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What do we know about the impact of the laws related to marijuana?

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Abstract

Objectives—This paper presents information on the status and impact of medical and legalized marijuana as well as the latest data on attitudes and prevalence of use since implementation of these laws. Recent reports from epidemiologists in Denver and Seattle are summarized to give the readers a sense of the changes as these laws have taken effect in their communities.

Methods—The status of these laws is reviewed and the results of surveys taken before and after the laws were enacted are presented, along with data on changing potency and driving under the influence of marijuana.

Summary—Prevalence of use by youths has not increased but their negative attitudes towards the risk of using marijuana have decreased; use by adults has increased. Potency continues to increase, as has the proportion of drivers testing positive for use of the drug. Data from Denver show increases in hospital admissions, emergency department visits, and calls to poison centers, with decreasing arrests and admissions to substance abuse treatment programs. Data from the Seattle area show similar decreases in treatment admissions and police involvement, but also increased prevalence of more frequent use.

Conclusions—Current data suggest that increases in marijuana use preceded legalization in 2012. Treatment admissions were declining prior to these laws, but some indicators of morbidity appear to be increasing subsequent to legalization, with modest increases in poison center calls in both states and increases in acute medical visits in Denver. Data are needed to understand the relationship between the patterns and amounts of use in terms of consequences as well as data on the health conditions of those receiving medical marijuana and the impact of higher potency.

Keywords

marijuana; cannabis; recreational use; medicinal use

INTRODUCTION

Laws enacted to allow the use of marijuana to treat medical conditions, to lessen marijuana possession penalties, and to legalize the possession of varying amounts of marijuana have

become important issues for those in the public health field. It has been several decades since the legislation was first enacted in a state, so it is time to review the most current data and the reports of the impact of the changes and the additional data needs.

METHODS

This paper summarizes the legal status in each state as provided by the legal counsel to the National Alliance for Model State Drug Laws (NAMSDL). It also includes the results of surveys, studies of changes in behaviors since the laws went into effect, and epidemiological reports on the current situation in two communities in states which have implemented legislation to legalize marijuana or allow the use of medical marijuana.

RESULTS

1. Review of the current legal status of marijuana possession and medical marijuana laws in the states

NAMSDL, funded by congressional appropriations, is the non-profit successor to The President's Commission on Model State Drug Laws. In coordination with the Office of National Drug Control Policy, NAMSDL drafts model drug and alcohol laws, policies and regulations, and analyzes and compares related state statutes, policies and regulations using nationwide legal database software and individual state legislative websites.

a. Personal, non-medical possession of marijuana—Figure 1 shows the status of legislation regarding personal non-medical use. The states can be divided into several categories:

- 1. States where the possession/use of limited amounts of marijuana is legal;
- 2. States where the penalties for possession/use of limited amounts of marijuana have been reduced to something less than a criminal charge ("decriminalization");
- 3. States where legislation to legalize or decriminalize is pending;
- **4.** States where the personal possession/use of even small amounts of marijuana remains a criminal offense and no legislation is pending.

As of April 28, 2015, category #1 included Alaska, Colorado, the District of Columbia (D.C.), Oregon, and Washington. The earliest that any of these laws took effect was December 2012 (Colorado and Washington) with the others taking effect in 2015. Within this small group, there are differences amongst main provisions of the laws. For example, Alaska, Colorado, D.C., and Oregon allow the home cultivation of marijuana plants, but Washington does not. Alaska, Colorado, Oregon and Washington allow persons age 21 and over to purchase marijuana at state-licensed stores, but D.C. does not. D.C. allows the possession of up to two ounces of marijuana, while the other states limit legal possession to one ounce of useable product, i.e., harvested flowers/bud with different limits for other forms. The number of marijuana plants that an individual can cultivate in Oregon is different than the other states and each of the four states taxes marijuana sales differently (NAMSDL, April 28, 2015).

