The Legalization of Marijuana in Massachusetts

Effects, Implications, and Policy Prescriptions

Authors:
Daniel Shen
Eric Li
Gha Young Lee
Jeff Metzger
Jeffrey Wang
Louis Aghanwa
Neha Reddy
Noha Saho
Priyanka Kumar
Sofya Shchukina
Waverley Shen

Co-Chairs
Oliver Falvey
Megan Parsons

Advisors
Kathryn Bussey
John Gabrieli
Christian Flynn

January 2016
Table of Contents:

Introduction........................................................................................................................................3

Public Health Concerns
- Marijuana and pregnancy.................................................................................................................3
- Marijuana and child development......................................................................................................4
- Bystander effect.................................................................................................................................5

Marijuana as a Gateway Drug
- Marijuana and other illicit drug use.................................................................................................8
- Marijuana and alcohol and tobacco usage patterns...........................................................................11

Consequences of Legalization of Marijuana
- Political considerations.....................................................................................................................12
- Changing demand.............................................................................................................................15
- Tax revenue........................................................................................................................................17
- Penal system......................................................................................................................................17
- Necessary healthcare use................................................................................................................18
- Freedom of research and use medicinally.......................................................................................19

Mechanism of Effective Legalization
- Age restrictions.................................................................................................................................19
- Anti-drug campaigning....................................................................................................................20

Conclusion ..........................................................................................................................................21

Works Cited.......................................................................................................................................22
Introduction

In this policy document, the Harvard Health Policy Group details the public health, political, societal, and economic considerations regarding the legalization of recreational marijuana. In light of this data, the Health Policy Group:

- Urges voters and legislators to be cognizant that marijuana is federally classified as schedule 1.

- Encourages Massachusetts to support increases in National Institute of Health (NIH) and National Science Foundation (NSF) funding annually, and boost future research on the biological and epidemiological effects of marijuana use.

- Supports the clear presentation of current health data on the effects of marijuana on all packaging, advertising, and partnership branding, allowing potential users to make informed decisions. Given that data suggests the most effective youth educational initiatives involve teaching students how to deal with peer pressure, incorporating marijuana usage scenarios in these initiatives is vital to the health and well-being of youth.

- Cautions that marijuana should not be legal for purchase or possession for those under the age of 21.

- Notes that policymakers should be aware of the potential market power of tobacco firms in the marijuana industry, given the synergistic qualities of their products, and remain active in expressing the documented harms of tobacco on human health without conflating those with marijuana.

- Suggests that relevant programming, advocacy, and education be funded through taxation of the marijuana industry.

Public Health Concerns

Marijuana during Pregnancy and Impacts on Child Development

In a 2015 report, The American College of Obstetricians and Gynecologists’ Committee on Obstetric Practice stated, “because of concerns regarding impaired neurodevelopment, as well as maternal and fetal exposure to the adverse effects of smoking, women who are pregnant or contemplating pregnancy should be encouraged to discontinue marijuana use.” In the same paragraph, the committee admitted that there is “insufficient data to evaluate the effects of marijuana use on infants during lactation and breastfeeding.” (American College of Obstetricians and Gynecologists [ACOG], 2015). This is the state of our knowledge about marijuana and pregnancy – at best ambiguous.

This section will first detail the prevalence of marijuana use among pregnant women in Massachusetts. Then, a treatment of the current research findings on marijuana use during pregnancy will be given. Finally, a set of guidelines and recommendations will be outlined.

The Prevalence and Patterns of Use of Marijuana among Pregnant Woman in Massachusetts
The federal agency SAMHSA\textsuperscript{1} publishes the National Survey on Drug Use and Health (NSDUH) annually for each state (Substance Abuse and Mental Health Services Administration, 2014). However, the NSDUH’s Massachusetts report does not distinguish between pregnant women and other groups in the population. Thus, there has not been an accessible state-initiated survey to monitor the prevalence of use of marijuana among pregnant women. Most studies that specifically target prevalence of marijuana use by pregnant women were conducted by a group of researchers on a population cohort that represents the nation but not the state.

A recent paper by Ko et al. (2015) found that in a cohort of about 5,000 pregnant women who are representative of the national population, 10.9 percent have used marijuana in the past year and 3.9 percent of pregnant women have used marijuana in the past month. The study confirms the range of prevalence of marijuana use in pregnant women of previous studies (ACOG, 2015). Among pregnant women, past month use was highest in women during the first trimester and lowest in the third trimester. Perhaps the most astounding fact the study found is that “among both pregnant and nonpregnant women, tobacco smokers, alcohol users, and other illicit drug users were 2-3 times more likely to use marijuana in the past year than respective nonusers” (ACOG, 2015).

With the legalization of marijuana, one would expect to find that the percentage of marijuana use during pregnancy increases as the legalization of marijuana removes some of the legal and social barriers associated with marijuana use. Also, marijuana use is associated with other forms of substance abuse, which further complicates this issue.

**The Effects of Marijuana Use during Pregnancy on Pregnancy Outcome and Child Development**

According to Metz and Stickrath (2015), marijuana use during pregnancy is possibly associated with a large variety of negative pregnancy outcomes, such as a decrease in fetal growth rate, an increased risk of stillbirth (Varner et al., 2014), preterm birth, and an increased risk for congenital anomalies. However, different studies that employ different methods show conflicting results, with some pointing at no association and others proposing a link between marijuana use and negative pregnancy outcome. The sample sizes of some of these studies are sometimes inadequate to represent the entire population. To further complicate the issue, most of the studies rely on self-reporting of marijuana usage and not toxicological studies, resulting in the validity of the data collected being highly dependent on the subjectivity of the pregnant women themselves. For instance, due to the social stigma attached to marijuana use, women might refuse to divulge that they had used marijuana during pregnancy. In conclusion, though there are studies that find association between marijuana use during pregnancy and negative pregnancy outcomes, they do not offer conclusive evidence on the use of marijuana during pregnancy and pregnancy outcomes.

