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## Is There a Difference Between Democrat and Republican States in the Percentage of Male High School Students Who Have Ever Used Marijuana?

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## I. INTRODUCTION

Many Americans smoke marijuana and/or consume marijuana products (Foundation for a Drug-Free World, 2020). For example, over 94 million Americans have admitted using marijuana at least once, 2.1 million Americans admitted abusing marijuana, and 6.7% of marijuana users are children who are 12 to 17 years of age. Marijuana is readily available in America, and domestic marijuana production has increased from 2.2 million pounds to 22 million pounds over the last 25 years.

Some individuals argue that marijuana is harmful. First, marijuana has over 400 chemicals in it, it produces 2,000 chemicals when smoked, it contains cancer causing chemicals, and it is much more harmful than alcohol (Califano, 1998; Stimson, 2012). Second, marijuana can damage the lungs, brain, and bones because it is toxic (Porter, 2012). Third, smoking marijuana adversely affects the immune system and it contributes to chronic coughing, respiratory diseases, and leukemia (Fanning, 2011). Fourth, marijuana is addicting and more than 2,500 youths each year require emergency room services, which are overtaking the emergency rooms (Burns, 2006; Walters, 2005). Fifth, if marijuana is illegal, then the courts can formally order the addicted youths to receive the necessary treatment, which can then be monitored by the authorities (Moline, 1998). Finally, some research has shown that early marijuana use negatively affects educational outcomes and it is positively related to aggression and crime (Cobb-Clark et al., 2015; Odgers et al., 2008).

Some individuals argue that marijuana may be beneficial. First, preclinical data have demonstrated that cannabinoids may spur brain cell growth (Armentano, 2012). Second, marijuana is neuroprotective and protects against alcohol-induced brain damage. For example, the administration of marijuana has reduced ethanol-induced brain cell death by up to 60%. Third, cancerous glioma tumors, which typically do not respond to standard medical treatments, do respond to cannabis. Marijuana has been shown to target malignant cells while ignoring healthy ones. Fourth, there is evidence that marijuana slows the progression of certain neurodegenerative diseases, such as Parkinson's disease and Multiple Sclerosis. Fifth, research has indicated that most of the crime committed by juveniles involve possessing and using marijuana, and that there was no relationship between non-drug specific charges and marijuana use (Pedersen & Skardhamar, 2009). Finally, users of marijuana agreed that marijuana has therapeutic benefits in treating depression, painful conditions, anxiety, and insomnia (Keyhani, 2018).

There are opposing viewpoints on whether marijuana should be legalized. Democrats and Republicans have different attitudes toward the drug (Snyder, 2016). Democrats believe marijuana should be legalized for medical patients, if it is prescribed by a physician and is needed to reduce severe pain. In addition, Democrats believe that the war on recreational marijuana has been a waste of time and government resources. Many Democrats are in favor of legalizing recreational marijuana because it is considered normal by social standards. Republicans, on the other hand, oppose legalizing medical marijuana because they believe other drugs can be prescribed by physicians to reduce pain experienced by medical patients. In addition, Republicans believe that legalizing medical marijuana will lead to legalizing

recreational marijuana, which is dangerous and a threat to public safety and health. In 2005, for example, there were 242,200 emergency room visits across the country (for youths and adults), which involved the use of marijuana (Foundation for a Drug-Free World, 2020).

According to Akers' social learning theory, individuals learn to behave according to the frequency, importance, intensity, and duration of their social learning experiences (Akers & Sellers, 2009). Children will learn how to act through communications with intimate others, by definitions defined as favorable by others, and by observing how other individuals are rewarded and punished. In addition, role modeling occurs in early childhood, when humans are at their greatest developmental rate for learning. This is important because parents, teachers, and other individuals in the social environment can have a strong lifelong influence on children's behaviors. For example, if marijuana use becomes readily available and is deemed acceptable by significant others, then it is expected that more high school students will learn to use marijuana. Indeed, according to a study by Keyes et al. (2011), there is a positive relationship between the approval of marijuana use from a person's birth cohort and the individual's use of marijuana, independent of the person's personal attitude toward marijuana use.

Because the use of marijuana is a political issue, and the government controls society, it is important to know if the behaviors of high school students are being affected by the different social learning environments created by the government. Because public safety and children's health are important social issues, it is important to know if there is a difference in the number of children who use marijuana in the two different social learning environments. Thus, the purpose of this study was to determine if there is a difference between political partisanship and the percentage of male high school students who have ever used marijuana. The research question and the null hypothesis are listed below.