By February 26, 2015, 15 states (not including Alaska and Oregon) had statewide laws that fit into category #2 that decriminalize the personal possession of limited amounts of marijuana (NAMSDL, February 26, 2015). The maximum amount of marijuana subject to a non-criminal penalty varies by state from about one-third an ounce to 4 ounces, as do the penalties themselves (from \$25 fine to \$650 fine). The remaining states fall in category #3, where the personal possession/use of marijuana is still a criminal offense.

In the future, it is expected that more states will move towards categories #2 and #1. During the state legislative sessions in the first half of 2015, at least 18 legislatures in category #3 had considered legislation to move to category #2. Legislation in Alabama, North Dakota, and Utah was enacted this spring to lower the criminal penalties associated with the personal possession of small amounts of marijuana. Moreover, legislation to legalize the personal, non-medical use of limited amounts of marijuana was proposed in at least 15 states. Although no additional states have moved into category #1, the trend is towards more decriminalization or legalization.

States which have experienced the results of their earlier legalization are now revising their laws. On July 8, 2015, NAMSDL published a list of "follow-up" legislation proposed at the federal and state level to respond to problems posed by the initial legalization. The proposed legislation included topics such as changes in the tax code, creation of state agencies to control sale, prohibition of use on school grounds, establishment of testing laboratories, allocation of state revenues from the sale of marijuana, licensure of producers and retailers, and prohibition of driving with an open container of marijuana. A review of the list on the NAMSDL website provides evidence of complex issues that are faced when a state legalizes personal use (NAMSDL, July 8, 2015).

b. Review of the current legal status of the medicinal use of marijuana—The medicinal use of marijuana, often colloquially referred to as "medical marijuana," is the exemption from civil or criminal penalty for the use of marijuana pursuant to a physician's diagnosis and recommendation (Figure 2). According to NAMSDL, state laws can be broken into three categories:

- 1. States that allow only the limited use of low THC, high cannabidiol content products extracted from the cannabis plant (such as Epidiolex) for treatment of a very limited number of conditions (generally intractable epilepsy or seizures);
- 2. States that allow broader use of marijuana (including via smoking) for treatment of a more expansive list of medical conditions than category #1;
- 3. The remaining states that do not allow either type of use.

As of June 2, 2015, there are 17 states who fall into category #1. The programs established in each of these states vary, including setting the maximum THC content/minimum cannabidiol content that a product must have to be legal.

Some 23 states and D.C. fall into category #2. The first of these laws was enacted in 1996 (California) and the latest in 2014 (Minnesota and New York). The extent of regulation is different state-by-state in terms of who can prescribe and what can be prescribed. For

instance, New York's new medicinal use law, enacted in 2014 but not yet operational, does not allow patients to administer marijuana through smoking; most other state programs do. In addition, some states with longer-established programs, such as Washington, are revamping their regulatory systems.

In terms of the future of medical marijuana, it is expected that more states will move towards categories #2 and #1. In the 2015 state legislative session, 11 states proposed laws broadening the use of medical marijuana in the state. Some of these states are currently in category #3 and others are currently in category #2.

2. Evidence on the use of cannabinoids for medical use

The primary cannabinoids contained in marijuana are delta-9-tetrahydrocannabinol (THC) and cannabidiol. Marijuana's therapeutic effects depend on the concentration of THC and the ratio of THC to cannabidiol, which has resulted in strains of marijuana being engineered to achieve desired effects (Hill, 2015). Whiting et al. (2015) reviewed 79 clinical trials and found moderate-quality evidence to support the use of cannabinoids for the treatment of chronic pain and spasticity. However, evidence was of low quality to support use cannabinoids associated with improvement in nausea and vomiting due to chemotherapy, weight gain in HIV infection, sleep disorders, and Tourette syndrome. A review of 28 randomized clinical trials and the conditions approved for treatment in each state found high-quality evidence to support the use of marijuana for chronic pain, neuropathic pain, and spasticity due to multiple sclerosis, but for other indications, few had evidence to support treatment with medical marijuana (Hill, 2015)¹ and the use of cannabinoids could be associated with increased risk of adverse events (Sevigny et al., 2014; Volkow et al., 2014).

