

Policing Pot: State-Level Cannabis Arrests Increase Perceived Risks and Costs but Not Use

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ABSTRACT

Legal sanctions are purported to play a role in cannabis use and related consequences. General models of deterrence suggest that increases in arrests should decrease consumption by heightening perceptions of the negative consequences of use as well as the likelihood and severity of penalties. The present study examined if arrests resulting from cannabis possession relate to cannabis consumption, perceptions of use, and likelihood and severity of related penalties. Combining data from the National Survey on Drug Use and Health with the FBI Uniform Crime Report (2002-2013) allowed for the estimation of a series of fixed-effects models that compare rates of arrests and perceived risks of aggregate rates of self-reported use at the state-level over time. Forty-nine states reported data ($N = 592$ state-years). Cannabis-related arrest rates (ratio of possession arrests for state/state population times 1,000) ranged from 0.04 - 5.63. Increases in cannabis-related arrests were associated with heightened perceptions of risk from use ($b = .80 [-.16, 1.8]$, $p < .05$); but this association was non-significant in the model omitting states that legalized recreational cannabis in 2012. Arrests related to greater perceptions of the severity of potential penalties, including community service ($b = .54 [.24, .85]$, $p < .05$), probation ($b = .85 [.44, 1.3]$, $p < .001$), and prison sentences ($b = .25 [.02, .5]$, $p < .05$). Arrest rates were not associated with cannabis use ($b = -.25 [-.52, .05]$, $p > .05$) or the proportion of new initiates ($b = -.02 [-.08, .05]$, $p > .05$). We conclude that increased arrests are associated with perceptions of negative consequences and penalty but appear unrelated to actual use. This study highlights the need to re-examine the utility of punitive approaches to reduce the public health burden posed by substance use.

Key words: = cannabis, marijuana, deterrence, arrest

Illicit drug use remains a persistent public health concern in the United States. In the United States, more than one in ten individuals over the age of 12 reported illicit substance use in 2017 (Center for Behavioral Health Statistics and Quality, 2017). The most recent data from 2007 estimates a nearly \$193 billion annual cost stemming from illicit substance use, including expenses for crime, loss of work, and healthcare (Birnbaum et al., 2011; National Drug Intelligence Center, 2011). By far, cannabis is the most consumed prohibited drug. Of the 53.2 million individuals who reported using illicit substances in the past year in 2018, 43.5 million specifically

indicated using cannabis (Substance Abuse and Mental Health Services Administration, 2019).

At the federal-level, cannabis remains a Schedule I substance. States' policies vary substantially, ranging from the legalization of recreational cannabis to medical exceptions to total prohibition. To date, 37 states and the District of Columbia (D.C.) have legalized medical cannabis, while 18 states and D.C. legally allow recreational use. Similarly, policies regarding penalty for cannabis use, possession, and sales also vary widely by state, and can include considerable fines and prison time (see Caulkins et al., 2016; Room et al., 2010). Federal prohibition of cannabis is

longstanding, yet rates of use continue to rise (Fielding et al. 2008). Punitive policies implicitly rely on deterrence to stay the financial, social, and healthcare costs associated with problematic cannabis use, yet the effects of such efforts are not well understood.

The general logic underlying deterrence policies is that the threat of sanctions will discourage individuals from engaging in criminal behavior (Elliott et al., 1982; Jervis, 1979; Loughran et al., 2016; MacCoun, 1993; Nagin, 2013). In regard to cannabis, deterrence models assume that individuals will weigh negative consequences heavier than the perceived rewards of using, and act accordingly. Such consequences include threat of punishment, but also social sanctions and negative consequences for mental and physical health. The effectiveness of deterrence relies on exposure to threats of punishment, including the consistent application of judicial procedures and penalties and one's perceived relative risk of experiencing sanctions. Fundamentally, individuals must also be aware of and understand the legal ramifications of one's behavior. To work, deterrence requires individuals to be aware of and responsive to the possibility of punishment.

The empirical evidence on the effectiveness of punitive criminal legal sanctions for curbing cannabis use is mixed. Some work indicates that deterrence shapes the behavior of individuals who use cannabis who seek to avoid detection and penalty (Elliott et al., 2012; Erickson et al., 2013). Certainty of punishment appears inversely related with cannabis use (Meier et al., 1984; Tittle, 1977). This trend is complicated by the finding that both users and non-users consider detection and arrest related to cannabis use to be unlikely (Lundman, 1986). Other work demonstrates that deterrence has no effect on use (Reinarman et al., 2004), or prompts the opposite effect, where greater likelihood for experiencing sanctions increases cannabis use (Meier & Johnson, 1977). Further, early research on cannabis deterrence found that penalties of varying severity had little impact on use (Single, 1989). A closer examination of deterrence on use, including social and perceptual factors, suggested that certainty of punishment might not play as decisive a role as previously hypothesized (Erickson, 1980; Erickson, 1982; Meier & Johnson, 1977)..