On the other hand, most studies that focus on neurodevelopment do show some association between marijuana use during pregnancy and neurocognitive impairment. The Maternal Health Practices and Child Development Project (MHPCD) showed that the use of one or more joints per day during the third trimester is associated with decreased verbal reasoning at age 6 (Goldschmidt et al., 2008); at age 10, the children exhibited hyperactivity and attention deficit (Goldschmidt et al., 2000); and at age 14, the children (particularly those exposed to marijuana in the first trimester) scored lower in reading, math, and spelling (Gray et al., 2004). Recent animal studies also show that exposure to marijuana results in T cell dysfunction and a significantly reduced immune response to pathogens, as well as an epigenetic alteration in microRNA, DNA methylation, and histone modification profiles (Zumbrun et al., 2015). That marijuana may alter an animal’s epigenetics is of utmost concern as epigenetic changes can be passed down from parent to progeny, but this has yet to be confirmed in humans.

\textsuperscript{1} Substance Abuse and Mental Health Services
A recent study twenty-two years in the making highlighted the interesting association between prenatal marijuana exposure (PME) and marijuana use in young adulthood. The study by Sonon et al. (2014) followed the birth cohort in the MHPCD study for twenty-two years and found that “the association between PME and offspring marijuana use in young adulthood was significant” insomuch that with one gram per day increase in marijuana use, the odds of the offspring using marijuana increased by 1.28. The paper has significant implications for Massachusetts’ marijuana policies because if we see an increase in pregnant women using marijuana after legalization, this will have an underlying consequence: a future increase in young adult marijuana users.

Recommendations

![Graph showing total marijuana taxes, licences, and fees in Colorado after marijuana legalization]

Data from: Colorado State Department of Revenue (2014-2015)

The above data shows the total marijuana taxes, licenses, and fees collected in the state of Colorado after the opening of commercial marijuana sales to the public. The trend line ($R^2 = 0.9637$) fits the data well and the data shows that the amount of marijuana sales is increasing with time. The taxes, licenses, and fees provide an indirect way of gauging the increase in marijuana use after legalization. Assuming that the habits of marijuana use do not differ drastically between residents of Colorado and those of Massachusetts, one can predict that the increase in marijuana sales and consumption will follow a similar trend as that in Colorado.

Below are some recommendations on actions that the government should take to deal with the
consequences of legalizing marijuana:

1. Initiate an annual statewide survey on the use of marijuana during pregnancy to determine the number of pregnant marijuana users in Massachusetts.
2. Cooperate with hospitals, clinics, and physicians to develop an educational platform to inform women of the health risks associated with marijuana use during pregnancy. Using marijuana during pregnancy should be discouraged because of the possible health risks for the offspring. The educational program should be disseminated in hospitals and clinics with a special focus on low-income communities, as these communities are where marijuana use during pregnancy is typically most prevalent.
4. Participate in information exchange and collaboration with other states that have also legalized the recreational use of marijuana.
5. If studies show clear evidence that marijuana use during pregnancy indeed causes neurocognitive impairments and other negative birth outcomes, the legality of marijuana should be reconsidered.

Bystander effect of Marijuana

Important public health issues to consider regarding the legalization of recreational marijuana in Massachusetts are the secondhand smoke effects of marijuana on nonsmokers, as well as the effects of smoking marijuana by pregnant women on their prenatal children. There has been important, but limited, research done on neurotoxic and cardiovascular effects of marijuana smoke on nonsmokers. In addition, there have been numerous longitudinal studies done on the prenatal gestational and morphological growth effects experienced by women who smoked marijuana during their pregnancies. These studies all warrant attention because they dispel many myths about the pernicious effects of marijuana as a public health concern.

According to a study done by the Johns Hopkins University School of Medicine, under “extreme conditions,” nonsmokers may start to feel the effects of marijuana, “having minor problems with memory and coordination, and in some cases test positive for the drug in a urinalysis.” This study demonstrated that nonsmokers exposed to very large amounts of marijuana smoke ended up testing positive for tetrahydrocannabinol (THC) in their bloodstream – enough so that they would not be able to pass the standard urine test used in the Federal Workplace Drug Testing Program. However, it is vital to understand the experimental conditions in this study are unrealistic, extraordinarily unlikely to ever be replicated in any nonexperimental setting. Researchers solicited a contingent of six smokers and six nonsmokers and placed them together in a 10- by 13-foot room, and according to the study, “Each smoker was given 10 high-potency cannabis cigarettes to smoke.” In one session, the room’s ventilation fans were turned on. In another session, the fans were turned off, and the room became smoke-filled. At the end of the exposures, smokers’ and nonsmokers’ blood, urine, saliva, and hair were tested at regular intervals for THC.” The conclusion of the first session with room ventilation stated that the nonsmokers exposed to the drug experienced no chemical or neurotoxic effects except for claims that they had been

3http://www.hopkinsmedicine.org/news/media/releases/extreme_exposure_to_secondhand_cannabis_smoke-causes_mild_intoxication
4Ibid.
5Ibid.
6Ibid.
hungry.\textsuperscript{7} In the second study in the unventilated room, “THC in blood was observed immediately after exposure and for up to three hours afterwards.”\textsuperscript{8} This study illustrates that under unnatural conditions, the secondhand effects of marijuana will have chemical effects on nonsmokers; however, “outside of laboratory conditions, passive secondhand smoke of marijuana does not cause THC to appear in the blood stream at high concentrations” and therefore we would argue that this study proves that the concern of marijuana as a dangerous secondhand drug is unwarranted.\textsuperscript{9}