3. Prevalence of use of marijuana

The National Survey on Drug Use and Health (NSDUH), conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA), collects data on the U.S. civilian, non-institutionalized population aged 12 or older through face-to-face interviews with a representative sample of the population at the respondent's place of residence. It excludes homeless persons who do not use shelters, military personnel on active duty, and residents of institutional group quarters such as jails and hospitals. It obtains information on nine categories of illicit drugs as well as the nonmedical use of prescription-type pain relievers, tranquilizers, stimulants, and sedatives.

Between 2002–2003 and 2012–2013, past year use nationally by those ages 12–17 decreased while use by the older two age groups increased (Table 1). Table 1 also shows the perceptions of the respondents about great risk of smoking marijuana once a month; their perceptions of risk dropped significantly between 2002–2003 and 2012–2013 (SAMHSA, NSDUH, 2002, 2003, 2012, and 2013).

Similar findings were found in examining the NSDUH results of the prevalence and attitudes in states which were among the first to change their laws related to marijuana.

¹See Hill (2015) for list of conditions approved in each state.

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California was one of the first states both to decriminalize the personal possession/use of small amounts of marijuana in 1975 and allow the medicinal use of marijuana in 1996. Colorado first allowed the medicinal use of marijuana in 2000 and legalized personal possession/use in 2012. Similarly, Washington first allowed the medicinal use of marijuana in 1998 and legalized personal possession/use in 2012. Past year use for the populations 12 and over in these states increased significantly between 2002 and 2013, but when measured by age group, the changes in prevalence among youths 12–17 were not significant (Table 1). In terms of perceptions of great risk, the decreases between 2002–2003 and 2012–2013 were significantly lower for all three age groups.

The Monitoring the Future Survey (MTF), a nationally representative survey of over 43,000 eighth, tenth, and twelfth grade students surveyed in the U.S., analyzed results of marijuanarelated behaviors and attitudes in California three years before and after the possession of marijuana was decriminalized in 2010 (2007–2013). The results showed that when compared to their peers in other states, California 12th graders were 25 percent more likely to have used marijuana in the past 30 days, 20 percent less likely to perceive regular marijuana use as a great health risk, 20 percent less likely to strongly disapprove of regular marijuana use, and about 60 percent more likely to expect to be using marijuana five years in the future. These finding results lend some support to concerns that decriminalization may be a risk factor for future increases in youth marijuana use and acceptance (Miech et al. 2015). Similar analysis of the national MTF data found that passage of state medical marijuana laws did not increase adolescent use of marijuana, but adolescent use is higher in states that had ever passed such laws than in other states (Hasin et al., 2015).

To learn more about the use of medical marijuana, a question was added to the California version of the Behavioral Risk Factor Surveillance System telephone survey in 2012 and the results showed the prevalence of ever having used medical marijuana was highest among white adults and younger adults ages 18–24 (Ryan-Ibarra et al., 2015).

4. Availability and potency

Marijuana potency has risen over the last two decades. Between 1995 and 2014, the average THC content in marijuana increased from 4.0 THC in 1995 to 6.3 THC in 2014; the potency of sinsemilla, which is a high-potency female marijuana plant allowed to blossom, increased from 9.6 percent to 13.0 percent at the same time, and the combined THC content of marijuana and sinsemilla increased from 3.98 percent to 11.7 percent (University of Mississippi, 2015). As measured by law enforcement seizures, marijuana potency between 1990 and 2010 nationally increased from 1.8 percent to 10.7 percent. In California, potency increased from 3.7 percent to 10.8 percent, in Colorado, potency increased from 2.1 percent to 13.8 percent, and in Washington State the potency increased from 4.6 percent to 13.8 percent (Sevigny et al., 2015).

