OBSERVATOIRE FRANÇAIS DES DROGUES ET DES TOXICOMANIES

MARIJUANA LEGALIZATION IN THE UNITED STATES

A Comparison of Non-Medical Marijuana Policies and Regulation Across Ten U.S. States

Gillian L. Schauer, PhD, MPH
Principal | Gillian Schauer Consulting

Report prepared as part of the ASTRACAN research project (For a Strategic Analysis of Regulatory Cannabis Policies) coordinated by Ivana Obradovic, Deputy Director of the French Monitoring Centre for Drugs and Drug Addiction (OFDT)

November 2020

ASTRACAN

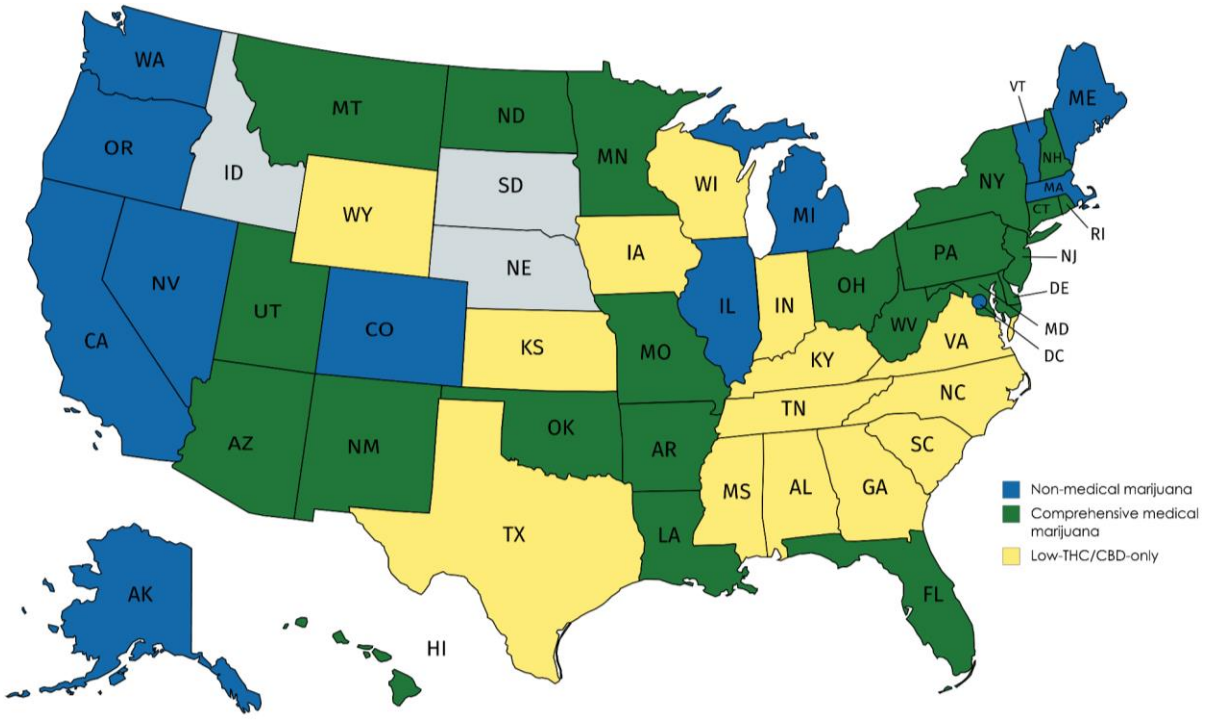
This report was produced on behalf of the French Monitoring Centre for Drugs and Drug Addiction (OFDT) as part of the ASTRACAN research project (For a Strategic Analysis of Cannabis Regulation Policies). The report was written in English by Adam Darnell, an independent consultant specialising in public policy evaluation. This work was coordinated by Ivana Obradovic, Deputy Director of OFDT.

TABLE OF CONTENTS

INTRODUCTION

Marijuana (also called cannabis[a]) is the most commonly used federally illicit substance in the United States (U.S.), with nearly 28 million people (10.1% of the population) aged 12 years and older reporting past month use.[1] Although marijuana remains an illegal substance at the U.S. federal level, as of July 2020, 33 states and the District of Columbia (DC) have enacted policies making marijuana legal for medicinal use, and 11 of those states (Colorado [CO], Washington [WA], Oregon [OR], Alaska [AK], California [CA], Maine [ME], Massachusetts [MA], Nevada [NV], Vermont [VT], Michigan [MI] and Illinois [IL]) and the District of Columbia (DC) have legalized marijuana for adult use or non-medical use (also called recreational use[b]). A number of additional states have legalized products with low tetrahydrocannabinol (THC) or cannabidiol (CBD) products (see the section on U.S. Hemp/CBD policies). Figure 1 depicts the current legalization status of marijuana, by state, as of July 2020.

Figure 1: Marijuana legalization policies in U.S. States – July 2020



*Iowa has legalized products with up to 3% THC. Some maps depict Iowa as a medical marijuana state, despite the fact that they legalized low-THC products.

[a] Cannabis is a broader classification, referring to both (1) marijuana, which – by U.S. federal definition refers to all parts of the plant Cannabis sativa L., including flower, seeds, and extracts that have ≥0.3% delta-9 tetrahydrocannabinol [THC] concentration, and (2) hemp, which, by U.S. federal definition refers to all parts of the plant Cannabis sativa L. that contain < 0.3% THC concentration on a dry weight basis.