Nonsmokers are not limited to humans; nonsmokers include household pets as well. According to a study conducted by researchers at Colorado State University, “A significant correlation was found between the number of medical marijuana licenses and marijuana toxicosis cases seen in 2 veterinary hospitals in Colorado. Ingestion of baked goods made with medical grade tetrahydrocannabinol butter resulted in 2 deaths.”\textsuperscript{10} This study looked at the effects of marijuana toxicosis after drug ingestion by dogs. Marijuana toxicosis is defined as THC poisoning that results in clinical signs of “depression, hypersalivation, mydriasis, hypermetria, vomiting, urinary incontinence, tremors, hypothermia, and bradycardia in dogs.”\textsuperscript{11} This study demonstrates that the consumption of marijuana has more effects on dogs than do the secondhand smoke effects on humans. Despite this, after a visit to the vet, “The majority of dogs experiencing intoxication after marijuana ingestion recover completely…”\textsuperscript{12} Moving forward, as part of a public health campaign if legalization of marijuana were to occur, smokers would have to be educated on the dangers of marijuana consumption by household pets.

Marijuana has surprisingly minimal growth effects on prenatal children. According to a longitudinal study on the effects of prenatal marijuana use on offspring child growth from birth through three years of age, University of Pittsburgh School of Medicine researchers found that “prenatal marijuana exposure was only associated with decreased length at birth,” and had no effect on “predicted gestational age or morphological abnormalities.”\textsuperscript{13} This study contradicted public health arguments on the effects of marijuana on prenatal children. It showed that there were “no significant effects of marijuana use during any trimester on the birth weight, head or chest circumference of the offspring.”\textsuperscript{14} Researchers did observe a slight 1.5 mm measured height on infants of pregnant women who smoked one or more joints per day compared to offspring of nonmarijuana smokers.\textsuperscript{15} Despite that initial measured difference between children of marijuana smokers and nonsmokers, researchers found that the difference in height “disappeared by the 8th month and no other significant relationships between prenatal marijuana use and growth retardation were found.”\textsuperscript{16}

In a more comprehensive longitudinal study done by researchers at the University of Ottawa, the effects of prenatal exposure to marijuana were measured in eighteen- to twenty-two-year-olds on

\textsuperscript{7} Ibid.
\textsuperscript{8} Ibid.
\textsuperscript{10} Ibid.
\textsuperscript{11} http://www.ncbi.nlm.nih.gov/pubmed/23796481
\textsuperscript{12} Ibid.
\textsuperscript{13} http://www.sciencedirect.com/science/article/pii/089203629290051B
\textsuperscript{14} Ibid.
\textsuperscript{15} Ibid.
\textsuperscript{16} Ibid.
response inhibition. This study used “detailed cognitive/behavioral performance from infancy to young adulthood, and current and past drug usage.” All participants were given a task to complete and researchers found that “prenatally exposed offspring had significantly more commission errors than nonexposed participants, but all participants were able to perform the task with more than 85 percent accuracy. These findings were observed when controlling for present marijuana use and prenatal exposure to nicotine, alcohol, and caffeine, and suggest that prenatal marijuana exposure is related to changes in neural activity during response inhibition that last into young adulthood.” Therefore, this study illustrates that there might be noncommunicable effects of marijuana on prenatally exposed infants. This experiment warrants more complementary studies, but it served as another source of information regarding this public health concern.

As a public health concern, marijuana has no demonstrated threatening effects. The study on the secondhand effect of marijuana smoke on humans only proved toxic in extremely unrealistic laboratory conditions; outside of that setting, the secondhand effects were negligible. On another note, household pets should not consume marijuana because it does irritate them and results in sickness; however, this is not directly related to human health, and such concerns can be mitigated through educational campaigns to raise awareness of the issue. On a final note, prenatal exposure to marijuana has been found to have no growth effects; but the effects on response inhibition are worth investigating as a public health concern.

**Marijuana as a Gateway Drug**

**The Relationship Between Marijuana and Other Illicit Drug Use**

One of the primary public health concerns regarding marijuana use is whether or not it functions as a gateway drug. This section will examine the relationship between marijuana and future illicit drug use.

**“Marijuana as a Gateway” Hypothesis**

Marijuana is the most common drug to initiate illicit drug use ("Drug Facts: Nationwide Trends").

![First Specific Drug Associated with Initiation of Illicit Drug Use 2013](image)

18 Ibid.
19 Ibid.
Lack of Causal Relationship

Marijuana is a likely candidate as a gateway drug; however, the relationship is simply correlative. To better understand the role of marijuana as a potential gateway drug, we must analyze confounding factors.

In a University of Central Oklahoma School of Justice study, 51 current and former users of marijuana were given qualitative, semistructured interviews to understand whether the participants believed marijuana use was the cause of further illicit drug use. Almost all (98 percent of participants) had used at least one illicit drug other than marijuana (Shukla, 2013).

While 64.7 percent of participants followed the “drug initiation sequence” (alcohol/tobacco, marijuana, and then other illicit drugs) that is the basis for the gateway theory, only a small proportion claimed any causality. Forty-five percent of participants expressed viewpoints characterized as mixed or conflicting, 35 percent did not support the idea that marijuana was a gateway drug, and only 19.6 percent strongly supported the notion (Shukla, 2013).

Most participants attributed further illicit drug use to complex factors such as socio-economic background, drug availability, and perception of risks; many also emphasized the importance of alcohol and tobacco as gateways to marijuana and other illicit drugs while doubting the function of marijuana itself as a gateway (Shukla, 2013).