Accurate labeling and standardized dosing have been problems both in use of medical marijuana and in purchasing edible products. To determine the variability in labeling, edible products were purchased by medical marijuana patients in dispensaries in Los Angeles, San Francisco, and Seattle. Of the 75 products (47 different brands), 17 percent were accurately labeled, 23 percent had lower purity, and 60 percent over-stated their THC content (Vandrey

et al., 2015). A traumatic death in Colorado following ingestion of an edible marijuana product found a blood level of 7.2 ng/mL without evidence of polysubstance abuse (whole blood limit of delta-9 THC for driving a vehicle in Colorado is 5.0 ng/mL). On the basis of initial surveillance data and cases of accidental overconsumption, on February 1, 2015, Colorado instituted new packaging and labeling rules, requiring that recreational edible marijuana products contain no more than 10 mg of THC, or have clear demarcation of each 10-mg serving. In addition, before distribution, cannabinoid potency testing is now performed on batches of recreational edible marijuana products by state-certified laboratories (Hancock-Allen et al., 2015).

Availability was also related to use. A recent survey of individuals living in 50 mid-sized cities in California found respondents who were male, white, had higher incomes, higher levels of impulsivity, and tolerance of deviance were more likely to have ever, currently, or more frequently use marijuana, and cities with higher levels of medical marijuana had more current and more frequent marijuana use. The physical availability of medical marijuana through dispensaries was positively related to current marijuana use and greater number of marijuana hospitalizations (Mair et al., 2015). Regulations on the number and densities of marijuana outlets may be a way to restrain levels of marijuana use within cities; alternatively, the use of delivery services may also provide easy access to marijuana and mitigate these effects (Freisthler and Gruenewald, 2014). However, since these are population-level findings, it is not possible to determine the direction of causality, i.e., whether people moved to where the marijuana was available or whether use increased due to availability of marijuana.

5. Drug Impaired Driving

One of the major concerns with medical marijuana and decriminalization has been its effect on driving. The National Roadside Survey of Alcohol and Drug Use by Drivers, sponsored by the National Highway Traffic Safety Agency (NHTSA), found that between 2007 and 2014, the measurable alcohol levels declined by about 30 percent, but more than 15 percent of nighttime weekend drivers tested positive for at least one illegal drug, up from 12 percent in 2007, and of those testing positive, 12.6 percent had marijuana in their systems, up from 8.6 percent in 2007 (a 47 percent increase) (Berning et al., 2015).

The 2007 roadside survey was replicated with drivers in six California counties in 2010, and found that cannabis-involved driving had increased in those counties. Among the drivers, THC prevalence went from 4.9 percent in 2007 to 7.8 percent in 2010, but there was substantial variation among jurisdictions. Drivers who tested positive for THC did not think cannabis might impair their driving. And although only a fraction of the participants had a medical cannabis permit, they were significantly more likely to test positive for THC (38.9 percent vs. 7.5 percent). Depending on the jurisdiction, the rate of nighttime drivers in California testing positive for THC was between 1 in 5 and 1 in 10 (Johnson et al., 2012).

Cannabis data from the 2007 version of the roadside survey in California was also compared with data from comparable counties from NHTSA's Fatality Analysis Reporting System (FARS), which includes results of drug testing in fatal accidents. The study found a significant increase in cannabis-positive fatalities following decriminalization but no

significant changes in the proportion of THC-positive drivers among nighttime weekend drivers interviewed in the roadside survey. These discrepant findings may be due to the variations in the FARS laboratory testing protocols, the lack of standardization in the laboratory testing, and changes in the testing procedures over time. Better standardized data is needed to inform policies on "drugged driving" (Pollini et al., 2015).

6. Report from Denver, Colorado (Mendelson, 2015)

Medical Marijuana—In 2000, Colorado voters approved a state constitutional amendment to create a medical marijuana registry (MMR). To obtain a registry card, patients must have been diagnosed with a "debilitating condition" in the context of a "bona fide" relationship with a physician who "maintains, in good standing, a license to practice medicine." Debilitating conditions included cancer, glaucoma, human immunodeficiency virus or acquired immune deficiency syndrome, cachexia, severe pain, severe nausea, seizures, muscle spasms and any other condition approved by the Colorado Department of Public Health and Environment (CDPHE).