[b] This report will not use the term "recreational" use, as it denotes "fun or enjoyment" and is not an accurate descriptor of many of the state marketplaces, which have legalized the sale of marijuana for self-determined medical use (e.g., medical use not necessarily based on the recommendation from a clinician) and/or have combined medical and non-medical marketplaces into one market.

Despite the widespread policy changes, the health effects of cannabis (both marijuana and hemp) use are still poorly understood,[2] which can complicate policymaking. Taken together, findings from three recent systematic literature reviews,[2–4] including one by the U.S. National Academies of Sciences, Engineering, and Medicine, provide a basis for our understanding of potential health effects. Potential therapeutic uses of marijuana (including studies that assess cannabinoid isolates) include: use for chemotherapy induced nausea and vomiting, use for improved control of patient-reported symptoms of multiple sclerosis, use for chronic pain, and use for sleep disorders.[2] Data on potential therapeutic uses are insufficient for a number of other conditions, despite the fact that many U.S. states authorize much broader indications for medical uses of marijuana.

Potential health risks from marijuana include: strong evidence of increased risk of Schizophrenia and other psychoses – particularly among heavy users, individuals who initiate marijuana use at a younger age, and those already prone to psychoses; strong evidence of increased risk of chronic bronchitis and other respiratory effects, especially among chronic and heavy users; strong evidence of lower birthweight babies born to pregnant women who use marijuana; strong evidence of cannabis use disorder or dependence, especially among those who initiate use at a younger age and among heavy users; evidence of increased risk of abuse of other substances besides marijuana; evidence of impaired learning, memory, and attention; evidence of increased motor vehicle crash in people impaired by marijuana (particularly when also impaired by alcohol); and evidence of increased accidental ingestion by children in states with legal marijuana marketplaces.[2]

Protecting public health and safety as marijuana legalization expands will require not only a clear understanding of the potential health risks, but also of the impact that certain policy variables may have on marijuana access and use behaviors. Marijuana legalization stands to impact nearly every part of public health from injury prevention, to food inspection, to chronic disease, to maternal/child health, to environmental health, to occupational health, to mental health and co-occurring substance use, to adolescent health. Tobacco prevention and control provides a good illustration of the link between policy and behavior, as research has definitively shown the impacts that tobacco price, smokefree policies, packaging and labeling, and advertising and marketing/counter-marketing can have on tobacco initiation and cessation.[5–7] We do not yet know the exact policy levers that may impact marijuana initiation and use (particularly heavy use patterns),[8–11] and rules and regulations governing state marijuana legalization are changing quickly. However, there are policy differences between U.S. states that are worthy of study in the coming years, and early experiences in U.S. adult use states that other jurisdictions can take and improve upon future policymaking.

Accordingly, this report provides an overview of the history and context for the current U.S. marijuana policy climate, outlines marijuana regulatory elements that may be important in terms of protecting public health and safety, highlights similarities and differences in policies across U.S. states that have legalized adult use, describes the evolution of marijuana regulatory policy across states, and summarizes policy considerations in the context of medical marijuana and hemp legalization.

METHODS

Data for this report come primarily from state laws, rules, and statutes that contain the regulations for marijuana legalization in each of the ten states with legal adult use and a legal retail marketplace. The sources for the primary regulations from each state are listed in Appendix A. Importantly, because marijuana policies in states are constantly changing, policy data described in this report are current as of July 2020.

In addition to state laws, rules, and statutes, data in this report come from: (1) published and unpublished literature (peer-reviewed, reports and other white papers, and news-related publications), (2) websites (primarily related to industry practices and products), and (3) personal knowledge the author has gained over a number of years working on cannabis policy in U.S. states.

Published literature was identified by searching PubMed ® and MEDLINE for: (Cannabis OR marijuana) AND (lessons learned OR recommendation* OR best practice) AND (United States OR U.S. OR state*). The search returned 276 results. All abstracts were reviewed. Thirty-one articles were retained are included in this report. The remaining articles either pertained to policy in other countries, or reviewed scientific studies related to health effects. To ensure that key publications had not been missed, additional searches were conducted by author name, based on the authors known to be state agency employees and academic researchers engaged in cannabis policy related publications.

STATE VS. U.S. FEDERAL CANNABIS POLICY

Unlike Canada or Uruguay (both countries with national marijuana legalization policies in place), marijuana[c] remains federally illicit in the U.S. and is a Schedule 1 substance based on the U.S. Drug Enforcement Administration Controlled Substances Act (Title II of the Comprehensive Drug Abuse Prevention and Control Act of 1970, P.L. 91–513, October 27, 1970, 84 Stat. 1242, 21 U.S.C. 801, et seq.). A Schedule 1 substance, by definition, has no currently accepted medical uses, and has a high potential for abuse and psychological and/or physical dependence. The U.S. considers marijuana on the same schedule as heroin and has scheduled it more restrictively than cocaine or methamphetamines (both Schedule 2).[12] While researchers, advocates, and the media have debated the scheduling of marijuana for a number of years,[13–15] no changes have been made to its Schedule 1 status.[16] Many might wonder how, then, U.S. states have been able to legalize a federally illicit substance.