Line of Legality

One major theme of the answers given in Shukla’s study was crossing the line of legality in drug use and how doing so diminishes the perceived risk of using other illicit drugs. A recent Gallup poll found that admitted marijuana use increased from 38 percent to 44 percent of Americans between 2013 and 2014, a trend that could reflect both increased usage and increased willingness to admit to use (McCarthy, 2015). The 2014 National Survey on Drug Use and Health found that 22.2 million people were current (past month) users of marijuana, making it the most used illicit drug in America (“Cannabis”). Marijuana’s illegality is therefore putting a large number of individuals past the line of legality, increasing the risk for further illicit drug use. Legalization would thus have the surprising effect of lowering other illicit drug use by placing a greater psychological and legal gap between marijuana and other, more harmful illicit drugs.

Ease of Access to Other Illicit Drugs

Another undesirable effect of marijuana’s illegality is its exposure of individuals to other illicit drug markets, which would promote further illicit drug use. This was the second main theme of the answers given in Shukla’s interviews. In the Netherlands, policymakers responded to this risk by allowing for commercial sources for marijuana. This caused the proportion of marijuana users capable of accessing other drugs through their cannabis source to be as low as 14 percent compared to 52 percent in Sweden (Grund & Breeksema, 2013).

A different study found that only
22 percent of individuals aged 12 and over in the Netherlands who have ever used cannabis have also used cocaine, whereas 33 percent of individuals in the United States have (MacCoun & Reuter, 2011). These results support the theory that marijuana’s placement in the illegal market creates an avoidable risk for further illicit drug use by forcing marijuana users to make contact with the illegal drug market.

**Significant Alternative to Prescription Opioids**

The option of marijuana could deter individuals with chronic pain from abusing prescription opioids, which are responsible for almost 17,000 overdose deaths per year ("The Dangers of Painkillers - Consumer Reports."). University of Pennsylvania researchers reported that in states that enacted medical cannabis laws between 1999 and 2010, there was a 24.8 percent lower annual opioid overdose death rate compared to states without medical marijuana laws (University of Pennsylvania Health System).

**Exit Drug for Hard Drugs**

In a survey of more than 400 medical cannabis patients across four dispensaries in British Columbia, over three-quarters of those surveyed said they had used cannabis to replace pharmaceuticals, alcohol, or illicit drugs. These survey results are similar to those found by the University of California-Berkeley for medical cannabis patients in California (Reiman, 2009).

**Conclusions**

There is no conclusive evidence proving that marijuana serves as a gateway drug. In fact, the vast majority of marijuana users do not proceed to use other illicit drugs (Hedden, et al., 2015). The tenuous perceptions of marijuana as illegal have been weakened due to several factors, among them, rising social approval and ambiguous sentiments on legality due to the dichotomy between federal and state legality. This weakened perception of illegality makes it easier for individuals to cross the line of legality, which increases the risk of further illicit drug usage due to lowered perceptions of risk and increased access to other illicit drugs. Marijuana can also have the reverse function of serving as a replacement drug for prescription opioids and other, more dangerous illicit drugs.

**The Relationship Between Marijuana, Alcohol, and Tobacco Use**

The state of Massachusetts should additionally consider the effects of potential entry by the tobacco industry into the marijuana industry. The prevalence of large tobacco companies in the U.S. has undeniably led to negative public health outcomes for the nation. The current state of the marijuana industry resembles the state of the tobacco industry before the twentieth century, prior to the mass production of cigarettes. Further behavioral usage patterns connect the two drugs: among young adults, usage of marijuana and tobacco tend to be coincident, with marijuana usage preceding, or acting as a gateway, to tobacco usage (Tullis, 2003). And indeed, legalization of marijuana may increase usage of tobacco due to the synergistic effects of the two drugs – 55 percent of marijuana users are also tobacco users. Multinational tobacco companies have shown demonstrated interest in entering the marijuana market (Barry et al., 2014). To avoid allowing large corporations to exploit an open access to the marijuana market and manipulate American consumers and public perception, Barry et al. (2014) suggest that federal or state governments create an agency to control production and distribution of marijuana products to de-incentivize advertisement and marketing of competing products by large tobacco companies. Additionally, Barry et al. (2014) suggest that the federal or state governments prohibit advertisements, sports sponsorships, or other brand name sponsorships to curb the cultural influence of tobacco companies that may enter the industry. The state of Massachusetts should carefully consider the potential public health and social impacts of the entry of large multinational tobacco corporations in a
legalized marijuana market and potential modalities for controlling their influence to avoid negative social, economic, and health outcomes that might result from their market entry.

Finally, let us examine the relationship between usage patterns of marijuana and alcohol and also how marijuana legalization can impact usage of alcohol. Interestingly, alcohol and marijuana effectively function as substitute drugs, and increased marijuana usage often corresponds to decreased alcohol consumption among young adults and teenagers (Anderson & Rees, 2013). The authors, Anderson and Rees (2013), suggest that from a societal and public health standpoint, the legalization of marijuana will likely produce contradictory effects; that is, while marijuana usage among young adults will likely increase, alcohol usage will likely decrease. Since alcohol usage is strongly correlated to both traffic fatalities and violent crime, legalization of marijuana may lead to fewer traffic fatalities and a reduction in violent crime by causing inadvertent reduction in alcohol consumption. Indeed, this has already been shown to be the case in several states (Anderson et al., 2012). States that have legalized recreational marijuana usage, on average, experience an 8 to 11 percent reduction in traffic fatalities, though the causative mechanism for this effect has not yet been definitively proven. Finally, legalization of marijuana may lead to externalities including a reduction of violent crime and a reduction in suicides. One case study in a borough of London showed that rates of nondrug crime fell when the borough suspended arrests for possession of marijuana. Improved quality control for marijuana may reduce suicides and hospitalization due to poor-quality or contaminated marijuana products (Anderson & Rees, 2013).