From 2001 to 2007, there were about 2,000 patients on the registry annually. In 2004, CDPHE imposed a 5 patient per caregiver limit, but a Denver district court overturned the caregiver limit. Without the caregiver limit, the first dispensaries or medical marijuana centers appeared in 2008, and the number of medical marijuana patients increased 250 percent. In July 2009, the Colorado the Board of Health rejected a definition of the responsibilities of a caregiver beyond providing marijuana and allowed large medical marijuana centers to become patient caregivers. In October 2009, the U.S. Department of Justice issued the "Ogden memo," which instructed federal prosecutors not to focus federal resources on "individuals whose actions are in clear and unambiguous compliance with existing state laws providing for the medical use of marijuana" (U.S. Department of Justice, Memorandum).

All these changes led to a rapid rise in the number of medical marijuana use applications. In January 2009, there were 495 applications per month. By October, there were 4,751 applications per month and CDPHE could no longer process the applications within the required 35 days. As a result, applicants were assumed to have a valid registration without the application being processed. By December, there were 10,155 applications per month. At the same time, there was an increase in the number of medical marijuana dispensaries. As of September 2014, there were 274,766 patient applications, 116,287 approved marijuana patients on the Colorado Marijuana Registry and 495 Medical Marijuana Centers in Colorado. Of these programs, 419 centers had a Type 1 license (1 to 300 primary patients); 43 had a Type 2 license (301 to 500 patients), and 33 had a Type 3 license (501 or more) (CDPHE, Medical Marijuana Registry, 2014).

Personal, Non-Medical Use of Marijuana—On November 6, 2012, Colorado voters passed an amendment to legalize the personal use of marijuana. The amendment allows those 21 and older to purchase up to one ounce of the drug at specially regulated retail stores. It also allows adults to possess up to six marijuana plants in their homes, with up to three being mature, flowering plants. The amendment does not allow use in public places.

Currently, there are 371 retail marijuana stores in Colorado (Colorado Department of Revenue, 2015). Revisions to current laws became effective in May-June, 2015 (NAMSDL, July 8, 2015).

Past year use of marijuana by Colorado residents increased significantly between 2002 and 2013 (Table 1). Past month marijuana use by those ages 12 and over in the Denver metro area increased from 8.6 percent in 2002–2004 to 13.4 percent in 2010–2012. The Denver area reported substantially higher past month marijuana use than national respondents, who reported 6.1 percent in 2003–2004 to 7.0 percent in 2010–2012 (SAMHSA, Substate estimates, 2004–2006 and 2010–2012).

The Healthy Kids Colorado Survey reported the range for past 30-day marijuana use for Denver public school students in 6th to 12th grades was from 3 percent to 30 percent in 2013, with an average of 27 percent. The percentages varied little from the 2011 DPS Survey, which averaged 28 percent (CDPHE, 2013).

The rate per 100,000 of Denver metro area marijuana-related emergency department (ED) visits increased from 152.9 in 2011 to 256.5 in 2013 (67.8 percent increase). Calls to the Rocky Mountain Poison and Drug Center increased more than five-fold from 45 to 238 between 2006 and 2014, while arrests for possession and sale of marijuana decreased from 2,836 to 703 in the same time period (Table 2).

The changes in the laws have led to increased marijuana hospital discharges, emergency department visits, and calls to the Rocky Mountain Poison and Drug Center, but arrests for marijuana possession and sale offenses and admissions to licensed substance abuse treatment programs with a primary diagnosis of marijuana have decreased (Table 2). The decrease in treatment admissions may be related to fewer referrals from the criminal justice system and it may be temporary, since the average time from onset of marijuana use to first treatment for marijuana abuse in Colorado is almost 11 years. Thus, given the decreased perception of risk, increased prevalence of marijuana use, and the increase in "early warning" indicators (e.g., hospital discharges, ED visits), it is likely that Colorado may see increased numbers of cases of marijuana misuse and treatment admissions in the future, which are important components of deleterious public health outcomes (Davis et al., 2015).

