory loss were more likely to use marijuana. For both groups, students who indicated that drinking interferes with their life on or around campus makes them feel unsafe, were more likely to have higher use of marijuana.

Beliefs on benefits of alcohol. Simple correlations revealed three significant negative predictors. For both groups, students who indicated that alcohol enhances social activity were less likely to use marijuana. For students attending private institutions, indicating alcohol makes it easier to deal with stress are less likely to use alcohol. For students at public institutions, they were less likely to use marijuana if they had the perception that alcohol facilitates a connection with peers.

Cues to Action. Three variables were entered in the equation that measured students' perception of the campus environment. For both groups, students who indicated that the social atmosphere on campus promotes alcohol use and head someone else brag about alcohol or other drug use (during the past 30 days) were more likely to use marijuana. For students attending private institutions, feeling safe on campus was related to marijuana use.

Discussion and Conclusion

Consistent with prior research by Montauti and Bulmer (2014), this study found gender (male) as predictive of higher marijuana use in the past 30 days. However, one contraction from this study is that non-white were more likely to use marijuana compared to white students. This result is different. Personal behaviors of marijuana use in the past 30 days as associated with having a memory loss were consistent with Keith et al. (2015). Consistent with prior research on frequency of heavy episodic drinking and marijuana (Keith et al., 2015; Montauti & Bulmer, 2014), this study found that having five or more drinks in one sitting was a predictor for marijuana use in the past 30 days. Previous studies found that marijuana use does not seem to negatively impact academic performance. Two studies found students maintained GPAs of a B or better (Keith et al., 2015; Walker, Martin, & Hussey, 2015). McChargue, Klanecky, & Anderson (2012) found that alcohol use mediated marijuana use and lower grades. While this study found an interesting inverse relationship indicating higher grades predicted increased marijuana use in the past 30 days; however, prior studies examined highly competitive, selective, and private institutions. Academic performance and marijuana use needs further study and examination to understand the interaction and impact for college students.

The results of this study showed comparable marijuana use among college students attending public and private four-year institutions. The strongest predictors of more frequent marijuana use (using marijuana more days in the past month) included background characteristics, alcohol use, perceptions about the risk of harmfulness of smoking marijuana regularly, and perception of peer approval and campus support.

Supporting previous literature on perception of risk and harm, this study further validated that students who think there is a great risk to regularly smoking marijuana did not use marijuana

as frequently. Interestingly, behavioral aspects and beliefs about experiences contributed

significantly to predicting marijuana use. It seems just because students know a campus program

or prevention strategy exists, it does not mean the student is not going to use marijuana. This

phenomenon raises questions about how to better understand college students with regard to the

intellectual or cognitive knowledge of drug use and negative effects, and the extent to which

one's behavior contradicts information. The HBM can be adapted to include sociological factors

to account for external forces that may influence college students' marijuana use. The research

on college students and the impact of the environment on students suggest that involvement in

social organizations such as sorority or fraternities could negative or positively influence

behaviors. More research is needed to further investigate these relationships.

     While public and private institutions were remarkably similar across descriptive and

inferential analyses, predictors of marijuana use at private institutions included students who

were actively involved in prevention efforts did not use marijuana as much as those who were

not involved. While public institutions revealed that students who believed the effects of alcohol

facilitated a connection between peers used marijuana more frequently.

     Future research may explore the relationship between marijuana use and student

perception of the campus environment and feelings of security. It is unclear the role of alcohol

use, feeling safe, and the campus and social environments in accurately predicting and

understanding marijuana use. This study finds contradicting results with regards to feelings of

safety and security, alcohol, and marijuana use.

     At the same time, this study found that getting into trouble with authorities was about the

same for non-users and frequent users for both public and private institutions when considering

students who reported trouble with authorities 3-5 times and 6-9 times. This finding suggests that

there is something more going on than just marijuana use. And, considering students' perception and beliefs of the effects of alcohol on social situations, campus environment, and safety, it is not clear (like how it is represented or how it works).

Although this study examined background characteristics such as gender, ethnic origin (white, non-white), father and mother history of alcohol and drug use, this study did not include other variables such as sorority/fraternity involvement or athletic participation. It will be important for future studies to examine other factors such as social and athletic involvement. Majority of the studies about these two groups tend to focus on alcohol use and consumption.

This study connects to the theoretical framework of Health Behavior Model by studying perception as contributing to the health behavior of marijuana use in the past 30 days. Perceived benefits of close friends who do not disapprove of regular marijuana use along with perceived barriers such as perceived risk of harm or living on-campus may lead to marijuana use. This study informs the Health Belief Model by suggesting that whether a student used marijuana in the past 30 days can be understood by knowing the perception of health practices. Because health beliefs play a role in determine intentions to exercise health behaviors (Taylor, 2006), it is relevant for understanding marijuana perceptions, attitudes, and beliefs among college students.

Implications for Practice, Policy, and Future Research

As marijuana use becomes more accepted and widespread in terms of laws and policies across the nation, it is important to research these impacts on college students and institutions.

The purpose of this study was to assess the extent and scope of marijuana use among college students, describe attitudes and perceptions, and develop a predictive model of marijuana use among students attending public and private four-year institutions. This topic is important because college student alcohol and drug use is prevalent and there are many possible

consequences related to drug use (National Institute on Alcohol Abuse and Alcoholism, 2013).

This study sought to extend previous research on marijuana by examining a national dataset to

provide an update on marijuana use, perception, and outcomes. Notably, previous research

suggested that health education leads to better health practices, including health benefits after

graduation (Pascarella & Terenzini, 2005; Pearman et al., 1997). Education impacts health

through environmental conditions, social and psychological resources, and a healthy lifestyle

(Ross & Wu, 1995). This research will inform educators and leaders about factors associated

with marijuana use and highlight areas for future programs and activities to improve health and

wellbeing.

Regarding implications for practice, this study provides evidence that more education is

still needed to educate college students about alcohol and other drug use. Given the changing

nature and availability of marijuana across the U.S., individuals have easier access to obtain

marijuana for social (and non-medicinal) purposes. A growing challenge for student affairs and

health professionals on college campuses is to develop and implement effective and meaningful

intervention programs for students. The old campaign of "just say no" raises a philosophical

question about whether or not this is an effective approach. College is a time when students are

exposed to many opportunities and are faced with dilemmas. The "just say no" approach may be

ineffective for college students who want to experiment many different things including drug use

and alcohol consumption. What types of programming and/or intervention strategies could be

developed and implemented to reach students? How can social media be used to re-

conceptualize and redesign health and wellness programs for all students no matter their social

affiliation?

From a policy perspective, colleges and universities are required to implement drug prevention programs to be eligible for federal funding. In states where recreational marijuana is legal, colleges and universities face challenges in addressing student behaviors and/or illicit drug use. Policies will continue to be developed and implemented on college campuses such as banning pot smoking in residence halls, campus grounds, and off-campus student organizations (e.g., Greek houses). These complex issues will continue to present challenges for administrators and law enforcement professionals.

Implications for future research is to consider sociological theories and models to better understand and account for external factors that may influence marijuana use. The predictive model is an exploratory attempt to measure the variance explained. Although the final model explains over 40% of the variance for both groups, the variance change is minimal when the last two blocks (beliefs on benefits of alcohol and cues to action) are entered in the model. This result suggests that further research is needed to better account for the HBM or the need to account for social factors.

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