In summary, from a public health standpoint, we believe that it is important to consider the effects of legalization on usage patterns of not only marijuana, but also other legal drugs, including tobacco and alcohol. We find, based on the literature, that marijuana usage can be effectively controlled in young adults by price controls, as casual users reflect price-elastic demand of marijuana. Legalization of marijuana should occur in conjunction with tighter control of tobacco companies, as marijuana and tobacco are synergistic drugs, and marijuana users tend to also be tobacco users. Additional controls should also be implemented to avoid increasing the influence of large tobacco companies in the marijuana market to avoid repeating public health issues encountered in the mid-twentieth century with large tobacco corporations. Finally, marijuana and alcohol tend to be substitute drugs, and increased consumption of tobacco is typically associated with reductions in alcohol consumption. Legalization of marijuana may correspondingly be associated with improvements in societal alcohol-related issues, such as alcohol-related traffic fatalities and violent crime.

Consequences of Legalization of Marijuana

Political Considerations

National Support Statistics

A March 2015 poll by the Pew Research Center found that a slim majority of Americans (53 percent) support the legalization of recreational marijuana. This statistic is a part of an upward trend in support (Motel, 2015).
Summary of National Marijuana Legalization Support

Demographics

According to a study by Motel (2015), men are 8 percent more likely than women to support marijuana legalization. The approval rates are 57 percent and 49 percent, respectively. Whites and Blacks have the highest rates of support, with majorities of 55 percent and 58 percent approval, respectively. Hispanics have the lowest rate of support, at only 40 percent.

Age is the most drastic differentiator in marijuana legalization support. Millennials (age 18-34), are most supportive of legalization, with a supermajority approval rate of 68 percent. Generation X (35-50) and Baby Boomers (51-69) have approximately similar approval rates: 52 percent and 50 percent, respectively. The Silent Generation (70-87) has a drastically lower approval rate of 29 percent.

Level of education has a relatively mild effect on marijuana legalization approval rate, with the most drastic difference found between higher education levels and high school degree or lower. Post-graduates marginally approve of marijuana legalization at 52 percent. College graduates and those with some college education have a higher support rate of 58 percent. Individuals with a high school degree or less have a significantly lower approval rate of 47 percent.

Overall, only 39 percent of Republicans support marijuana legalization. Democrats and Independents are approximately 20 percent more likely to support marijuana legalization than Republicans, with approval rates of 59 percent and 58 percent, respectively.

Massachusetts Marijuana Legalization Support

On November 6, 2012, 63 percent of Massachusetts voters approved Question 3, a statewide ballot initiative, and legalized a medical marijuana program. A 2014 poll by Suffolk University/Boston Herald found that 53 percent of likely Massachusetts voters favor complete marijuana legalization, with only 37 percent opposed. ("Massachusetts Will Consider Taxing and Regulating Marijuana")

Massachusetts Voter Demographic Dynamics

While the 2014 Suffolk/Boston Herald poll found a slim majority of 53 percent of likely Massachusetts voters were in favor of marijuana legalization, it is possible that actual voting results (should marijuana legalization be put on the ballot) could differ due to demographic dynamics among the voting population.
Based on above data from the U.S. Census Bureau, in Massachusetts, approximately 200,000 more voters were female than male. If Massachusetts women were to vote similarly to the national average, then this higher proportion of female voters might potentially skew against legalization.

The great majority of Massachusetts citizens are white (82.6 percent), and white voters comprise an even greater proportion of the population that voted in the 2014 election (92.4 percent, although this may be skewed higher since 2014 was a congressional election year). If we were to once again assume that white Massachusetts citizens follow the same pattern of support for marijuana as the national average, then legalization would be somewhat favored (Whites and African Americans have the highest rates of approval, while Hispanics have the lowest).

### Political Ideology

The Gallup Poll below, conducted in 2014, shows that a supermajority (73 percent) of self-identified Liberals supported the legalization of marijuana. This would make Massachusetts more likely to support marijuana legalization.
Possible Demographic Trends (Based on National Data)

As for age, the Census Bureau demographic breakdown shows that individuals between the ages of 45 and 64 are also far more likely to vote than other age demographics, composing around 40 percent of the voters in any given election (see Figure 6 for details). In contrast, all other age demographics (18-34, 35-44, and 65 and older) comprise only around 20 percent of the voting population, with voters between 35 and 44 recently dipping into the teens. From 2004 to 2014, there was a slight downward trend in voter population ratio for voters 18-34 and 35-44 and an increase in voter population ratio for those 65 and older to the high twenties.

These age factors would hurt marijuana legalization as support recedes with increased age. Older voters, those who were at least 45, composed 69.7 percent of the voter population in the 2014 congressional election and 61.4 percent in the 2012 presidential election. They are therefore far more influential than the younger, pro-marijuana population. However, over time, millennials will dominate the main voting population, which would mean increased marijuana support over the years.

**Geographical Region**

Gallup found that approximately 57 percent of residents in the East and West of the United States support marijuana legalization, which is significantly higher than the support found in the South, 47 percent, and the Midwest, 45 percent. This 57 percent support in the East is higher than the national statistic of 53 percent in support (Motel, 2015). This means it is more likely for states outside of Massachusetts to follow suit in marijuana legalization.