More recent work focuses on the perceptual factors that relate to deterrence, such as risk, normalization, availability of cannabis, and public knowledge and attitudes surrounding cannabis policies (Apel, 2013; Arazan et al., 2015; Hall et al., 2019; MacCoun et al., 2009; Nguyen et al., 2015). For instance, while many individuals are cognizant of penalties associated with cannabis, perceptions of risk appear more accurate among those already involved in criminal conduct (Apel, 2013). Additionally, proximal factors, such as the presence of peers, alter situational perceptions of risk, suggesting that risk perceptions are partly influenced by contextual factors. Individual factors are also involved in the decision to use cannabis (Erickson et al., 2013; Jacobs, 2010). Perceptions play a pivotal role in how individuals evaluate the risks and rewards associated with cannabis use, which inherently incorporate beliefs about stigma, acceptability, and therapeutic benefit (Brunt et al., 2014; Caulkins & Pacula, 2006; Hathaway et al., 2011b; MacCoun et al., 2009; Pacula et al., 2010).

In addition to the insights gained from the present literature, an updated examination of perceptual factors and cannabis penalty is needed. The Federal government and many states still prohibit the use of recreational cannabis. Cannabis use is increasingly recognized as a public health issue, leading to adverse health outcomes and placing some individuals at an increased risk of social, financial, and legal consequences. Cannabis policy changes appear to have a bearing on both use and penalty. Results on the prevalence of use following legalization are mixed, with some reports indicating an increase in use, and others demonstrating stabilized rates over time (Cerdá et al., 2012; Doran et al., 2021; Williams & Bretteville-Jensen, 2014). Recent work indicates that decriminalization was associated with fewer arrests for adults (Grucza et al., 2018a; Gunadi & Shi, 2021), though reductions vary across demographics (Plunk et al., 2019; Tran et al., 2020). Despite the general trend toward decriminalization and legalization and subsequent reduced arrests, states overwhelmingly rely on the criminal legal system, and the primary tool in their kit, deterrence, to waylay the negative consequences of cannabis use. This is consistent with the increasing interest in substance use as a public health concern. Assuming that the actions of the criminal legal system are an effective deterrent, we would still expect increasing levels of

punishment, such as arrests, to increase perceptions of risks of cannabis use, ultimately driving down prevalence rates of use.

The present study aimed to examine whether state rates of cannabis-related arrests between 2002 and 2013 were related to changes in use, proportion of cannabis initiates, and perceptions of risk and penalty. We predicted that perceptions of risk and penalty would increase as arrests increased, while use and proportion of new users would diminish, as arrest rates provide cues to the certainty of punishment and thereby disincentivise use.

METHODS

Data

We combine state-level data from the Federal Bureau of Investigation's Uniform Crime Report (UCR) with disaggregated state-level data from the National Survey on Drug Use and Health (NSDUH) for the period spanning 2003 – 2013. NSDUH's sampling strategy changed in 2013; we therefore selected this observation period to maintain consistency in sampling and survey items overtime. As noted below, this observation period also buttresses the legalization of recreational cannabis use in Washington State and Colorado in December of 2012. The UCR provides aggregate data on crimes known to police and arrests compiled from local jurisdictions across the United States. The UCR utilizes a standardized classification system which divides offenses into Part I and Part II offenses. Part I offenses are considered the most serious, occur with regularity, and are most likely to be reported to police. Part II offenses are less serious forms of offending, including substance use offenses. NSDUH is a nationally representative survey of the civilian, noninstitutionalized U.S. population aged 12 years and older. NSDUH collects, among other indicators, self-reported information about illicit drug use and the perception of harms associated with substance use. We rely on disaggregated state-level estimates of prevalence of cannabis use and related indicators computed by Azofeifa and colleagues (2016). After removing missing data, we arrive at a final sample of 592 state-years.