U.S. states began to legalize medicinal marijuana in the late 1990's, with California being the first state where voters approved a proposition to legalize medical marijuana in 1996, followed in short order by voter approval of ballot measures in Alaska, Oregon, and Washington in 1998.[17,18] While these states legalized medical marijuana, they did not legalize a marketplace where medical marijuana users could access marijuana, and marijuana was provided through illicit means.[18] States with medical legalization continued to be the subject of federal raids and law enforcement action.[18]

A decade later, President Obama's Administration made it clear they would not use U.S. Department of Justice (DOJ) resources to pursue legal action in states whose medical marijuana laws violated federal law. A memo from the U.S. DOJ Deputy Attorney General David Ogden was published in October of 2009 and formalized this approach, laying out further guidelines for federal enforcement in certain cases.[19] This paved the way for a marketplace for medical marijuana. In some states, this marketplace was officially legalized (e.g., in Colorado, through SB 10-109 and HB 10-1284), and in others, it operated in a gray area, under the assumed protection of the Ogden memo.

In 2012, voters in Colorado passed Amendment 64 and voters in Washington passed Initiative 502, legalizing personal use and regulation of marijuana. Shortly after the passage of those two state ballot measures, a memo from the U.S. DOJ Deputy Attorney General James Cole was published advising U.S. Attorneys that the DOJ would not prioritize enforcement resources in states where marijuana policies differed from federal policy, with the exception of certain priority enforcement areas (e.g., distribution to minors, diversion to states where marijuana remains illegal, promotion of or funding of criminal enterprises or drug trafficking, etc.).[20] This memo provided some protection for Washington and Colorado to develop rules and regulations for the legal sale of marijuana within their state borders. While the memo was subsequently rescinded by DOJ Attorney General Jeff Sessions in 2018, it was not replaced by any subsequent guidance, and thus states have continued to develop rules and regulations for marijuana despite its federal illegality.

[c] Defined as all parts of the plant Cannabis sativa L., including flower, seeds, and extracts that have ≥0.3% delta-9 tetrahydrocannabinol [THC] concentration

LEGALIZATION IN STATES

Overview

As of July 2020, 11 states and DC have legalized adult use of marijuana, and ten states have legalized a regulated, commercial marketplace for the sale of marijuana for adults ages 21 years and older (Vermont did not legalize a marketplace, and DC is not permitted to have a marketplace without U.S. Congressional Approval, which has not been granted). Table 1 depicts the states that have legalized adult use, the year of legalization, whether it was a ballot measure that voters approved or a legislative measure, and when the marketplace for the commercial sale of marijuana opened (or is slated to open). As noted, 9 states and DC legalized adult use marijuana through ballot measures and citizen's initiatives. Only two states (Vermont and Illinois) have legalized legislatively (through state congressional bodies). Ballot measures in states are typically written by various advocacy groups, and thus may contain certain regulatory constraints that lawmakers and regulators would not have necessarily put in place. Legislative processes can also be influenced by lobbyists and special interest groups, but typically allow for much more debate on certain regulatory aspects than a ballot measure would.

Table 1: States with Legal Adult Marijuana Use

	Year Passed (% support)	Retail marketplace open?
Colorado	2012 (55%)	January, 2014
Washington	2012 (56%)	July, 2014
Oregon	2014 (56%)	October, 2015 (through medical dispensaries)
Alaska	2014 (53%)	October, 2016
District of Columbia	2014 (65%)	No retail marketplace approved
Nevada	2016 (54%)	July, 2017
California	2016 (56%)	January, 2018
Massachusetts	2016 (54%)	November, 2018
Maine	2016 (50%)	Expected in 2020
Vermont	2018 (legislative)	No retail marketplace approved
Michigan	2018 (56%)	December 1, 2019
Illinois	2019 (legislative)	January 1, 2020 (through medical dispensaries)

All states that have legalized non-medical, adult marijuana use also have legal medical marijuana use, however, Alaska did not have a preexisting medical marijuana marketplace (all other states did). As noted on the table, at least two states (Oregon and Illinois) opted to use their medical marijuana marketplace to fast track adult use sales, allowing access to products before the full adult use marketplace was set up. This approach can favor both the structure and the licensees in existing medical marijuana marketplaces, which may not necessarily facilitate strong public health regulations or foster social equity in licensees (since public health and social equity approaches were not front and center when many state medical marketplaces were evolving in the early 2000s).

In all cases, there has been a delay – typically of between 12 and 24 months – between when legalization happens and when the retail marijuana marketplace actually opens. This is because, particularly in the case of legalization through ballot measures, time is needed following the passage of the measure and the opening of the marketplace to develop and finalize all of the rules and regulations, set up licensing, award licenses, set up lab testing, develop an enforcement approach, etc. Challenges with the development of rules and regulations, as well as political changes or disagreements can delay market opening (e.g., as in the case of Maine).[21]

States as a Policy Laboratory

As the first two states to legalize marijuana in the U.S., legalization approaches differed in important ways between Colorado and Washington – in part due to the ballot measures that voters passed, and in part due to the regulatory approach that each state took. The different approaches taken by each state provided a laboratory for other states to observe and paved the way for much of the state-based legalization policy we see today. Accordingly, understanding some of the early differences in the Colorado versus Washington policies and marketplaces provides important context for subsequent state marijuana regulations.

In 2012, Colorado's voters approved a state constitutional amendment that legalized possession and consumption of up to an ounce of marijuana by persons 21 and older and cultivation of up to six plants at home; provided licensing of cultivation facilities, product manufacturing facilities, testing facilities, and retail stores; permitted local governments to regulator or prohibit such facilities; and enacted an excise tax on wholesale marijuana with the first $40M in revenue annually being required to go to public school capital construction assistance.[22] The legalization framework in Colorado focused on legalizing marijuana like alcohol and the constitutional amendment effort was sponsored by a pro-marijuana group called "Campaign to Regulate Marijuana Like Alcohol."[23] Many of the details of legalization were left to the Colorado State Legislature to determine.