Research Question: Is there a difference between Democrat and Republican states in the percentage of male high school students who have ever used marijuana?

Null Hypothesis: There is no difference between Democrat and Republican states in the percentage of male high school students who have ever used marijuana.

## II. LITERATURE REVIEW

First, Eisenberg et al. (2019) conducted a qualitative study to examine the marijuana-related attitudes, behaviors, and challenges of parents involving the legalization of marijuana. The researchers collected data from 54 parents in Seattle via six focus groups. A structured interview protocol was used to ask the participants about their parenting behaviors in a marijuana-legal environment. The researchers used NVivo software to perform content analysis. The findings indicate that, although most parents did not approve of their children consuming marijuana, they expected it would happen. Therefore, the parents indicated that they talked with their children about the drug and its effect, and the parents set marijuana-consuming guidelines in their homes. However, several parents found it hard to monitor their children's behaviors and difficult to discuss their own personal use of the drug. Parents stated that they needed to learn how to better

deal with the situation by attending programs that teach strategies on how to deal with the situation. Thus, the parents believe that the social learning environment (i.e., training classes) will modify their behaviors.

However, there were several limitations in the Eisenberg et al. (2019) study. First, the sample was comprised of parents in the Seattle area who are believed to have very permissive views toward the use of marijuana, and they may not necessarily reflect parents in other areas outside Seattle. Second, the sample consisted of college graduates and may not necessarily represent parents with different educational and socioeconomic backgrounds who may face different challenges. Third, individuals who were invited to participate in the study, but who had fewer concerns about marijuana, may have declined to participate. As a result, the results may be biased. Finally, qualitative studies do not quantify relationships, identify patterns, or make numeric predictions (Bordens & Abbott, 2008).

Second, Verweij et al. (2010) conducted a meta-analysis study to determine the magnitude of environmental influences on marijuana use. The researchers examined 52 existing twin studies from western countries. The researchers meta-analyzed the standardized variance components for initiation of cannabis use and problematic cannabis use by calculating the weighted average for shared and unshared environmental estimates. The findings indicated that there is a relationship between siblings, friends, and peers and the abuse of cannabis in young adults.

However, there were several limitations in the Verweij et al. (2010) study. First, the findings, which were based on studies of twins, may not necessarily be generalized to the general population. Second, the 52 twin studies differed in their measures, their statistical methods, and the characteristics of their samples. Finally, because the current study was quantitative in nature, it does not provide an in-depth understanding of the motives behind the actions of the participants (Berg, 2007).

Third, Willis et al. (2019) conducted a qualitative study to investigate how students develop their attitudes toward drug use. The researchers collected data from 63 college students in 13 focus groups. A thematic approach was used, and the themes revealed that students in the college culture are expected to use drugs by peers. In other words, college students socially learn how to behave in the college environment.

However, there were several limitations in the Willis et al. (2019) study. First, because the study was conducted on college students, the findings may not necessarily apply to high school students. Second, there may be a difference between what focus group participants say and what they do. Third, dominant personalities may influence the responses of a focus group, and introverts may not effectively voice their opinions. Finally, because the study was qualitative in nature, it does not quantify relationships or make numeric predictions (Bordens & Abbott, 2008).

Fourth, Keyes et al. (2011) conducted a quantitative study to determine the relationship between society-level disapproval of marijuana and marijuana use. The researchers examined secondary data collected from 986,003 students in eighth, tenth, and twelfth grades from 1976 to 2007. Public and private schools were selected based on a multi-stage random sampling design. Data were collected from the Monitoring the Future project, which provided a nationally

representative sample of adolescents. The individuals were clustered into birth cohorts to characterize the association between population-based norms and individual-level marijuana use. The researchers used odds ratio to assess the data, and the findings indicated that the use of marijuana by adolescents is influenced by fellow cohorts. In other words, social norms impact marijuana use.

However, there were several limitations in the Keyes et al. (2011) study. First, there is the possibility of systemic bias. It is possible that most of the students who participated in the study were interested in the marijuana controversy whereas those who were less interested did not participate in the study. As a result, the findings may be biased. Second, the researchers did not have information on the geographical norms for each student, and these norms may be important predictors of marijuana use. Third, students who dropped out of high school were not included in the survey estimates, which may impact the validity of the results. Fourth, the use of a nonparametric statistic may result in some loss of efficiency for estimation of the coefficients when compared to a parametric statistic (Fitzmaurice et al., 2004). Finally, because the research study was quantitative in nature, it does not describe *why* the use of marijuana by adolescents is influenced by fellow cohorts (Berg, 2007).