**Marijuana Demand and the Effects of Legalization and Pricing:**

The public health outcomes of legalization of marijuana in Massachusetts is inextricably tied to the economic policies that govern the pricing of marijuana products, and how legalization will impact both production and consumption of other legal drugs. We find that usage of marijuana can potentially be discouraged by controlling the pricing of marijuana products, as marijuana demand becomes price-elastic above a certain threshold. From an industry-wide standpoint, the U.S. government should discourage or prevent entry of large tobacco corporations into the marijuana industry to avoid recreating another smoking-related public health crisis as experienced in the midtwentieth century in the U.S. The tobacco industry views marijuana as a competing product, and marijuana and tobacco use tend to be coincident and synergistic.

The state of Massachusetts has an incentive to control the usage of marijuana in the event that the drug is legalized. Indeed, plausible mechanisms for the control of usage ought to be considered before the legalization of marijuana to avoid unforeseen negative public health outcomes. Most individuals are first exposed to marijuana as young adults, between the ages of 18 and 29, and this demographic tends to be consistently the heaviest user of marijuana (Saad, 2013). This demographic, however, is also susceptible to influence by state-mandated pricing controls of marijuana and usage patterns can likely be altered by differential pricing strategies. Collins et al. (2014) conducted a study with 59 young adults (mean age of 21) that demonstrated marijuana demand is inelastic at low prices, but elastic at high prices. Additionally, however, the authors found that marijuana demand is most elastic for high-quality marijuana, and less elastic for low-quality marijuana, indicating that price controls may be less effective for a certain portion

20 Generation X (35-50) and Baby Boomers (51-69) have tenuous approval rates of 52 percent and 50 percent, respectively. The Silent Generation (70-87) has a drastically low approval rate of 29 percent.
of the marijuana market. Finally, Collins et al. (2014) also found that simulation of marijuana demand is highly predictive of actual usage patterns based on self-reported surveys and simulated tasks. The state of Massachusetts can likely use a similar computational tool to predict various public health outcomes affected by proposed pricing or taxation strategies. Finally, one important caveat to keep in mind is that while many individuals are casual users, the bulk of total consumption is due to heavy users who make up a relatively small portion of the population (Lundberg, 2014).

These two populations respond differently to price control, implying that response of the population to price controls may, in fact, be highly nonlinear, with abstainers and heavy users both demonstrating highly price-inelastic demand, while casual users show price-elastic demand.

**Racial Bias**

The racial bias that is attached to African Americans in relation to drug policy is clear. In 2008, African Americans were being arrested for drug offenses at a rate 2.95 times greater than that of Whites (U.S. Department of Justice, 2008). However, opinion of African Americans as a whole regarding the legalization of recreational marijuana use and sale presents a paradox. African Americans are actually generally less supportive of marijuana legalization than Whites (Thornhill). In assessing the reasons for this paradox, Thornhill utilizes the urban frustration argument to explain Blacks’ apprehension to legalizing marijuana use and sale even though the legalization would likely lead to lower incarceration rates related to marijuana possession in Black populations.

The urban frustration argument “follows an assumption that marijuana legalization would increase overall drug use as well as crime, both of which already disproportionately affect urban Black communities” (Thornhill). Though many Americans consider marijuana a substance that is benign and should be legal to possess, proponents of the urban frustration argument and opponents of marijuana legalization, many well-supported community organizations refuse to support an argument for urban frustration. The crux of the argument is that due to dangerous and socially disadvantaged neighborhood conditions of many African Americans, most of these Black residents will endure more invasive law enforcement practices in order to potentially reduce crime, gang, and drug activity (Thornhill).

It is unclear to what degree the legalization of marijuana would ameliorate racial bias in law enforcement. While legalization would disallow law enforcement from profiling Black citizens for marijuana use or distribution, it appears likely that legalization can only marginally improve the underlying issue of racial biases in law enforcement practices.

**Tax Revenue**

As Colorado is the first state to have legalized marijuana, it serves as a valuable case study for any state that is concerned about the fiscal implications of legalization. Colorado has certainly benefitted from both increased tax revenue from an emerging industry.

In 2014, Colorado established a licensing and taxation system for all sellers. Taxes on marijuana were set at 15 percent for excise, 12.9 percent for retail, and 2.9 percent for medical at the state level. However, municipalities in Colorado are free to impose local sales taxes as they see fit.

In particular, the fiscal year of 2014-2015 serves as a good case study for marijuana legalization because it was the first full fiscal year in which marijuana was legal in the United States. A report prepared for the Colorado Department of Revenue estimated demand by using tax rates
and predicted behavior statistics based on estimation models. The conclusion was that the demand for the year would be 121.4 tons, an estimate much higher than those made by groups such as the Colorado Center For Law and Policy and the Colorado Futures Center. When the fiscal year came to an end, despite predictions that tax revenue would be lower than predicted due to underestimation of lowly taxed medical marijuana sales, tax revenue amounted to $70 million, exceeding the $47.4 million that the Colorado Legislative Council Staff predicted. To put this number in perspective, in the same fiscal year, tax revenue on alcohol amounted to $42 million in Colorado.

Tax revenue from the legalization of marijuana in Colorado has allowed for the allocation and reallocation of revenue to new state projects. Specifically, $40 million has been earmarked for school construction, $2.5 million for drug education, and $2 million to youth programs. Specific counties in Colorado are also using local sales tax revenue from marijuana to create sizeable college scholarship funds: one county is expected to raise $3.5 million by 2020.

**Reduced Expenditure in the Penal System**

Certainly, Colorado saw meaningful fiscal saving from full decriminalization of marijuana. Before the implementation of Amendment 64, it cost an average of $30,000 per year to house one inmate in Colorado. Additionally, police forces spent a significant portion of their time arresting individuals for charges related to marijuana, resulting in the cost of police labor tying directly to marijuana. In fact, in 2010 alone, 30,000 Coloradans went to court on marijuana charges. With the legalization of marijuana, arrests related to marijuana dropped by 95 percent. Overall, the legalization of marijuana led to at least $12 million in savings according to the Colorado Center on Law and Policy.