That same year, Washington's voters approved a 64-page ballot measure that also legalized adult use of marijuana. Initiative 502 in Washington was sponsored by the American Civil Liberties Union (ACLU), and framed legalization as a criminal justice issue, allowing law enforcement to refocus resources on violent and property crime, generating new state and local tax revenue for education, health care, research, and substance abuse prevention, and taking marijuana out of the hands of illegal drug organizations and bringing it under a tightly regulated, state-licensed system.[24] The measure authorized the state Liquor Control Board to regulate and tax marijuana for people 21 years and older, and to add a new threshold for driving under the influence of marijuana. The measure was extremely detailed in terms of which license types should be set up, licensing fees, who would be eligible for licenses; the timeframe for setting up the system; and the allocations of revenues from excise taxes. The Washington State Liquor Control Board (now the Liquor and Cannabis Board) was given rule-making authority.

Colorado was the first state to open its commercial marijuana marketplace in January 2014. When Washington opened later that year in July, a number of differences existed. Washington set an excise tax of 37% whereas Colorado's excise tax was 10%. While taxes can be set too high to cut into the illicit market, they can also be set too low, promoting use patterns that run counter to public health and safety.[8,11] Washington outlawed vertical integration (which is where one entity can hold licenses to grow, process, and retail marijuana), whereas Colorado allowed (but did not require) it. Vertical integration can, in theory, lead to larger market consolidation and potentially lower prices.[10] Washington restricted the number of retail licenses available by setting a ceiling in each county,[24,25] whereas Colorado allowed localities to set the regulations on the "time, place, manner, and number of marijuana retail establishment operations."[22,25] Washington restricted marijuana infused products to those that were "shelf-stable" only (e.g., foods that did not need to be refrigerated or frozen), whereas Colorado did not. One thing both states shared was a criticism that they were not focused enough on public health and safety in drafting the regulations, but rather on getting a marketplace up and running in a short window.[25–28]

Both Washington and Colorado legalized a commercial system for the sale of marijuana. This is important to note, as it paved the way for every subsequent state to set up a similar commercial system, when in fact many other policy approaches exist that might better protect public health and safety.[8] It is also critical to note that these initial rules and regulations – which have shaped so much of the current marijuana policy landscape – were developed by individual states without the guidance of the U.S. Federal Government, due to the federal illegality of marijuana. For example, regulations about marijuana food products were developed without guidance from the U.S. Food and Drug Administration, regulations about pesticide use when growing marijuana were developed without guidance from the U.S. Department of Agriculture, and approaches to protect public health and safety in the wake of the development of a commercial marketplace were developed without guidance from the U.S. Department of Health and Human Services. In addition to developing a new marketplace – unlike any in the world at that time – state officials had to do so in relative isolation, without many of the usual technical assistance and support they would receive in other domains. This was extremely challenging for regulators and public health officials in these first two states. Certain opportunities to better safeguard public health and safety may have been missed – simply because this was such a nascent area of policymaking.

IMPORTANT POLICY ELEMENTS FOR PUBLIC HEALTH AND SAFETY

While few studies exist on the impacts evolving marijuana policy has on public health and safety, the past eight years have shown that a number of policy variables are likely to have important impacts. Below is a summary of some of those critical policy areas, along with some of the key regulatory questions or considerations that may be helpful in assessing how current regulations address specific public health and safety concerns.

- **How is marijuana regulated? Who regulates it? How engaged is public health in regulatory decisions?**
  - A range of policy options exist for the regulation of marijuana. To date, U.S. States and Canada have largely selected a commercial, for-profit model that makes it more challenging to protect public health and safety.[8,11,29] There are a number of other models that could be used for legalization (including a state operated monopoly, non-profit organizations, etc.) that could make it easier to protect public health and safety while still making marijuana legal.[25,29] Furthermore, public health principles are often lost or at least downplayed in the development and regulation of a commercial marketplace.[25,26,29] State regulators that are part of the public health agency, engage public health stakeholders, or even employ public health experts at the regulatory agency are likely to better understand the potential public health risks and benefits of certain regulatory decisions.[30,31]
- **What is the effective tax on marijuana? Where are revenues allocated?**
  - Different tax approaches can incentivize certain behaviors that may have public health consequences.[11,32] For example, taxing too high can leave open a robust unregulated illicit market, taxing too low could lead to increased use because products are so inexpensive, taxing based solely on total product weight may incentivize the purchase of concentrates that weigh less and have greater THC concentration, and taxing based on THC content could incentivize people to consider lower THC products.[9] Where tax revenues are allocated can also impact public health and safety in ways both directly and indirectly related to marijuana. For example, are a certain proportion of revenues allocated towards data collection and monitoring to assess how policies impact behavior and health outcomes? Are a portion of revenues allocated towards evidence-based prevention and treatment programs?
- **What are the legal possession limits? Are people allowed to grow marijuana at home (homegrow)?**
  - These are important considerations given that diversion or unintended youth access could occur in the case of high possession limits or homegrowing.[10,32–34] In particular, homegrows have been associated with increased diversion and public health risks related to youth and dependence.[9,35,36] For example, research has found that in addition to diversion, states with homegrow cultivation may provide easier access to youth, and have a lower age of first marijuana use, heavier use patterns, and increased risk of dependence.[9] Furthermore, products grown at home are not subject to the same lab testing requirements and may contain contaminants (e.g., pesticides, mold, aspergillus, fungus, etc.).
- **What products are allowed to be sold? What restrictions are placed on those products?**
  - The type of products that are available can impact consumption patterns, accidental ingestion, accidental overdose, and potential dependence.[37–39] All modes of marijuana use have different public health concerns (e.g., combustion effects from smoking; overconsumption, accidental consumption with edibles; consumption of ingredients not intended for aerosolization with vaping; consumption of high quantities of THC with vaping and concentrates, etc.). Many of these potential public health effects are not well explored in current scientific literature.[9,37] Important questions also include whether or not products allowed to be perishable (in which case, food inspection – which is challenging given that marijuana is considered an adulterant federally - would be a necessity). Are products allowed to be similar to non-marijuana products (e.g., gummy bears, hot chocolate, ice cream, soda pop, candy bars, etc.) that could appeal to children and/or lead to unintentional consumption?