Fifth, Odgers et al. (2008) conducted a quantitative study to assess the association between early exposure to drugs and deviant behavior later in life. During the first stage, the researchers collected data in 1972 and 1973 from 1,037 New Zealand children during the Dunedin Multidisciplinary Health and Development Study. Follow-up assessments were conducted between 2003 and 2005 after the children turned 32 years of age. The researchers collected data on early exposure to illicit substances and conduct problems. The measure of illicit substance use during childhood was measured via self-reports, and the measure of illicit substance use during adulthood was measured via private structured interviews with the help of the fourth addition of the Diagnostic and Statistical Manual of Mental Disorders. The measure of conduct problems during childhood was measured via self, parent, and teach reports, and the measure of conduct problems during adulthood was measured via the New Zealand Police database for both violent and non-violent crimes. The researchers then used multivariate logistic regression to calculate propensity scores for early-exposed adolescents and non-early-exposed adolescents. The researchers conducted propensity score matching, and the findings indicated that early exposure to illicit substances is positively related to substance dependency and to criminal arrest.

However, there were several limitations in the Odgers et al. (2008) study. First, study participants were not randomly selected, and propensity score matching does not test for causal relationships. Second, the participants were from New Zealand, and they may not necessarily reflect Americans. Third, the culture of drug use has changed over time, and the study did not separate cannabis from other types of drugs. Finally, because the research study was quantitative in nature, it does not describe *why* the participants used illicit substances (Berg, 2007).

Finally, Pedersen and Skardhamar (2009) conducted a quantitative study to examine the relationship between marijuana use during adolescence and early adulthood and arrest later in life. Data were collected from 1992 to 2005 from a sample of 1,353 Norwegian adolescent students who participated in the Young in Norway Longitudinal Study. Data were collected

from the participants when they were 13, 15, 20, and 27 years of age. The sample was stratified according to geographical area and school size. Crimes were measured by the number of charges filed against each participant for serious crimes, and the crime data were provided by Statistics Norway. Marijuana use was measured by using a six-point Likert-type scale that ranged from never to more than 50 times. The participants were asked if they used marijuana in the prior 12 months. Subsequently, the researchers used multivariate analyses to assess the data, and the findings indicated that there is a relationship between early drug use and the number of arrests. However, many of the arrests were related to drug use. When all drug-related arrests were excluded from the study, then findings indicated that there is no relationship between marijuana use and the number of arrests.

However, there were several limitations in the Pedersen and Skardhamar (2009) study. First, the number of crimes was measured by the number of arrests. Sometimes, innocent persons are arrested, and this may impact the validity of the data. Second, many offenses that are committed are not detected by the police, and, as a result, many offenders are not arrested. This may impact the validity of the data. Third, some offenders may be apprehended more easily than others, which may impact the validity of the data. Fourth, due to attrition, many serious criminal records were lost during the study, which may impact the validity of the data. Fifth, it is possible that important extraneous variables were not identified and controlled, which may impact the validity of the findings. Finally, because the research study was quantitative in nature, it does not describe *why* the participants used marijuana or committed crime (Berg, 2007).

In sum, it appears that social norms and the social environment affect the consumption of marijuana. Siblings, friends, and peers seem to influence the behaviors of persons with whom they associate. In addition, parents recognize the importance of the social learning theory in modifying behaviors. In short, if marijuana use becomes the social norm, children may socially learn to consume it as normal behavior.

### III. METHODOLOGY

#### Political Partisanship Definition

A state was considered either Democrat or Republican based on the 2012 and 2016 U.S. Presidential elections (“Presidential Voting History by State,” n.d.). If a state’s electoral college voted for the Democrat U.S. Presidential candidate, then that state was considered a Democrat state. If a state’s electoral college voted for the Republican U.S. Presidential candidate, then that state was considered a Republican state. To be considered in this study, a state had to be consistently Democrat or Republican during the years of data collection, which were 2013, 2015, and 2017.

#### Data Collection

The Centers for Disease Control and Prevention, which is devoted to the public’s safety and health, collected data in 2013, 2015, and 2017 via the Youth Risk Behavior Surveillance System (Kann et al., 2014; Kann et al., 2016; Kann et al., 2018). A three-stage cluster sample design

produced a nationally representative sample of students in grades 9-12 who attended public and private schools. The standard questionnaire in 2013 included 86 questions, and the standard questionnaires in 2015 and 2017 included 89 questions.