While Colorado is only one example, it is possible to broadly see how marijuana legalization could similarly impact Massachusetts financially. If Massachusetts were to legalize marijuana, it is likely that a taxation and licensing system like that of Colorado would be implemented because one infrastructure has already been proposed in an initiative petition written by the state. Regarding incarceration, the average cost to house an inmate in Massachusetts per year is roughly $53,000, $20,000 more per year than in Colorado. Thus, incarceration savings could potentially amount similarly, if not to a greater degree.

**Use of Health Care for Marijuana-Related Ailments**

As the nation and state debates legalization, the potential for use and abuse must be considered – studies have found that about 10 percent of users go on to develop marijuana dependence (Hall & Degenhardt, 2009). The legalization of marijuana will undoubtedly come with benefits for a number of individuals. There is a plethora of evidence suggesting that marijuana for medical purposes is effective in managing a variety of disorders ranging from chronic pain to neurological disorders (Hill, 2015). Yet, the potential fallout on the health industry from the increased use, subsequent misuse, and dependence on the drug should come under scrutiny.

For all the discussion about the lower fallout of marijuana misuse compared to other drugs, the detrimental effects of marijuana should not be ignored. Habitual smokers of marijuana have been found to report a wide range of symptoms comparable to tobacco smokers who have been smoking for ten years
These symptoms include wheezing, worsening of asthma, sputum production, and chronic coughing. While it is not surprising that individuals who misuse the drug develop such complications, the effects of this misuse on the health industry should also be considered. A study that aimed to understand the impact of marijuana dispensaries in communities found that an additional dispensary per square mile in a ZIP code was associated with nearly a 7 percent increase in marijuana-related hospitalizations in the area (Mair et al., 2015). It is clear that dispensaries and businesses will follow the legalization of marijuana; whether or not these firms will contribute to an increased burden on the health systems in every state is yet to be seen.

Studies in Colorado on the increased health care utilization from marijuana legalization have so far been inconclusive as marijuana use is often coincident with other drug use that together contribute to hospitalization (Monte et al., 2015). Yet, as Columbia University Neuroscience Professor Margaret Haney has stated, “People who are seeking treatment relapse at rates as high as they are for cocaine, heroin and alcohol” (Munsey, 2010). With this in mind, it is critical to consider the burden that medical field responders, hospitals, and the greater health system will face as a result of marijuana legalization in Massachusetts. Recent studies have proposed that a key factor in marijuana use and misuse may be influenced by changing community norms through legalization that are more supportive of the drug (Cerdá et al., 2012). The legalization of marijuana in Massachusetts must account for not only the burden it may impose on the health system, but also on the changing values of drug acceptance it brings.

**Research Freedom for Medicinal Use**

Political interference with cannabis as a source of medicine began with the Marijuana Tax Act of 1937, when the U.S. Congress restricted access to the drug for all purposes (Clark, Capuzzi & Fick, 2011). Health insurance companies have been unable to cover many cases of medical marijuana due to a hesitance to approve a substance that has not yet received FDA approval. Without approval from an official federal agency, insurance companies have taken the stance that they are not in a position to deem a substance safe and effective, and thus will not extend coverage to said substance.

A major reason the FDA has been unable to approve medical marijuana, despite usage in several states in the country, is what they deem a lack of definitive research on the subject. This is largely because there are barriers in place to prevent this research from being conducted. Currently, federal law, under the Controlled Substances Act, restricts marijuana research. This means laboratories that want to conduct research on the substance must obtain approval from several federal agencies. Further limitations include that research groups are limited in the strains that can be studied (certain strains are prohibited from research) and from where those strains come (marijuana used in research must be obtained from the government). This creates an unnecessarily complicated process for groups interested in researching the safety and efficacy of medical marijuana.

Therefore, in support of a recommendation by the American Medical Association and to support research efforts to determine marijuana efficacy, the reclassification of marijuana under the Controlled Substances Act should be considered, so that the substance is no longer subject to such harsh restrictions and limitations. In spite of the failed attempt to do so in October 2012, the increased research that this would create would, in turn allow the federal government and health insurance industry to more easily take a stance on the issue of marijuana legalization and coverage. Also, the federal government should consider

---


22 [http://www.huffingtonpost.com/2014/05/08/marijuana-health-insurance_n_5288484.html](http://www.huffingtonpost.com/2014/05/08/marijuana-health-insurance_n_5288484.html)
a call for a comprehensive review of current studies in order to properly determine what new research needs to be conducted. Furthermore, to streamline the research approval process regarding medical marijuana research, a single agency should be designated to be in charge of marijuana research.

It should be noted that on their own, policy changes will be limited in their impact. A cultural change that fosters an acceptance of medical marijuana must accompany any proposed policy changes. In the current health care system, it is often cultural barriers that prevent medical marijuana from being covered by insurance. For example, due to a lack of pro-medical marijuana culture, companies can choose health insurance policies for their employees that do not include coverage of medical marijuana, or employers and/or peers can place a stigma on the usage of medical marijuana as a medical tool. This cultural shift is equally as important as the proposed policy shifts. If medical marijuana is found to promote population health, practicing physicians, who would need to vocally express support for medical marijuana, could legitimize this cultural shift. In further support of medical marijuana, legalization of the drug for recreational use would result in reduced barriers for medicinal usage.