- **What is allowed to be in the products that are sold? What are the testing requirements?**
  - One of the potential public health benefits of regulation compared with the illicit market is the opportunity to regulate what is in the products (e.g., additives, flavors, etc.) and to have highly tested products that are free from potential harmful contaminants. Relevant questions here include: Can products contain added flavoring agents that might appeal to children and/or mislead consumers? How are terpenes and other flavoring additives regulated? Can additives contain diluents or excipients? What restrictions exist with regard to the amount of THC that can be present in products? Are there serving size limits? What constituents or contaminants are products being tested for? What levels of each contaminant are acceptable (if any)? How are samples for testing being drawn? Who is conducting the testing? What accreditation are testing labs required to have? What quality control measures are put in place for testing labs? Is there a reference lab for potential testing disputes and validation checks? How long should testing take? What happens to a product that fails testing?

- **What are the packaging and labeling requirements?**
  - Packaging and labeling can impact adult consumers' understanding of what they are consuming, can attract or deter underage consumers – including those who might accidently consumer the product, and can impact whether or not people understand what is contained in the product (e.g., THC, CBD, terpenes) and what the potential considerations and risks of consumption are.[40] Key considerations include: Do packages and labels appeal to underage consumers? Do they clearly communicate the necessary information? Do they clearly denote that the product contains marijuana? Do they clearly communicate potential risks? Are public health warnings prominent on the package? Is there information about who to contact in case of accidental ingestion or overconsumption?

- **How do people access products on the regulated marketplace? What restrictions or requirements are in place at the point of sale?**
  - Where and how people access products in the regulated marketplace has the potential to impact public health and safety. For example, is marijuana sold alongside other products? In retail stores that serve other purposes? Is product allowed to be delivered? Ordered online? Picked up without going into the store? Who has contact with the customer to make the sale? What are the training requirements for the people selling the product? The answers to these questions have implications for potential diversion and youth access and appeal, and for informing consumers accurately at the point of sale.

- **What restrictions exist on the zoning, density, and number of allowable retail outlets?**
  - Zoning restrictions can further limit ease of access to youth.[41,42] However, some research has found that, in part because of zoning restrictions that occur in the absence of any density restrictions, many retail marijuana stores are clustered in neighborhoods with low socioeconomic status.[41–43] Density caps have also been shown to reduce negative public health impacts, including high-risk consumption and youth use.[11] Limiting the number of retail licensees can help avoid over population of marijuana retail outlets that could exacerbate marijuana use disparities.[11] Important questions here include: Are stores allowed to be located by schools, childcare centers, or other places where youth might congregate? Is there a cap on the number of retail stores, or are unlimited stores allowed? Are there density limits by geographic area?

- **Where are people allowed to legally consume marijuana? How does that consumption impact others who are not consuming?**
  - Where marijuana is allowed to be consumed – particularly in smoked and vaped forms – can have implications for social norms and can expose bystanders to secondhand marijuana smoke or vapor, which has been shown to have many of the same constituents as tobacco, and the potential for some similar health-related harms.[44,45] However, in states that have legalized adult use marijuana, it has effectively been legalized only for people who own their own home, since use in rental properties and federal or state housing is generally not permitted. Based on this reality, states have explored options to provide other spaces for people to consume marijuana. Public health has not always been at the forefront of the discussion. Key considerations include: Are people allowed to consume marijuana in public? In retail stores? In other designated indoor spaces? If allowances have been made for public indoor or outdoor spaces, what regulations have been put in place in terms of products that people are allowed to use, who else is present during use, visibility to others, exposure to others?
- **What are the advertising and marketing requirements?**
  - Although commercial speech has protections under the first amendment of the U.S. Constitution, marijuana remains federally illegal and even in states where it has been legalized, it remains illegal for people under 21 years of age. Furthermore, marijuana may have certain harmful effects that warrant limitations on and oversight of advertising and marketing. For example, are advertisements allowed in places where underage youth might see or hear them (e.g., billboards, TV, radio, etc.)? Can the advertisements contain images that might appeal to youth? Images that represent marijuana (e.g., the pot leaf) or marijuana use? What claims can advertisements make? Do advertisements need to warn the consumer about possible risks? Are sponsorships allowed (e.g., of sporting events, festivals, etc.)? Is funding being allocated from tax revenues for public health-related education about marijuana at a similar rate to the industry expenditures on marijuana promotional advertisements?
- **What are the thresholds and repercussions for driving while under the influence of marijuana?**
  - Marijuana and THC use can impact reaction time and motor coordination, making operating heavy machinery and driving a risk. Data suggest that driving is even more risky when marijuana is combined with alcohol. The key questions related to policy making around impaired driving are extremely difficult, because research is insufficient to answer most of them. Questions include: What amount of THC in the blood constitutes impairment? Does this level differ for different types of users (e.g., chronic vs. naïve)? By sex? By race/ethnicity? How does use of other substances impact the impairing effects of THC? How can you test for THC impairment in a timely manner given the absence of roadside "breathalyzer" like tests? If someone is beyond the per se limit for impairment, what are the consequences?
- **What provisions are put in place to foster more social equity and social justice – particularly among communities that have been disproportionately impacted by the war on drugs?**
  - Many U.S. voters who vote to legalize marijuana are motivated by social justice arguments.[46,47] For decades, black and brown communities in the U.S. have been disproportionately arrested for marijuana possession and use.[48–50] As such, the creation of a legal adult use marijuana marketplace should contain remedies to past law enforcement actions that may have impacted family units, job prospects and earnings, mental health, and overall wellbeing (among other things). Policy questions related to social equity include: What policies exist related to expunging marijuana-related convictions, commuting marijuana-related sentences, funding and promoting recidivism reduction programs? How are people who have been impacted by marijuana-related convictions incorporated into the existing economy (and the growing marijuana industry)? Are technical assistance, capital, and mentoring available to help them start businesses and pursue careers (in or outside of the