Our primary independent variable, *cannabis arrest rate*, is the state-by-year specific arrest rate for cannabis possession, measured as the ratio of

possession arrests for state/state population multiplied by 1,000. The UCR employs a hierarchical classification system in which only the most serious offense is recorded in situations in which multiple offenses occur during a single incident. The hierarchy rule ensures that cannabis possession will only be recorded in the most minor of events (e.g., those in which a more serious crime did not occur). As such, while our measure does not capture the full range of cannabis arrests, it captures ebbs and flows in innocuous forms of possession – those not linked to more serious forms of criminality. The dependent variables in our models are a series of estimates regarding the prevalence and perceived harms of cannabis use at the state-level over time. *Annual usage* is the percentage of respondents who reported using cannabis in the past 12 months. *Past year initiates* captures the percentage of first-time cannabis users. *No risk* and *great risk* are defined as those who reported that smoking cannabis once a month and once or twice a week might cause harm [great risk] and might not cause harm [no risk]. Several items were included to capture perceived punishment associated with simple cannabis possession. These range from 'no punishment' to 'mandatory prison sentence.' A full description of these items is provided in Supplemental I. Descriptive statistics are presented in Table 1. All NSDUH estimates were weighted in our analyses.

Analytic Strategy

We employ a series of fixed effect regression models to estimate the effect of cannabis arrest rates on the indicators of state-level cannabis prevalence. We first examined fixed effects estimates of cannabis use, perceived risk, and perceived penalty regressed on possession rate for all states from 2002-2013 ($N = 592$). Given the legalization of recreational cannabis at the end of 2012, we re-estimate our model omitting data from Colorado and Washington in 2013 ($N = 590$). As Vermont legalized at the end of 2013, we retained Vermont's data from 2013 in our analyses. The fixed-effects estimator incorporates demeaned values of the independent and dependent variables, holding constant time-stable factors which might otherwise confound the observed association between year over year fluctuations in arrest rates and corresponding

fluctuations in the measures of prevalence, harm, and perceived punishment. This helps overcome some of the issues associated with the UCR's hierarchy rule. State-level processes that affect reporting and/or policing of minor possession are unlikely to change in meaningful ways, suggesting that the measurement error in our

arrest rates should be relatively consistent within-states over this 12-year period. From this vantage point, the hierarchy rule provides a robust indicator of exactly the type of cannabis-policing to which we would expect the general public to be responsive.

Table 1. *Descriptive Statistics for Cannabis Arrests, Annual Cannabis Use, Perceptions of Risk, and Perceptions of Penalty (N = 592)*

	Mean	S _{x_b}	S _{x_w}	Min	Max
<i>Possession Arrest Rate*</i>	2.17	0.96	0.40	0.00	5.63
<i>Cannabis Use</i>					
Annual Usage Self-Report	11.42	2.67	1.35	5.30	21.40
Past Year Initiates	1.58	0.36	0.31	0.50	3.90
<i>Perception of Risk</i>					
% Reporting 'no risk'	12.74	2.47	3.59	4.90	28.40
% Reporting 'great risk'	34.06	5.63	4.57	14.00	53.00
<i>Perception of Penalty</i>					
% Reporting no punishment	4.47	3.96	3.62	0.50	58.20
% Reporting Fine	32.26	7.95	4.91	15.50	66.80
% Reporting Mand. Prison	5.66	1.33	1.11	0.70	11.70
% Reporting Community Service	8.24	1.55	1.47	2.40	19.20
% Reporting Probation	17.17	3.50	1.98	5.80	28.40

Note. Risk (no risk, great risk) and penalty (no punishment, fine, mand. prison, community service, probation) indicate percentage of perceived maximum legal penalty for cannabis possession. NSDUH variables reported as percentages. Complete survey items from UCR and NSDUH can be found in Supplemental 1. S_x – standard error; b – between states; w – within-state; * – per 1000 individuals.

RESULTS

Table 1 presents the descriptive statistics for each of the measures. The average possession arrest rate was 2.17 per 1,000 individuals. Approximately 11 percent of the sample reported using cannabis in the past 12 months, with 1.6 percent of the population, on average, reporting first time initiation. Respondents were more likely to report a great risk associated with regular cannabis use than they were to report no risk. The modal perceived legal sanction for cannabis possession was a monetary fine, followed by probation, community service, mandatory prison sentence, and no punishment. Risk perceptions and perceived penalties varied greatly both between states and within states during our observation period.