### Statistical Analysis

Because the observations for the three questionnaires used in 2013, 2015, and 2017 were from the same states, a lack of independence among the data values was expected (Su, 2020). Indeed, a prior study that used data from the same surveys over the same time period has indicated that the data values have a very large overdispersion problem, which was 5,000 times larger than it should have been (Davis, 2020). Thus, to address this parametric assumption violation, generalized estimating equations (GEE), a nonparametric statistic, was used to assess the data. However, although GEE avoids the distributional assumptions of independent observations, the use of a nonparametric statistic may result in some loss of efficiency for estimation of the coefficients (Fitzmaurice et al., 2004; Su, 2020).

## IV. RESULTS

Data were collected from 29 states in 2013, 23 states in 2015, and 24 states in 2017 for a total of 76 observations (see Table 1). Of all the states considered, 60.5% were Republican and 39.5% were Democrat. The mean numbers of male high school students who have ever used marijuana for the Republican states were 267.00 (SD = 167.36), 255.23 (SD = 146.87), and 221.64 (SD = 137.59) in 2013, 2015, and 2017, respectively (see Table 2). The mean numbers of male high school students who have ever used marijuana for the Democrat states were 1216.40 (SD = 2526.56), 1169.90 (SD = 2257.15), and 940.10 (SD = 1779.20) in 2013, 2015, and 2017, respectively. The mean rates of male high school students who have ever used marijuana for the Republican states were 0.358 (SD = 0.064), 0.339 (SD = 0.049), and 0.312 (SD = 0.057) in 2013, 2015, and 2017, respectively. The mean rates of male high school students who have ever used marijuana for the Democrat states were 0.417 (SD = 0.039), 0.367 (SD = 0.037), and 0.347 (SD = 0.040) in 2013, 2015, and 2017, respectively.

Table 1. Sample Size Overview

Variable	Total number of observations	Number of states (%) per political party		Number of states per year		
		Republican	Democrat	2013	2015	2017
Male high school students who have ever used marijuana	76	46 (60.5)	30 (39.5)	29	23	24

Table 2. Descriptive Statistics for the Variables of Interest

Variable	Year	Party	Number of states	Events		Trials		Events/Trials			
				M	SD	M	SD	M	SD	Min	Max
Males who have ever used marijuana	2013	R	19	267.00	167.36	742.32	413.24	0.358	0.064	0.172	0.434
		D	10	1216.40	2526.56	3153.50	6754.01	0.417	0.039	0.334	0.461
	2015	R	13	255.23	146.87	739.00	376.17	0.339	0.049	0.238	0.418
		D	10	1169.90	2257.15	3481.00	6965.73	0.367	0.037	0.306	0.416
	2017	R	14	221.64	137.59	707.21	387.43	0.312	0.057	0.168	0.395
		D	10	940.10	1779.20	3012.90	6042.57	0.347	0.040	0.297	0.429
	Overall	R	46	249.87	151.01	730.70	386.85	0.339	0.060	0.168	0.434
		D	30	1108.80	2135.35	3215.80	6370.76	0.377	0.048	0.297	0.461

Note. R = Republican; D = Democrat; M = mean; SD = standard deviation; Min = minimum; Max = maximum. Events represent the number of male high school students who have ever used marijuana. Trials represent the male sample size. Events/Trials represent the rate of male high school students who have ever used marijuana.

