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Marijuana Use and Policy: What We Know and Have Yet to Learn

Rosalie Liccardo Pacula*

Marijuana is the most widely used illicit drug, with over 25 million individuals in 2003 estimated to have used marijuana in the past year.¹ Although prevalence rates for the general population have been relatively stable over the past decade, the proportion of current users who meet criteria established by the American Psychiatric Association for dependence or abuse of marijuana has increased at a statistically significant rate, from 30.2 percent to 35.6 percent.² In addition, prevalence rates among youth rose considerably during the mid-1990s before stabilizing, while perceptions of harms declined.³ At the same time the United States has experienced a rise in youth use rates and dependence, there has also been a significant rise in arrests.⁴ There is increasing pressure on many state legislatures to soften their policies toward marijuana as a way of reducing the criminal justice burden, and despite virtually no information available on the economic cost of marijuana use or abuse, there is growing support to do so.

Indeed, during the 1990s several states reduced the penalties or criminal status of first-time marijuana possession offences involving small quantities of marijuana and some other states enacted legislation that gave patients protection from prosecution in state courts if they used or grew marijuana for medicinal purposes.⁵ Whether changes in policies such as these would generate a cost savings for state governments depends on a number of different factors, including changes in enforcement that might have occurred in response to these policy changes, changes in use, and increases in the harmful consequences

associated with use and abuse. Only the latter two associations have been carefully considered in recent empirical analyses in the United States and significant limits exist in drawing conclusions from them. Nonetheless, some important insights have been gained that are relevant for anyone interested in discussing marijuana policy. This research summary provides a review of what we currently know about marijuana use and identifies some gaps that need to be explored before a careful assessment of current marijuana policies can be conducted.

Price Matters

It is well established from national survey data that marijuana initiation generally occurs among youth in their mid-to-late teens and that regular use persists into the early twenties, and then steadily declines through the mid-to-late twenties and into the thirties.⁶ Thus, if one is interested in understanding factors determining the initiation and escalation of marijuana use, it is important to examine youth populations. And, as one recent study points out, it is also important to understand that factors that are important correlates with contemporaneous demand may not be all that important for predicting trends in use rates over time. In a comprehensive assessment of the annual and 30-day prevalence of marijuana among high school seniors, my co-authors and I show that many of the key contemporaneous correlates with marijuana use (race, gender, and religiosity for example) could not explain the trend in use rates observed during the 1980s and 1990s.⁷ Instead, the two most important predictive factors for explaining variation in both contemporaneous use rates and trends over time were attitudes about marijuana (perceived harmfulness) and price. The finding that marijuana use even among adolescents is sensitive to changes in the monetary price of the

drug represents a major discovery for this literature, which had previously concluded that supply factors, including price, were not important determinants of marijuana initiation and consumption. I also show price to be an important determinant of demand among college students.⁸ Estimates of the sensitivity of demand to changes in price (that is, the elasticity of demand) have been shown to be similar to those for smoking.

Marijuana Prevalence Rates are Responsive to Changes in the Legal Risk

Although there has been considerable inconsistency in the literature regarding the sensitivity of marijuana consumption to changes in the legal risk of using marijuana, my comprehensive review included in a recent book provides a reasonable explanation for this: there are subtle but important differences in how the legal penalties for marijuana possession offences are represented in various analyses, making the interpretation of specific penalty variables different across studies.⁹ Another factor contributing to the inconsistency in findings across studies, particularly those evaluating policies in the United States, has been the over-examination of an ill-defined “decriminalization” policy indicator. In a recent NBER Working Paper, I show through a careful legal review of the eleven original U.S. state decriminalization statutes adopted in the mid-1970s that the lowest common denominator across state statutes was a reduction in jail time for first-time marijuana possession offenders.¹⁰ When state statutes from 1999 were examined along the same key dimensions as the original 11 statutes, it was impossible to uniquely identify the so-called decriminalized states. More than half of the non-decriminalized states also had reduced penalties associated

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with possession of small amounts of marijuana, calling into question the interpretation of studies evaluating the effects of decriminalization when a simple dichotomous indicator is employed. The authors re-evaluated the impact of actual statutory penalties on use rates among a nationally representative sample of tenth graders and found that higher fines and longer jail times were consistently associated with reduced cannabis prevalence. These findings are consistent with similar studies that focused more precisely on actual penalties rather than on single dichotomous indicators of decriminalized policies.¹¹

If lower penalties indeed are associated with increased marijuana prevalence, then the next question is whether increases in use are associated with negative consequences and whether the economic value of those consequences is less than or exceeds the cost of maintaining the current policy.