The number of marijuana drug violation arrests in Colorado decreased for 20,541 in 2000 to 13,521 in 2014 (Colorado Bureau of Investigation, 2000 and 2014) but driving under the influence of marijuana became an increasing problem: in 2009, 675 drivers arrested for driving under the influence of drugs tested positive for THC; in the first six months of 2013, 1590 tested positive. The number of cannabis-related driving fatalities increased from 36 in 2008 to 52 in 2013.

The "canna-business" has generated \$90 million in taxes, licenses and fees for the state since FY 2013. In June 2015, the Colorado Legislature created an option for a public vote in November 2015 to allocate marijuana tax funds of \$40 million for public school construction, \$12 million for substance abuse prevention and treatment programs, and \$6 to the general fund (NAMSDL, July 8, 2015). The Colorado cannabis industry also has

licensed 15,992 people to work in the industry, according to a recent Rocky Mountain PBS news article (Boiko-Weyrauch et al., 2015).

7. Report from Seattle, Washington (Banta-Green et al., 2015)

In 1998 Washington State became one of the first states to pass legislation allowing the use of marijuana for medical purposes. In November 2012, Washington State legalized recreational marijuana and stores selling marijuana for recreational purposes began slowly opening in the summer of 2014. Meanwhile, medical marijuana dispensaries have become common throughout the region. During the 2015 legislative session, state law was modified to bring the medical dispensaries into the regulatory framework of the recreational market (WA SB 5052 - 2015–16).

Among adults, only past-year use of marijuana by those ages 26 and over changed between 2002–2003 and 2012–2013. However, perceptions of great risk of smoking marijuana once a month decreased for all age groups (Table 1). Some 26.7 percent of high school seniors in King County reported use of marijuana in the past month in 2014, significantly higher than the 18.6 percent in 2004 (Washington State Healthy Youth Survey). These survey results also indicated a significant increase in students reporting using marijuana 10 or more days per month, up from 6.0 percent to 10.3 percent with the greatest increase appearing to occur in 2008.

Admissions to publicly-funded treatment programs for marijuana as the primary drug have declined in absolute numbers (down 32 percent) and as a percentage of all admissions (down 23 percent) since 2010. In 2014, marijuana comprised 14 percent of all admissions, and almost half were under 18. More than 70 percent of treatment admissions for marijuana were male, the highest proportion of males for all drugs. Conversely, just one-third of marijuana treatment admissions were white, the lowest proportion excepting cocaine, with large proportions of marijuana admissions among African Americans (25 percent) and Hispanics (16 percent) disproportionate relative to their representation in the county population (6 percent) and (9 percent) respectively. The majority (55 percent) of those who reported marijuana as primary drug at treatment entry reported their second drug as alcohol (Washington State Department of Social and Health Services (DSHS), 2015).

Marijuana indicator data for police evidence and treatment admissions have trended downwards in recent years, although marijuana calls to the Recovery Help Line were level from 2012 to 2014. In 2009, marijuana was the most common drug identified in police evidence (n=704). Since then law enforcement policies and priorities have de-emphasized arrests for marijuana consumption and there were 78 total cases for marijuana in 2014 (Figure 3).

Felony convictions for marijuana-related cases steadily declined from 2011 through 2014 for Washington State (Washington State Office of Financial Management, 2015). Convictions for the manufacture, delivery or possession with intent to deliver marijuana declined from 73 to 13 for prison related convictions and from 502 to 98 for non-prison convictions (Figure 4).