The parameter estimates, 95% confidence intervals, and standard errors for each of the outcomes regressed on the cannabis possession rate are presented in Table 2. The coefficients can be interpreted as the expected change in outcome

variable associated with a one-unit increase in the possession rate (1 additional arrest per 1,000 population) at the state-level. As evidenced here, arrest rates had no discernible effect on annual prevalence of cannabis use nor the prevalence of first-time initiates. A one unit increase in the possession rate was associated with an approximately one-percent increase in the percentage of the population reporting that regular cannabis use was a great risk ($b = 0.80$ 95% CI [-.16, 1.8], $p < 0.05$) and a concurrent one-percent decrease in those reporting regular cannabis use engenders no risk ($b = -0.85$ [1.6, -.09], $p < 0.05$). Turning to perceived penalties – state level increases in possession arrest rates were associated with more severe perceived penalties for cannabis possession. For instance, a one-unit increase in the arrest rate was associated with a .25 percentage point increase in those perceiving a mandatory prison sentence ($b = .25$ [.02, .5], $p < 0.05$), a .54 percentage point increase in those reporting community service ($b = .54$ [.24, .85], $p < 0.001$), and a .85 percentage point

Table 2. *Fixed Effects Estimates of Cannabis Use, Perceived Risk, and Perceived Penalty Regressed on Possession Rate (N = 592)*

	B [95% CI]	se	
<i>Self-Reported Use</i>			
Annual Usage Self-Report	-0.25 [-.52, .05]	0.14	
Past Year Initiates	-0.02 [-.08, .05]	0.03	
<i>Perceived Risk</i>			
% Reporting 'no risk'	-0.85 [-1.6, -.09]	0.38	*
% Reporting 'great risk'	0.80 [-.16, 1.8]	0.48	*
<i>Perceived Penalty for Possession</i>			
% Reporting no punishment	-2.94 [-3.8, -2.1]	0.44	***
% Reporting Fine	-1.34 [-2.4, -.31]	0.51	***
% Reporting Mand. Prison	0.25 [.02, .50]	0.11	*
% Reporting Community Service	0.54 [.24, .85]	0.15	***
% Reporting Probation	0.85 [.44, 1.3]	0.21	***

Note. se – standard error; * $p < .05$; ** $p < 0.01$; *** $p < 0.001$

Table 3. *Fixed Effects Estimates of Cannabis Use, Perceived Risk, and Perceived Penalty Regressed on Possession Rate, Removing Colorado and Washington State Post-2012 (N = 590)*

	B [95% CI]	se	
<i>Self-Reported Use</i>			
Annual Usage Self-Report	-0.09 [-.38, .20]	0.15	
Past Year Initiates	-0.01 [-.07, .06]	0.03	
<i>Perceived Risk</i>			
% Reporting 'no risk'	-0.6 [-1.4, .10]	0.39	
% Reporting 'great risk'	0.61 [-.40, 1.6]	0.50	
<i>Perceived Penalty for Possession</i>			
% Reporting no punishment	-1.34 [-1.9, -.79]	0.28	***
% Reporting Fine	-1.8 [-2.8, -.72]	0.53	**
% Reporting Mand. Prison	0.17 [-.07, .40]	0.12	
% Reporting Community Service	0.41 [.10, .72]	0.16	*
% Reporting Probation	0.70 [.28, 1.1]	0.21	**

Note. se – standard error; * $p < .05$; ** $p < 0.01$; *** $p < 0.001$

increase in those reporting probation ($b = 0.85$ [.44, 1.3], $p < 0.001$). By contrast, increases in arrest rates reduced those reporting 'no punishment' by 2.79 percentage points ($b = -2.79$ [-3.8, -2.1], $p < 0.001$) and those reporting a monetary sanction by 1.34 percentage points ($b = -1.34$ [-2.4, -.31], $p < 0.001$). Finally, we examined estimates for outcomes regressed on the cannabis possession rate omitting 2013 data from Colorado

and Washington ($N = 590$; Table 3). Overall, these results were similar to our initial model for past year annual use and initiates as arrests were not associated with either outcome. One unit increases in arrests were again related to greater perception of penalty, specifically for community service ($b = .41$ [.10, .72], $p < 0.05$), and probation ($b = 0.70$ [.28, 1.1], $p < 0.01$). Notably, the association between cannabis arrests and

perceived risk of use was no longer significant with the removal of the Colorado and Washington state.

DISCUSSION

The present study examined whether cannabis arrests were associated with changes in use and perceptions of risk of use and penalty of possession at the state-level. Between 2002 and 2013, increases in cannabis arrest rates covaried with riskier perceptions of use and increased perceived penalty for possessing cannabis. The removal of states with legal recreational cannabis indicated that perceptions of risk were no longer related to arrests. We found no evidence in either model that arrest rates influence the proportion of new users or rates of self-reported use. These results demonstrate that increasing levels of arrest influence related perceptions of punishment severity.