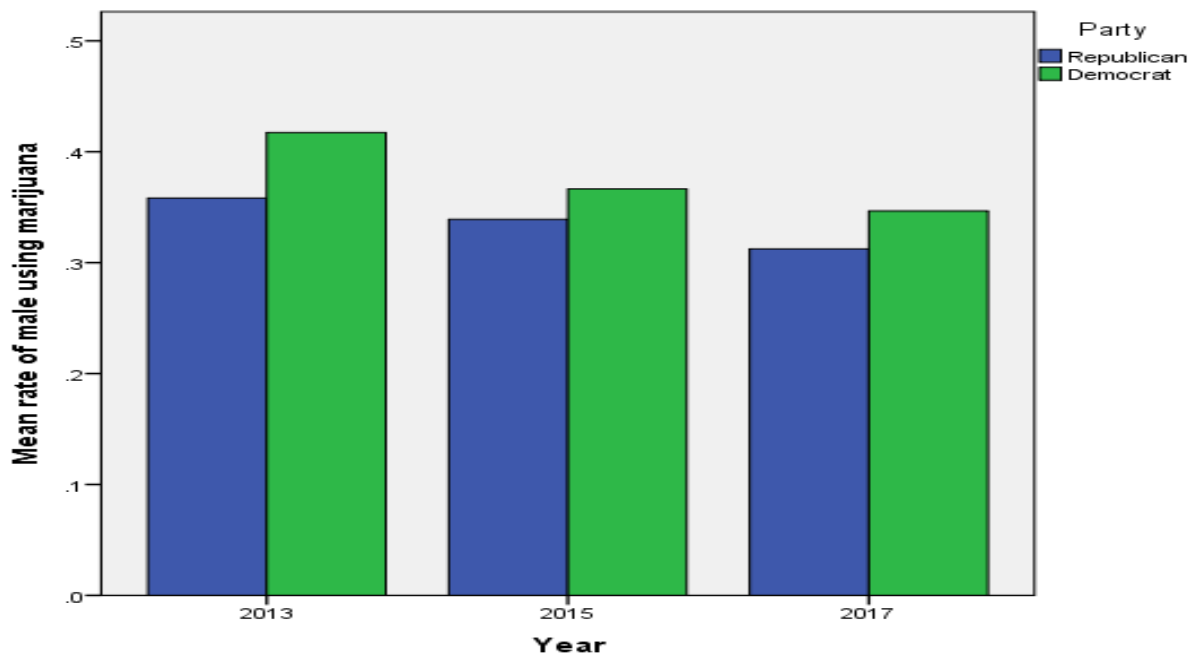


Figure 1. Bar chart of mean rates of male high school students who have ever used marijuana by year and political party.



Figure 1 shows the bar chart of mean rates of male high school students who have ever used marijuana by year and political party, which provides a direct comparison of the mean rates of male high school students who have ever used marijuana between the two political parties. Based on Figure 1, compared to Democrat states, Republican states seem to have lower mean rates of male high school students who have ever used marijuana. However, the results of the logistic regression for repeated measures indicate that there is no statistically significant relationship between male high school students who have ever used marijuana and political party ( $\chi^2(1) = 0.040$ ,  $p = 0.842$ , Table 3; OR = 0.987, 95% CI = [0.873, 1.117], Table 4).

Table 3. Tests of Model Effects

Model	Wald $\chi^2$	df	p
Male using marijuana	0.040	1	0.842

Note. Wald  $\chi^2$  = Wald chi-square statistic; df = degrees of freedom; p = p-value.

Table 4. Parameter Estimates and Odds Ratios

Model	Variable	B	SE	95% CI of B		OR	95% CI of OR	
				Lower	Upper		Lower	Upper
Male using marijuana	Intercept	-0.642	0.038	-0.716	-0.568			
	Political party							
	Republican	-0.013	0.063	-0.136	0.111	0.987	0.873	1.117
	Democrat	Ref						

Note. B = parameter estimate; SE = standard error; CI = confidence interval; lower = lower bound; upper = upper bound; OR = odds ratio; ref = reference group. OR was computed as  $\exp(B)$ .

## V. DISCUSSION

The results of the logistic regression for repeated measures indicate that there is no statistically significant relationship between male high school students who have ever used marijuana and political party. Therefore, the null hypothesis is accepted. Although the consumption of marijuana among high school students is not endorsed by either political party, the results are important because they indicate that neither political party is better than the other when it comes to creating a social learning environment that discourages marijuana use among high school students. According to the social learning theory, the social learning environment can modify a person's behavior involving the use of marijuana. Therefore, both political parties

may need to consider other ways to modify the social learning environment to address the issue. To reduce the amount of male high school students who use marijuana, the proper social learning environment must be created.

### Limitations

There were several limitations in this study. First, the study employed a nonparametric statistic, which may result in some loss of efficiency for the estimation of the coefficients (Fitzmaurice et al., 2004; Su, 2020). Second, the social learning theory states that the same learning process produces both conforming and nonconforming behaviors (Akers & Sellers, 2009). Thus, what is actually learned in any given situation will depend on the learning process within each individual. Third, because the study was quantitative in nature, it does not explain *why* male high school students used marijuana (Berg, 2007). Fourth, there is a possibility that the participants who chose to participate in the study may be different in a meaningful way from those individuals who chose not to participate, which may affect the results. Fifth, because the sample was limited to male high school students in the U.S., the findings cannot be generalized to other populations. Sixth, because the participants knew they were involved in a study, their responses may have been artificial (Bordens & Abbott, 2008). Seventh, the participants may try to help the researchers by providing the answers that they believe the researchers want them to provide. Finally, there are different ways to define political partisanship, which may provide different results. For example, political partisanship may be defined by the political party affiliation of state senators and/or U.S. senators.

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