Discussion and Conclusions

This article has sought to update available data sources on the changes that have occurred since states began legalizing marijuana and allowing medical use of the drug. Because of the rapidity of changes in the laws, the reader is advised to look at the website of the National Alliance of Model State Drug Laws to compare their maps against later changes. In addition, each of the surveys cited in this paper used different sampling methodologies, interview instruments, time periods, etc., so the results of the different surveys are not comparable. An overview of the differences in survey estimates of marijuana use has been previously described (Williams and Banta-Green, 2015).

Since 2007, in Colorado there have been increases in the proportion of drivers testing positive for marijuana as well as increases in hospital discharges, emergency department visits, and calls to poison centers, but admissions to drug treatment programs for primary problems with marijuana and arrests for drug violations have decreased. In Seattle, treatment admissions have decreased, as have criminal convictions involving marijuana. The potency of marijuana has continued to increase, but there has been no research to date linking the increases to poison center calls or emergency room admissions to increased potency.

The legislation regarding medical marijuana and possession of marijuana had different effects than expected. Prevalence of use by youths has not increased as originally anticipated, but the decreases in attitudes that the drug is harmful may result in increased use in the future. Note that the wording of the question about great use of harm from using once a month is problematic, given that a person with a reasonable reading of the availability literature could report none or very low. Increases in use by adults have already been significant. Implementation of medical marijuana laws has also resulted in new issues, including use of the drug for various conditions that have relied on low-quality scientific evidence that fail to meet the FDA standards and inconsistencies in how medical conditions are qualified for medical marijuana use both within a state and between states (NAMSDL, July 25, 2015). Other than the two FDA-approved drugs, the prescriber does not know the type of marijuana that will be purchased and the composition of the marijuana obtained. The medication can vary substantially, with the patient experimenting with different strains and doses to achieve the desired effect. In addition, there is the risk of addiction, psychotic disorders, interactions with other drugs, increased risk to patients in adolescence and early adulthood, lack of knowledge on how marijuana is effective in treating different conditions, and legal risks to the physicians for treating with a Schedule I drug (D'Souza and Ranganathan, 2015).

The lack of data on the characteristics of the users of medical marijuana, their medical conditions, and use patterns, as well as adverse events they may suffer by using different variations of the drug is an important knowledge gap. Information is also missing on the actual potency of the substance in different locations, as well as dosing instructions which give users information as to the effects related to potency (which may not be as indicated on the packaging). In addition, research on prevalence on use of the drug in the area as measured by proximity and number of outlets should be considered as the laws are enacted.

Data on whether or not these new laws lead to increased consumption or new patterns of use are needed.

As more states enact laws allowing the medicinal use of marijuana and relax penalties for the personal use of marijuana, attention should be paid to the experiences of the states to date and changes in their laws to handle unanticipated problems. The economic benefits of taxation of cannabis and regulations on buying are sometimes cited as benefits of this process, but ultimately there will be a need to determine if the economic benefits are greater than the total cost for public health and safety. Lastly, as Caulkins et al. (2015) point out, legalization of marijuana is not simply a yes vs. no choice: it includes the kinds of organizations that can provide the drug, the regulations under which they operate, the nature of the products that can be distributed, and the price. In addition, such policies are subject to quick changes with federal policies, as well as timing and reversibility of legalization options as states revise their programs to adjust to unanticipated problems as the laws take effect.

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Figure 2. Use of Marijuana for Medicinal Purposes



Source: Washington State Patrol Forensic Laboratory Services Bureau. Datat coding and analysis by Alcohol and Drug Abuse Institute, University of Washington

Figure 3.

Drugs Identified in King County by Washington State Patrol Forensic Services Laboratory: 2002–2014



Figure 4.