Our results comport with prior findings that suggests the threat of sanctions shape substance use disclosure and the management of the potential risk of penalty (Hammersley et al., 2001; Hathaway, 2004a, 2004b). For instance, New York City implemented aggressive policing of public cannabis to deter more severe crime in the 1990s (Elliott et al., 2012; Nadelmann, 2010). The threat of penalty moved users to private or marginal spaces to consume cannabis, but failed to accomplish larger goals to prevent escalating crime or reduce use (Elliott et al., 2012). Our study similarly found that increases in cannabis arrests placed upward pressure on risk perceptions. Similar trends are found in cross-sectional work demonstrating weak relations between actual punishment and perceived threat from punishment among offenders (Bridges & Stone, 1986). Beliefs about cannabis risk, or even more generally about cannabis, invite a broader conversation regarding the perceived acceptability of the substance. Qualitative work corroborates these findings, suggesting that many users endorse mainstream perceptions of cannabis as risky or deviant, yet normalize their own use (Hathaway et al., 2011). Much literature in this area agrees that despite the threat of sanctions and perception of risk, individuals continue to consume cannabis, albeit with updates to manage their use more discreetly. Thus, rather than curb cannabis use, increasing

arrests might move individuals who use cannabis to more marginalized spaces. The complex relationship between risk and access might also relate to our finding that perceptions of risk were not associated with arrests once we omitted states that had legalized recreational cannabis in 2013. Recreational cannabis appeared to drive the original effect. The novelty of public acceptability of cannabis use could potentially contribute to perceptions of risk. Similarly, legalization might indicate greater access to cannabis products, increasing the likelihood of problems and public health burden. Such responses are not as likely to be susceptible to deterrence policies, given the change in legalization status. Ultimately, while deterrence efforts can lead to appreciable shifts in aggregate attitudes about penalty, changing arrests have little bearing on actual use.

Perhaps the most important implication of this study is the disconnect between perceptions of cannabis risk and actual cannabis use behaviors. Our study indicates that increases in arrest rates fail to predict meaningful changes in cannabis use, and just as many new individuals start using cannabis each year. This finding not only corroborates similar trends regarding deterrence and cannabis outcomes, but also brings up additional considerations (Erickson, 1989; Erickson et al., 2013; Foglia, 1997). Individuals might not be responsive to the potential penalty of arrest associated with cannabis possession. Although not captured here, deterrent effects could manifest in more nuanced shifts in behavior. For instance, individuals using cannabis may take efforts to use more discreetly or in private or carry smaller amounts of product. This behavior is also consistent for those who normalize their own use, while recognize use as inherently risky or deviant (Hathaway et al., 2011). These strategies are most pronounced for those who identify as more frequent or heavy users and hold prior charges for possession. While punishment alone might not deter cannabis use, exposure to punishment and perceptions of severity might alter behavior in more subtle or indirect ways.

The results of our study might suggest that penalties aiming to deter cannabis use are ineffective in reducing the prevalence of cannabis use and the number of new users. A review of cannabis criminalization suggests that deterrence not only fails to achieve this goal, but can actually

cause more harm in the lives of those punished for minor drug offenses (Lenton, 2000). Significant resources are expended towards deterrence, particularly around policing and criminal justice processes. Fundamental goals of deterrence policies are to not just reduce use, but also mitigate the costs and harms associated with cannabis use. Prioritizing cannabis use as a public health issue and not a criminal issue might better achieve these goals. Criminalization of cannabis use, specifically through arrest, not only fails to limit use or number of initiates, but also does little to reduce the health and social consequences stemming from problematic use. With movement towards widespread legalization, other forms of regulation appear more effective to address these concerns (Rehm & Fischer, 2015). Lessons from US regulations of tobacco and alcohol provide further insight (Barry & Glantz, 2016). Emphasizing demand reduction strategies in a legal marketplace for cannabis, such as educating the community, protecting at-risk populations, and limiting market availability, could better allay public health concerns than traditional enforcement. Additionally, prevention efforts targeting target high risk groups and prioritizing mental health and substance use screenings can promote a public health agenda (Fischer et al., 2009).

Our study was not without limitations. First, our analyses depended on state-level estimates spanning 2002 to 2013. The reason for this range of time was based on several factors, including the availability of data, the consistency in methodology and items among the yearly surveys, and significant policy changes taking place in 2012. To the latter point, 2012 marked the first year that cannabis achieved recreational legal status (Washington and Colorado). As our variables relating to risk and use were likely impacted by changes in legal status, we opted to include data until recreational use became legalized. Our data also invites caution regarding the generalizability of state-level trends. Given that many states grant individual municipalities the opportunity to reject aspects of cannabis businesses even when they are legal within the state, generalizing from these state data to smaller jurisdictions would be inappropriate. Future work should continue to examine how trends regarding cannabis arrest and perceptions of risk and use may change, particularly as

cannabis policy continues to evolve after 2013 and into the present year.