The Relationship Between Marijuana Use and Human Capital Accumulation

Marijuana generally is believed to influence educational attainment through its impact on cognitive functioning. Evidence from the medical literature clearly demonstrates that persistent and/or heavy marijuana use diminishes an individual's cognitive functions, influencing attention, concentration, and short-term memory during periods of intoxication. Marijuana consumption also might influence schooling outcomes by affecting decisions about the allocation of time if, for example, marijuana users choose to spend their time getting high or hanging out with other users instead of studying. The association between marijuana use and poor schooling outcomes in population survey data may, therefore, be real or it may be the artifact of some underlying common factor that is correlated with both marijuana use and schooling outcomes (for example, rates of time preference, tastes for deviance and/or leisure, or general thrill seeking behavior).

Two recent NBER Working Papers examine this issue using alternative

measures of educational performance. In the first study, my co-authors and I try to isolate the impact of marijuana use on cognitive functioning by examining the relationship between marijuana use and performance on standardized tests using data on tenth and twelfth graders from the 1990 and 1992 National Educational Longitudinal Surveys (NELS).¹² We evaluated models that considered the direct impact of marijuana use on performance on a composite, reading and math standardized test as well as the impact of marijuana initiation on the change in standardized test scores over time. Findings from these analyses suggest that marijuana use negatively affects youths' performance on standardized tests by lowering math scores by as much as 15 percent. According to research conducted previously, this reduction in math test scores could translate into a reduction in future wages by as much as 2 percent for those not going on to college.

In a second NBER study, data from the fourth follow-up wave of the same NELS is used to explore the causal relationship between marijuana use during tenth and twelfth grade and the number of years of schooling completed in 2000, when most of the respondents were 26 years old.¹³ The study uses two alternative methods to deal with the probable association between marijuana use and unobserved factors influencing educational attainment; the results from both models suggest that marijuana use in the tenth grade does indeed decrease educational attainment. The author notes that the negative impact of marijuana use in the tenth grade on educational attainment is similar in magnitude to the effect of living in a single parent family or living in a family with an income in the lowest quartile.

Marijuana and Crime

A unique problem exists when we try to consider marijuana's involvement in crime. Objective measures of marijuana use (for example, urinalysis) identify use over an extended period of time, not necessarily use at the time of the offence, and are therefore likely to overstate an association between mari-

juana and crime, while self-reported measures are likely to understate the association because of underreporting. In an NBER Working Paper, I consider the implication of these measurement problems by using several different objective and subjective measures of marijuana use collected from a sample of arrestees drawn from the 1996-9 Arrestee Drug Abuse Monitoring (ADAM) data.¹⁴ Use measures determined by 1) a positive urine test, 2) self-reported use in the past thirty days, 3) self-reported use within 72 hours of the offence, 4) self-reported intoxication from marijuana at the time of the offence, and 5) marijuana price each were associated with the probability of being arrested for a non-drug involved violent, property, and income-producing crime. Results from these analyses demonstrated that statistical associations between marijuana use and specific crimes were extremely sensitive to how marijuana use was measured. More proximal measures of use were generally negatively associated with violent crime but positively associated with property and income-producing crime. Reduced-form models suggested that the negative association between marijuana use and violent crime was spurious while the positive associations between marijuana use and property and income-producing crime could be causal in nature. Future work needs to reconsider these associations with data on crime rates to determine if the findings among arrestees hold more generally.

Health Care Costs

Evaluations of the economic cost of treating marijuana-involved accidents, injuries, dependence, or co-morbidities have yet to be carefully examined, yet it has been argued that the case can be made for researchers to take the public health costs of marijuana use seriously.¹⁵ Even though only a small proportion of marijuana users adopt patterns of use that pose health risks, the growing prevalence of regular marijuana users suggests that the actual number of problem users is on the rise. Evidence showing trends in dependence rates confirm this suspicion. And, the cost of treating the

dependent population is not nearly as low as is frequently presumed. Data from the Agency for Healthcare Research and Quality's National Inpatient Survey show that in 2001 there were an estimated 5,392 discharges from hospitals where marijuana dependence or abuse was the primary diagnosis (see Table 1). Even though the number of marijuana primary diagnoses is significantly lower than those for alcohol, heroin, and cocaine, the mean length of stay for marijuana episodes is three times longer than for alcohol and

quate to properly measure these relationships and costs. As better data continue to become available, improved estimates of the real consequences and their costs will be constructed. Only then will it be possible to assess the economic benefit (or cost) of a change in marijuana policy.