Washington State Adult Felony Sentences for Marijuana-Related Convictions

Table 1

National Household Survey on Drug Use and Health

Marijuana L	Jse in the F	ast Year,	by Age Groul	p and State	: Percenta; and 201	ges and P Va 2–2013 NSD	lues from 7 0UHs	[ests of Di	fferences betv	ween Perce	entages, 20	02-2003
	$\begin{array}{c} 12+\\ (2002-\\ 2003) \end{array}$	12+ (2012- 2013)	12+ (P Value)	12–17 (2002– 2003)	12–17 (2012– 2013)	12–17 (P Value)	18–25 (2002– 2003)	18–25 (2012– 2013)	18-25 (P Value)	26+ (2002- 2003)	26+ (2012– 2013)	26+ (P Value)
Total U.S.	10.78 ^a	12.34	0.00	15.38 ^a	13.47	0.00	29.13 <i>a</i>	31.55	0.00	6.95 ^a	8.89	0.00
California	11.3^{a}	13.89	0.00	14.11	14.25	0.89	28.29 <i>a</i>	34.08	0.00	7.81 <i>a</i>	10.08	0.01
Colorado	15.08 ^a	18.92	0.005	19.55	18.76	0.703	36.57 ^a	42.42	0.029	10.73^{a}	14.98	0.00
Washington	13.50^{a}	17.48	0.001	17.64	16.48	0.519	36.16	37.57	0.567	9.05 <i>a</i>	14.3	0.00
Perceptions	s of Great l	Risk of Sn	ıoking Mariju	tana Once <i>i</i> between P	a Month, b ercentage:	y Age Group s, 2002–2003	and State: and 2012-	Percentag -2013 \	es and P Valu	ues from To	ests of Dif	ferences
	12+ (2002- 2003)	12+ (2012- 2013)	12+ (P Value)	12–17 (2002– 2003)	12–17 (2012– 2013)	12–17 (P Value)	18–25 (2002– 2003)	18–25 (2012– 2013)	18–25 (P Value)	26+ (2002- 2003)	26+ (2012- 2013)	26+ (P Value)
Total U.S.	39.05 <i>a</i>	29.50	0.00	33.66 ^a	25.34	0.00	24.19 ^a	15.81	0.00	42.38 ^a	32.40	0.00
California	36.68 ^a	28.34	0.00	32.86 ^a	20.95	0.00	25.51 ^a	16.61	0.00	32.22 ^a	31.51	0.00
Colorado	28.74 ^a	22.00	0.00	28.97 <i>a</i>	19.58	0.00	17.51 ^a	10.69	0.00	30.67 ^a	24.22	0.007
Washington	26.80 ^a	18.70	0.00	26.99 ^a	19.06	0.00	16.30^{a}	11.34	0.002	28.57 <i>a</i>	19.90	0.00
^a Difference bet	ween the 2	2002-2003	s estimate and	the 2012-	2013 estin	nate is statisti	cally signi	ficant at th	e 0.05 level.			
$b_{\text{Difference bet}}$	ween the 2	2002-2003	setimate and	the 2012-	2013 estir	nate is statist	ically sign	ificant at t	ne 0.10 level.			

Denver and Colorado Poison Center, Treatment Admissions. and Motor Vehicle Fatalities: 2006–2014

	2006	2007	2008	2009	2010	2011	2012	2013	2014
Poison Center Calls*	45	70	61	54	107	86	130	136	238
Cannabis Treatment Admissions	2908	2929	3295	3289	3229	2891	2856	2544	2431
% of All Admissions	23.6%	23.5%	23.9%	23.8%	24.2%	21.6%	19.9%	18.5%	17.6%
# Cannabis Related Motor Vehicle Fatalities ***			36	41	47	59	45	52	
% of All Fatalities Related to Cannabis			6.6%	8.8%	10.4%	13.2%	9.5%	10.8%	
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Statewide human exposure calls to the Rocky Mountain Poison and Drug Center for marijuana

** Numbers and percentages of admissions to substance abuse treatment programs by primary drug type in the Denver metro area

*** Number of cannabis-related motor vehicle fatalities in Colorado Sources: Rocky Mountain Poison and Drug Center, Drug/Alcohol Coordinated Data System of the Colorado Department of Human Services,