A second limitation involves the arrest data sourced from the UCR. Specifically, the UCR hierarchy limits reporting of cannabis possession to instances where possession was the most serious crime reported. Essentially, if possession co-occurred with a more severe crime, this event would be reported as a statistic for the more severe crime. This methodology could indicate that the present arrest data is underreported. This limitation is also linked to a broader concern that most cannabis use incidents remain undetected by law enforcement. Despite this limitation, the data do represent important changes in arrest patterns as measurement error within our fixed effects model is likely to be consistent within states. Moreover, this data is particularly insightful for drawing conclusions around the general population of cannabis users, those concerned primarily with use and possession and not serious criminality. Relatedly, the use of UCR data in conjunction with NSDUH data presents a limitation in the overlap of the two samples. UCR includes a small number of cases representing youth under the age of 12. Additionally, NSDUH data would not include incarcerated individuals, who are at higher risk for arrest and use; however, this limitation is consistent across all states and the examination of UCR with public health data is aligned with methods in previously published work (Friedman et al., 2006; Grucza et al., 2018b).

Finally, our data did not examine differences in perceptions of risk and penalty or in cannabis use across demographics. Stratified analyses could potentially uncover meaningful differences between youth and adults across our study outcomes. Given how penalty and policy effects vary substantially on factors such as race and socioeconomic status, future analyses should incorporate how group differences play a role in such outcomes. Such analyses will also be particularly relevant in the context of expanding legalization policies, where adults have legal access to cannabis and youth do not. Nevertheless, our present analyses provide general associations among study variables. While cannabis is currently legal in many states, federally, it remains classified as Schedule 1 substance and nearly two-thirds of Americans must still reckon

with risk and penalty if they intend to use cannabis recreationally.

Despite these limitations, the call for alternative strategies to penalty is clear. Such strategies might better utilize community resources to accomplish goals related to reducing harms related to cannabis use. Adopting a novel framework for addressing cannabis use might prove even more effective. A move from prohibition policies that emphasize deterrence to paradigms that incorporate harm reduction and critical criminological theory could be worthwhile (Fischer et al., 2020; Pratt et al., 2006). While further research is certainly needed to examine these theories in practice, they might offer an advantage by examining motivations for cannabis use through a multifaceted lens. Ultimately, a shift away from enforcement creates opportunities to prioritize the diverse array of public health outcomes associated with cannabis use.

REFERENCES

- Apel, R. (2013). Sanctions, Perceptions, and Crime: Implications for Criminal Deterrence. *Journal of Quantitative Criminology*, 29(1), 67–101.
- Arazan, C., Costelloe, M., & Hall, T. (2015). The Effect of Marijuana Legalization on Anticipated Use: A Test of Deterrence Theory. *International Journal of Criminology and Sociology*, 4, 181–191.
- Azofeifa, A., Mattson, M. E., Schauer, G., McAfee, T., Grant, A., & Lyerla, R. (2016). National estimates of marijuana use and related indicators - National Survey on Drug Use and Health, United States, 2002-2014. *MMWR Surveillance Summaries*, 65(11), 1–25.
- Barry, R. A., & Glantz, S. (2016). A Public Health Framework for Legalized Retail Marijuana Based on the US Experience: Avoiding a New Tobacco Industry. *PLoS Medicine*, 13(9), e1002131.
- Birnbaum, H. G., White, A. G., Schiller, M., Waldman, T., Cleveland, J. M., & Roland, C. L. (2011). Societal Costs of Prescription Opioid Abuse, Dependence, and Misuse in the United States. *Pain Medicine*, 12(4), 657–667.
- Bridges, G. S., & Stone, J. A. (1986). Effects of criminal punishment on perceived threat of punishment: Toward an understanding of specific deterrence. *Journal of Research in Crime and Delinquency*, 23(3), 207–239.
- Brunt, T. M., Van Genugten, M., Höner-Snoeken, K., Van De Velde, M. J., & Niesink, R. J. M. (2014). Therapeutic satisfaction and subjective effects of different strains of pharmaceutical-grade cannabis. *Journal of Clinical Psychopharmacology*, 34(3), 344–349.
- Caulkins, J., Kilmer, B., & Kleiman, M. (2016). *Marijuana legalization: What everyone needs to know®*. Oxford University Press.
- Caulkins, J. P., & Pacula, R. L. (2006). Marijuana markets: Inferences from reports by the household population. *Journal of Drug Issues*, 36(1), 173–200.
- Center for Behavioral Health Statistics and Quality. (2017). 2016 National Survey on Drug Use and Health: Detailed Tables. <https://www.samhsa.gov/data/sites/default/files/NSDUH-DetTabs-2016/NSDUH-DetTabs-2016.pdf>
- Cerdá, M., Wall, M., Keyes, K. M., Galea, S., & Hasin, D. (2012). Medical marijuana laws in 50 states: Investigating the relationship between state legalization of medical marijuana and marijuana use, abuse and dependence. *Drug and Alcohol Dependence*, 120(1–3), 22–27.
- Doran, N., Strong, D., Myers, M. G., Correa, J. B., & Tully, L. (2021). Post-legalization changes in marijuana use in a sample of young California adults. *Addictive Behaviors*, 115, 106782.
- Elliott, D. S., Ageton, S. S., & Huizinga, D. (1982). *Explaining delinquency and drug use*. Behavioral Research Institution.
- Elliott, L., Golub, A., & Dunlap, E. (2012). Off the street and into “the cut”: Deterrence and displacement in NYC’s quality of life marijuana policing. *International Journal of Drug Policy*, 23(3), 210–219.
- Erickson, P. (1980). *Cannabis criminals: the social effects of punishment on drug users*. Toronto: Addiction Research Foundation.
- Erickson, P. G. (1982). Illicit drug use, peer attitudes, and perceptions of harmful effects among convicted cannabis