marijuana industry)? What other policies can contribute to the due remedy for disproportionately impacted communities?

STATE REGULATORY SIMILARITIES AND DIFFERENCES[d]

As described above, policy can have major implications for public health and safety. This section highlights some of the policy differences across the ten states (Colorado [CO – legalized in 2012], Washington [WA -2012], Oregon [OR - 2014], Alaska [AK - 2014], California [CA - 2016], Maine [ME - 2016], Massachusetts [MA - 2016], Nevada [NV - 2016], Michigan [MI - 2018] and Illinois [IL - 2019]) with legal adult-use marketplaces. Policy characteristics are described as they span the product life cycle, from the basic regulatory structure that allows for production, to the types of products that are allowed, to the ways in which products are tested for safety, packaged, and labeled, to the places people can access and purchase marijuana, to advertising and promotional regulations, to aspects of policies that directly impact externalities including marijuana impaired driving policies, environmental policies, and social equity. The majority of the data described in this section of the report come directly from the state laws, policies, rules, and regulations. Primary data sources from each state are listed in Appendix A.

Overall Regulatory Infrastructure

Primary Regulatory Authority

In states with legal adult use marketplaces, regulatory authorities are typically stand-alone cannabis regulatory boards or commissions (MA, MI, NV), departments of revenue, taxation, or finance (CO, IL, ME), or liquor/alcohol/beverage control boards (AK, OR, WA). CA currently has three state agencies engaged in marijuana regulation: The Department of Consumer Affairs, the Department of Agriculture (who holds a regulatory role over growing), and the Department of Public Health (who regulates processing and manufacturing). While Public Health Departments are typically the agency in charge of regulating medical marijuana in U.S. states, public health departments have only been involved in regulatory functions for adult use marijuana in two states (CA and OR). Six states have advisory boards to inform (MI, OR) or create (AK, MA, NV, WA) adult use marijuana rules and regulations.

Taxes and Licensing

Taxes vary widely across states, from ~10%-15% excise tax (CA, ME, MA, MI, NV) to 37% (WA). IL is the first state to have a tiered tax system based on the percent THC and/or product type, with marijuana products (other than infused products) with a THC level at or below 35% being taxed at a rate of 10%, marijuana products (other than infused products) with a THC level >35% being taxed at 25%, and marijuana infused products (e.g., edibles, beverages) being taxed at a rate of 20%.[51] The tax structure a state chooses can have an enormous impact on use patterns.[11,32] Economic projections have tracked a lowering of prices overall in legal marijuana markets compared with illicit prices.[32,36,52] While this holds benefits in terms of cutting into the illicit market, lower prices can also lead to increased consumption,[53,54] which is associated with a number of public health risks.[2,10] In addition, the way a state chooses to tax can influence behavior.[11] For example, a tax based on product weight could influence consumers to purchase concentrates (which weigh less), whereas a tax based on THC could influence consumers to purchase lower-THC options, which could reduce some of the public health risks.[10,11]

Vertical integration – or allowing one entity to produce, process, and retail – is not required in any adult use state and is allowed in all states except for WA (with some exceptions to large cultivation licenses in CA). In theory, vertical integration may lead to large, multi-national corporations that can operate in all areas of marijuana production and sale and may result in falling prices (due to economies of scale).[10]

[d] Note: Few citations are included in this section, as most of this information comes from the state laws, policies, and statutes included in Appendix A. Where particularly relevant, these have been cited in text.

Local control to ban or amend state policy exists in all states (e.g., a locality can opt to ban marijuana retail outlets, grows, etc.), with most states allowing localities to add additional taxes if marijuana retailing is permitted, and to control zoning and other code enforcement.[31,55,56]

Revenues and Allocations

State revenues vary widely across adult use states and are a product of a number of variables, including the maturity of the marketplace, the amount of the illicit market that has been captured, the size and population of the state, and regulatory approach to licensed retailers (e.g., unlimited vs. capped), among other things. For example, CA's marijuana tax revenue generated $84.4M just in the 4th Quarter of 2019, whereas AK collected <$6M during that same time period. CA has nearly 40M people, and AK has under 1M, and AK has no excise tax at the point of sale, whereas CA has a 15% excise tax, in addition to state sales tax and any local taxes.