¹ *Substance Abuse and Mental Health Services Administration (SAMHSA), Office of Applied Studies, 2004, Overview of Findings from the 2003 National Survey on Drug Use and Health (SMA 04-3774),*

Table 1: 2001 National Statistics on Marijuana, Alcohol, Heroin and Cocaine Discharges from the Agency for Healthcare Research and Quality's (AHRQ) National Inpatient Survey *

Substance	Total Number of Discharges	Mean Length of Stay in Days	Mean Charges in Dollars
Marijuana	5,392	16.4	\$12,447
Alcohol	168,472	5.4	\$6,706
Heroin	55,642	4.5	\$5,734
Cocaine	21,134	6.2	\$6,667

* Data downloaded from <http://www.ahrq.gov/data/hcup/>

heroin discharges and more than two times longer than for cocaine diagnoses. The mean charge per marijuana discharge is nearly twice as large as those for any of the other substances. Work is currently being done to understand why these length of stay and cost differences exist.

As can be seen by the brief review above, substantial work evaluating and quantifying the negative effects of marijuana use remains. The lack of information on the cost of marijuana use should not be interpreted as evidence that there are no costs associated with marijuana use, but rather that the data currently available is inadequate

to properly measure these relationships and costs.

² *W. M. Compton, B. F. Grant, J. D. Colliver, M. D. Glantz, and F.S. Stinson, "Prevalence of Marijuana Use Disorders in the United States: 1991-1992 and 2001-2002," Journal of the American Medical Association, 291 (17) (2004), pp. 2114-21.*

³ *R. L. Pacula, M. Grossman, F. J. Chaloupka, P. O'Malley, L. D. Johnston, and M. C. Farrelly, "Marijuana and Youth" NBER Working Paper No. 7703, May 2000, and in J. Gruber, (ed.), Risky Behavior Among Youths: An Economic Analysis. Chicago, IL: University of Chicago Press, 2001.*

⁴ *Federal Bureau of Investigation (FBI) Annual, Crime in the United States: 2002,*

U.S. Department of Justice, Washington, DC.

⁵ *R. L. Pacula, J. Chbriqui, and J. King, "Decriminalization in the United States: What Does it Mean?" NBER Working Paper No. 9690, May 2003; and R. L. Pacula, J. F. Chbriqui, D. A. Reichman, and Y. Terry-McElrath, "State Medical Marijuana Laws: Understanding the Laws and their Limitations," Journal of Public Health Policy, 23 (4) (2002), pp. 413-39.*

⁶ *W. Hall and R.L. Pacula, Cannabis Use and Dependence: Public Health and Public Policy, Melbourne, Australia: Cambridge University Press, 2003.*

⁷ *See R. L. Pacula, M. Grossman, F. J. Chaloupka, P. O'Malley, L.D. Johnston, and M.C. Farrelly, "Marijuana and Youth."*

⁸ *J. Williams, R. L. Pacula, F. J. Chaloupka, and H. Wechsler, "Alcohol and Marijuana Use Among College Students: Economic Complements or Substitutes?" NBER Working Paper No. 8401, July 2001, and in Health Economics, 13 (9) (2004), pp. 825-43.*

⁹ *See W. Hall and R.L. Pacula, Cannabis Use and Dependence: Public Health and Public Policy.*

¹⁰ *See R. L. Pacula; J. Chbriqui, and J King, "Decriminalization in the United States: What Does it Mean?"*

¹¹ *J. Williams, "The Effects of Price and Policy on Marijuana Use: What Can be Learned from the Australian Experience?" Health Economics, 13 (2) (2004), pp. 123-37.*

¹² *R. L. Pacula, J. Ringel, and K. E. Ross, "The Impact of Marijuana Use on Human Capital Formation" NBER Working Paper No. 9963, September 2003.*

¹³ *P. Chatterji, "Illicit Drug Use and Educational Attainment," NBER Working Paper No. 10045, October 2003.*

¹⁴ *R. L. Pacula and B. Kilmer, "Marijuana and Crime: Is there a Connection Beyond Prohibition?" NBER Working Paper No. 10046, October 2003.*

¹⁵ *W. Hall and T. F. Babor, "Cannabis Use and Public Health: Assessing the Burden," Addiction, 95 (4) (2000), pp. 485-90.*