- offenders. *Substance Use and Misuse*, 17(1), 141–154.
- Erickson, P. G. (1989). Living with prohibition: Regular cannabis users, legal sanctions, and informal controls. *Substance Use and Misuse*, 24(3), 175–188.
- Erickson, P. G., Van Der Maas, M., & Hathaway, A.D. (2013). Revisiting deterrence: Legal knowledge, use context and arrest perception for cannabis. *Sociologicky Casopis*, 49(3), 427–448.
- Fischer, B., Daldegan-Bueno, D., & Reuter, P. (2020). Toward a “Post-Legalization” Criminology for Cannabis: A Brief Review and Suggested Agenda for Research Priorities. *Contemporary Drug Problems*, 1–17.
- Fischer, B., Rehm, J., & Hall, W. (2009). Cannabis use in Canada: The need for a “Public Health” approach. *Canadian Journal of Public Health*, 100(2), 101–103.
- Foglia, W. D. (1997). Perceptual deterrence and the mediating effect of internalized norms among inner-city teenagers. *Journal of Research in Crime and Delinquency*, 34(4), 414–442.
- Friedman, S. R., Cooper, H. L. F., Tempalski, B., Keem, M., Friedman, R., Flom, P. L., & Des Jarlais, D. C. (2006). Relationships of deterrence and law enforcement to drug-related harms among drug injectors in US metropolitan areas. *AIDS*, 20(1), 93–99.
- Gruza, R. A., Vuolo, M., Krauss, M. J., Plunk, A. D., Agrawal, A., Chaloupka, F. J., & Bierut, L. J. (2018a). Cannabis decriminalization: A study of recent policy change in five U.S. states. *International Journal of Drug Policy*, 59, 67–75.
- Gruza, R. A., Vuolo, M., Krauss, M. J., Plunk, A. D., Agrawal, A., Chaloupka, F. J., & Bierut, L. J. (2018b). Cannabis decriminalization: A study of recent policy change in five U.S. states. *International Journal of Drug Policy*, 59, 67–75.
- Gunadi, C., & Shi, Y. (2021). Cannabis decriminalization and racial disparity in arrests for cannabis possession. *Social Science & Medicine*, 293, 114672.
- Hall, W., Stjepanović, D., Caulkins, J., Lynskey, M., Leung, J., Campbell, G., & Degenhardt, L. (2019). Public health implications of legalising the production and sale of cannabis for medicinal and recreational use. *The Lancet*, 394(10208), 1580–1590.
- Hammersley, R., Jenkins, R., & Reid, M. (2001). Cannabis use and social identity. *Addiction Research and Theory*, 9(2), 133–150.
- Hathaway, A. D. (2004a). Cannabis Careers Reconsidered: Transitions and Trajectories of Committed Long-Term Users. *Contemporary Drug Problems*, 31(3), 401–423.
- Hathaway, A. D. (2004b). Cannabis users’ informal rules for managing stigma and risk. *Deviant Behavior*, 25(6), 559–577.
- Hathaway, A. D., Comeau, N. C., & Erickson, P. G. (2011). Cannabis normalization and stigma: Contemporary practices of moral regulation. *Criminology and Criminal Justice*, 11(5), 451–469.
- Jacobs, B. A. (2010). Deterrence and deterrability. *Criminology*, 48(2), 417–441.
- Jervis, R. (1979). Deterrence Theory Revisited. *World Politics*, 31(2), 289–324.
- Lenton, S. (2000). Cannabis policy and the burden of proof: Is it now beyond reasonable doubt that cannabis prohibition is not working? *Drug and Alcohol Review*, 19(1), 95–100.
- Loughran, T. A., Paternoster, R., Chalfin, A., & Wilson, T. (2016). Can rational choice be considered a general theory of crime? Evidence from individual-level panel data. *Criminology*, 54(1), 86–112.
- Lundman, R. J. (1986). One-wave perceptual deterrence research: Some grounds for the renewed examination of cross-sectional methods. *Journal of Research in Crime and Delinquency*, 23(4), 370–388.
- MacCoun, R. J. (1993). Drugs and the law: A psychological analysis of drug prohibition. *Psychological Bulletin*, 113(3), 497–512.
- MacCoun, R., Pacula, R. L., Chriqui, J., Harris, K., & Reuter, P. (2009). Do citizens know whether their state has decriminalized marijuana? Assessing the perceptual component of deterrence theory. *Review of Law and Economics*, 5(1), 347–371.
- Meier, R. F., Burkett, S. R., & Hickman, C. A. (1984). Sanctions Peers, and Deviance: Preliminary Models Of A Social Control Process. *Sociological Quarterly*, 25(1), 67–82.