In terms of **revenue allocations**, in addition to funding regulatory functions, revenues fund a variety of other things including schools (CO, MA, MI, NV, OR, WA), public health (AK, CA, CO, MA, OR, WA), mental health and substance abuse treatment (AK, CA, IL, MA, OR), research (CA, CO, MI, WA), local government (CA, IL, MI, NV), basic healthcare (MA, WA), road/infrastructure development (MI), recidivism reduction (AK), and criminal justice programs (IL).

Of note, while a growing number of states fund **public health** functions, these funds represent a small proportion (typically, between $1M and $7M per year) of the overall available tax revenues (typically in the hundreds of millions of dollars for states) and are not protected funds. They also often supplant or replace other funds coming to public health (Personal Communication with State Health Officials, 2018). Public health funding from marijuana tax revenues is typically reserved for marijuana-related data monitoring/data collection and public education campaigns[31,55] (see the section on Data Monitoring).

Legal Possession Limits

In most states, **legal marijuana possession limits** are ~1 ounce of dried flower or 7 to 8 grams of concentrates. ME and MI are outliers with a legal possession limit of 2.5 ounces (including concentrates).[9] MA and OR have higher home possession limits (10oz and 8oz respectively). Higher possession limits could lead to more diversion.[57] Many of these possession limits are set based on amounts discussed in decriminalization policies.[17]

Homegrow (e.g., wherein adults are allowed to grow their own marijuana at home) for non-medical purposes is allowed in all states except for IL and WA, where it is currently only permitted for medical marijuana. Homegrow limits are typically 6 plants (3 flowering, 3 not), though ME allows 15 and MI allows 12.[10,57] As noted, homegrows have been associated with increased diversion and public health risks related to youth and dependence.[9]

Legal Products and Product Restrictions

Just a decade ago, the vast majority of marijuana was consumed in combusted form (in joints and pipes).[58] However, legalization has resulted in a dramatic shift in the types of products being marketed and sold, and the proportion of those products being used by the public.[37,58,59] While smoking is still the predominate mode of marijuana use, states with adult use legalization have seen large increases in use of edibles and concentrates.[38,60] Regulating these new products can pose challenges, because of how little we know about their health effects, and because of how quickly new products evolve.

Marijuana-infused products (edibles and beverages)

Marijuana-infused products (edibles and beverages) are allowed in all ten adult use states, with some differences in allowable product types and serving sizes. When the CO marketplace opened in early 2014, there were no **serving size requirements** for THC in edibles or beverages. A serving size wasn't defined, and thus one brownie could contain, for example, 100 reasonable "servings" of THC.[38,60]

Overconsumption of THC can lead to acute psychosis and subsequent injury.[60,61] In the first few months that the marijuana retail marketplace was open, CO had at least two deaths that were linked to overconsumption of marijuana edibles purchased from legal retail stores,[31,61,62] prompting CO's Marijuana Enforcement Division to institute mandatory THC serving size limits on marijuana edibles and beverages (10 mg THC per serving, up to 10 servings per package) and clearly demarcated servings.[31,62] WA followed suit and issued emergency rules tightening edibles packaging and labeling, as well.[63]

Now, seven states (CA, CO, IL, ME, MI, NV, WA) require THC limits of 10 mg per serving size (ten servings per package); three states (AK, OR, MA) require a 5 mg serving size (10 servings per package). In most of these states, serving sizes are required to be scored and clearly demarcated on the product. However, in an effort to further prevent accidental ingestion or overdose, some states also require that bulk marijuana-infused products be wrapped or packaged into single servings. Policies on denoting serving sizes in beverages vary more widely across states, with some states requiring a measuring cup to be distributed with the beverage, and others requiring markings on the beverage bottle or container to measure serving size.

In terms of marijuana-infused product types, WA and CA only allow shelf-stable and/or non-refrigerated marijuana-infused products. All states prohibit marijuana-infused products that are branded to look like existing candy products or other existing commercial food items. Adulterated products (products that already exist commercially and have been sprayed with a THC coating) are prohibited in most states, as well. Finally, all states prohibit products that appeal to youth, though the definition of what might appeal to youth varies widely across states (e.g, no bright colors, no cartoons, no images of celebrities, etc.), and often leaves room for interpretation. For example, in CO, licensees put cartoons in their logos to skirt around the ban on the use of cartoons on packaging. WA is the only state that has a regulatory advisory group that specifically meets to review and preapprove all marijuana-infused products and packages for the potential appeal of new products for children.[63] CO had modifications to rules after their marketplace opened to prohibit pre-manufactured products (like gummy bears) and to ban edibles in the shape of humans, animals, or fruits (due to potential appeal to youth). ME and MI have since adopted similar language.

Vaping products and oils

Vaping products and devices in the adult use markets were generally not subject to any product specific regulations before the E-cigarette, or Vaping Lung Injury (also called EVALI) outbreak that occurred in late 2019 and resulted in hospitalizations in all 50 states, DC, and two U.S. territories.[64] Findings from EVALI investigations concluded that vaping products with THC – especially those obtained informally from friends, family, and online (e.g., illicit products) were primarily to blame.[64] However, some products came from legal marketplaces.[64] Vitamin E Acetate (VEA), which had been added to vaping cartridges as an excipient or diluent, was strongly linked to EVALI, but evidence was not sufficient to rule out other chemicals of concern.[65]