**Mechanism of Legalization**

**Age Requirements**

The American Academy of Pediatrics (AAP) established recommendations for marijuana use based on a study it conducted that focused on marijuana’s impact on youth and adolescent brain development. The AAP is not against the use of recreational marijuana, but would like to see restrictions on who can and cannot have access to and use the currently illegal substance. Research has shown that the younger an adolescent begins using drugs, including marijuana, the more likely it is that drug dependence or addiction will develop in adulthood. With this information, the AAP is opposed to marijuana use in persons less than 21 years of age. Due to this opposition, the AAP is a strong supporter of “strict enforcement of rules and regulations that limit access and marketing and advertising [of marijuana] to youth.” Ideally, the AAP wants the states to “regulate the product as closely as possible to tobacco and alcohol, with a minimum age of 21 years for purchase.”

![Graph showing usage and perceived risk of marijuana](image)

**Effective Anti-Drug Campaigning**

**Media-based campaigns**

Public health campaigns are designed by lawmakers as drug intervention strategies targeting key populations, especially youth and young adults. Over the past two decades, the Office of National Drug
Control Policy (ONDCP) has sponsored two campaigns of varying success. The first, the “My Anti-Drug” campaign, was implemented between 2000 and 2004 and was intended to educate youth about the dangers of drug use. In one survey, 94 percent of over 20,000 youth under 18 self-reported that they had seen the ad, though the campaign did not significantly or favorably affect the prevalence of marijuana use among teenagers (Hornik et al., 2008). In fact, as an unintended consequence, marijuana usage was highest at the peak of the “My Anti-Drug” campaign: in 2002, youth reported a 25.5 percent lifetime usage of marijuana, as opposed to a 23.6 percent lifetime usage in 2000, and a 23.5 percent lifetime usage in 2004 (Hornik et al., 2008).

The ONDCP’s second campaign, “Above the Influence” (ATI), was similarly designed to educate youth, but places more emphasis on developing social skills and strengthening anti-drug beliefs. Youth exposure to the ATI campaign was lower than exposure to the “My Anti-Drug” campaign – 73 percent of youth sampled among 10 communities self-reported seeing the campaign (Slater et al., 2011). However, the youth who had been exposed were statistically less likely to use marijuana compared to those not exposed to the campaign, with an odds ratio of 3.85 (Slater et al., 2011). Another study suggested that the trend of lower rates of marijuana use was significant among specific social groups, such as eighth-grade adolescent girls, but not among boys or older adolescents (Carpenter & Pechmann, 2011).

Both the “My Anti-Drug” and ATI campaigns focused their efforts on several channels of communication, including television, print, Internet advertising, and also on community partnerships. Despite the similarities of these campaigns, the ATI associated substance use with threats to future aspirations, rather than physical risks of marijuana use (Slater et al., 2011). In one study, people who viewed ads for both campaigns noted that compared to the “My Anti-Drug” ads, the “Above the Influence” ads offered a more positive emotional tone (Comello, 2013). The differences in success between the two ONDCP campaigns call attention to the need for media interventions that focus not only on maximum exposure, but also tone and content of the message.

Curriculum-Based Prevention Programs

Educational campaigns focused on marijuana have existed since the late twentieth century. The Drug Abuse Resistance Education (Project DARE) is the most widely implemented program in elementary schools and focuses on using trained, uniformed police officers to deliver curriculum in classroom settings. Through follow-up surveys with past participants, DARE was determined to be most effective one year immediately after the program – 7th graders who had received DARE education were only 63 percent as likely to begin cigarette usage as their classmates who had not received the education. However, these outcomes did not persevere. By the end of their 8th grade, initiation of cigarette usage returned to 99 percent, implying that the DARE program was not effective in the long term (Ennett et al., 1994).

LifeSkills Training (LST), another prevention program targeted at seventh graders, included a 15-class curriculum as well as subsequent booster sessions and was implemented in 56 public schools in New York. Unlike the DARE program, which focused on risk education, LST focused on developing social skills, such as the ability to resist peer pressure. When past participants were surveyed as 12th-grade students five years after their program participation, those who had received the LST Training were 44 percent less likely to be drug users and 66 percent less likely to be polydrug users (Botvin et al., 1995).
Conclusion

Having considered all relevant factors, the Harvard Health Policy Group recommends that recreational marijuana use be scheduled, subject to some moderate regulation.

Given the failure of the “Respect States and Citizens Rights Act,” Massachusetts is unable to reclassify marijuana from schedule 1 by overruling federal law. Officials in Massachusetts should make voters aware of this issue and ask party members to push for reclassification. Until then, Massachusetts should subsidize future research on health outcomes for marijuana users.

While mixed at best, the current health data should be presented in packaging, advertisement, or partnership branding, in order to better inform prospective users. Any such advertisements should be not be aired during children’s programming. Moreover, programs teaching students how to deal with peer pressure, which were noticeably more effective than simple information programs, should be implemented in junior high schools. Given budget constraints, it may be effective to include drug information sessions in both junior and senior high schools, where information remains useful and updated as students first interact with marijuana.

Given the uncertainty associated with marijuana use, the policy group believes that a minimum age of 21 should be implemented for purchase. Prospective users should be of adult age in order to weigh potential consequences and consent to use.

Massachusetts should be aware of the potential market power of tobacco firms in the marijuana industry, given the synergistic qualities of their products, and remain active in expressing the documented harms of tobacco on human health without conflating those with marijuana.

The above programming should be funded through taxation of the marijuana industry. There is little reason to believe a Colorado resident should differ significantly from a Massachusetts one, though a higher average age in Massachusetts may indicate lower average marijuana use. Massachusetts should thus tax the product at identical rates to Colorado for recreational use, and reevaluate after a predetermined period.


Hedden, S.L., Kennet, J., Lipari, R., Medley, G., & Tice, P. (2015). *Behavioral health*
trends in the United States: Results from the 2014 national survey on drug use and health. Substance Abuse and Mental Health Services Administration.