- Meier, R. F., & Johnson, W. T. (1977). Deterrence as Social Control: The Legal and Extralegal Production of Conformity. *American Sociological Review*, 42(2), 292.
- Nadelmann, E. (2010, July 19). Why New York City is the marijuana arrest capital of the world. *Change Org Criminal Justice Blog*. http://criminaljustice.change.org/blog/view/why_new_york_city_is_the_marijuana_arrest_capital_of_the_world
- Nagin, D. S. (2013). Deterrence: A review of the evidence by a criminologist for economists. *Annual Review of Economics*, 5, 83–105.
- National Drug Intelligence Center (2011). The Economic Impact of Illicit Drug Use on American Society. <https://www.justice.gov/archive/ndic/pubs/44/44731/44731p.pdf>
- Nguyen, H., Malm, A., & Bouchard, M. (2015). Production, perceptions, and punishment: Restrictive deterrence in the context of cannabis cultivation. *International Journal of Drug Policy*, 26(3), 267–276.
- Pacula, R. L., Kilmer, B., Grossman, M., & Chaloupka, F. J. (2010). Risks and prices: The role of user sanctions in marijuana markets. *The B E Journal of Economic Analysis and Policy*, 10(1).
- Plunk, A. D., Peglow, S. L., Harrell, P. T., & Gruzca, R. A. (2019). Youth and Adult Arrests for Cannabis Possession after Decriminalization and Legalization of Cannabis. *JAMA Pediatrics*, 173(8), 763–769.
- Pratt, T. C., Francis, T. C., Kristie, R. B., Leah, E. D., & Tamara, D. M. (2006). The empirical status of deterrence theory: A meta-analysis. In *Taking Stock: The Status of Criminological Theory* (pp. 367–396).
- Rehm, J., & Fischer, B. (2015). Cannabis legalization with strict regulation, the overall superior policy option for public health. *Clinical Pharmacology and Therapeutics*, 97(6), 541–544.
- Reinarman, C., Cohen, P. D. A., & Kaal, H. L. (2004). The Limited Relevance of Drug Policy: Cannabis in Amsterdam and in San Francisco. *American Journal of Public Health*, 94(5), 836–842.
- Room, R., Fischer, B., Hall, W., Reuter, P., & Lenton, S. (2010). *Cannabis Policy: Moving Beyond Stalemate*. Oxford University Press.
- Single, E. W. (1989). The impact of marijuana decriminalization: an update. *Journal of Public Health Policy*, 10(4), 456–466.
- Substance Abuse and Mental Health Services Administration. (2019). *Key substance use and mental health indicators in the United States: Results from the 2018 National Survey on Drug Use and Health* (HHS Publication No. PEP19-5068, NSDUH Series H-54).
- Tittle, C. R. (1977). Sanction fear and the maintenance of social order. *Social Forces*, 55(3), 579–596.
- Tran, N. K., Goldstein, N. D., Purtle, J., Massey, P. M., Lankenau, S. E., Suder, J. S., & Tabb, L. P. (2020). The heterogeneous effect of marijuana decriminalization policy on arrest rates in Philadelphia, Pennsylvania, 2009–2018. *Drug and Alcohol Dependence*, 108058.
- Williams, J., & Bretteville-Jensen, A. L. (2014). Does liberalizing cannabis laws increase cannabis use? *Journal of Health Economics*, 36(1), 20–32.

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