Accordingly, states have begun to take a number of actions to better regulate vaping products and the ingredients used in vaping oils (which are typically sold by currently unregulated third-party companies). These actions have included banning and regulating excipients and diluents (e.g., requiring disclosure of their use, banning certain diluents, etc.) and regulating terpenes (e.g., requiring disclosure of ingredients for terpene blends and banning or restricting use to only certain types of terpenes). In terms of excipients and diluents, CO banned the use of VEA, MCT oil, and polyethylene glycol (PEG) in vaping devices; OR put a policy in place prohibiting adulterants and banning dimethyl sulfoxide (DMSO), PEG, and VEA; IL and MI banned VEA (and MI requires that additives must be FDA approved for the intended use), MA put a quarantine on all vaping products until they could be tested for VEA, and WA still has emergency rules in place banning VEA. In terms of policies about terpenes, which can be derived from cannabis, from other plants (botanical), or can be created synthetically, WA allows only botanically derived terpenes and restricts flavors to those that mimic a particular cannabis strain, CO and MI allow only additives from FDA's approved list, and ME bans toxic or harmful additives. States have also considered options for regulating vaping devices and cartridges, though no such regulations are currently in place in any adult use states.

Other concentrates

Despite limitations on serving sizes for edibles, no states have limits on overall THC concentration (potency limits) in concentrate produces (including waxes and hash oils), which can be greater than 90% THC.[66–68] This remains an area of policy to consider, given the increasing potency of concentrates (THC in concentrates in CO increased from 56.6% in 2014 to 68.6% in 2017, with some products at >90%[69]), the increased availability of concentrates (both for vaping and dabbing) in the U.S.,[66,68,69] and their potential link to increased dependence among other public health concerns.[2,66,70] In addition, very little research exists on the potential health harms of these highly concentrated THC products may have on youth.[71,72]

Emerging product types

Recently promoted product types including metered-dosed inhalers,[73] nasal sprays,[74] and suppositories[75] have presented more of a challenge to policymakers, as they look like traditional medical products and may raise public health concerns requiring additional safety and oversight. CO is the only adult use state to date to develop specific rules for regulations for these alternative use products. CO's new rules went into effect in 2020 and define these as "alternative use/audited products". Rules require specific product audit and approval, insurance, minimum product requirements, minimum production requirements, and pre-production testing requirements.[76]

Tobacco and alcohol multi-national companies have made recent moves into the growing marijuana industry.[6,77] We may see new products as a result of that, and perhaps products that seek to combine marijuana and tobacco (e.g., like blunts and spliffs[78]) or products that combine marijuana and alcohol. For now, all adult use states prohibit marijuana products from being mixed with tobacco/nicotine or alcohol, and tobacco/nicotine and alcohol products are not allowed to be sold in marijuana retail stores.

Lab Testing

All ten states with legal adult use marketplaces require some lab testing of products. However, given the federal illegality of marijuana, states have been unable to ship samples across state lines for testing, and each individual state has had to rely on setting up their own lab testing systems to assure the quality and safety of marijuana and marijuana products.

Third-party testing lab, lab accreditation, and reference labs

All adult use states are licensing third-party labs for testing. Those labs must be accredited (lab accreditation standards vary – but most states are using ISO 17025). The third-party labs receive payment from licensed marijuana growers and processors to conduct required product testing (so the industry is the customer). This approach has led to industry "lab shopping" and wide variation in testing results from lab to lab, as licensees seek to maximize the total THC in products.[79,80] Due in part to this variation in testing across labs, states have begun to try to identify reference labs to validate that testing results from third-party labs are accurate, and to be an the arbiter in cases of testing discrepancy.[31] Developing proficiency testing processes to ensure interlaboratory reliability is also essential.[31] However, reference labs have been challenging for states to set up, since state labs – most of which receive federal funding for various laboratory projects - have limitations on their ability to test marijuana, a federally illicit substance. Currently, only CO and NV have reference labs set up (the CO Department of Public Health and Environment is serving as CO's reference lab, and the NV Department of Agriculture is serving as NV's reference lab). CA is in the process of setting up a reference lab.

Sampling requirements

In most states, the licensed third-party lab goes onsite to the producer or processor to obtain the sample. The goal of this is to attempt to ensure a non-biased sample is collected. However, in AK, MA, and WA, the licensed producer or processor submits the sample (following guidelines for obtaining the sample) to the third-party lab. Most states have specific requirements for the third-party labs in terms of handling

samples, as well. For example, AK recently updated their lab requirements and has expansive detail on how labs should handle samples.[81]

Contaminant testing

States require products to be tested for a variety of contaminants. Table 2 details testing requirements by state, as of July 2020. Thresholds for contaminants are not set by the federal government; states have had to set them on their own, making knowledge and information sharing across states important. In addition, many of the methods for testing across the heterogeneity of marijuana products have been recently developed within states. Having a community of practice (through the Association for Public Health Laboratories) for laboratorians to share knowledge has been important in terms of identifying and sharing these methods and thresholds.

Table 2: Marijuana contaminant testing requirements, by state, as of July 2020

	Cannabinoid concentration	Residual solvents	Microbials (bacterial/fungus)	Mycotoxins	Water activity/ moisture	Heavy Metals	Pesticides	Yeast / mold	Foreign Matter
AK	X	X	X				X		
CA	X	X	X		X	X	X		
CO	X	X	X	X		X	X	X	
IL	X	X	X	X			X	X	
MA	X	X	X	X		X	X	X	
ME	X	P	X		X		P	X	X
MI	X	X	X	X	X	X	X		X
NV	X	X	X	X	X	X	X	X	X
OR	X	X			X		X		
WA	X	X	X		X	X			

^Enterobacteriaceae, salmonella, e coli, aspergillus, coliform, etc.

P=pending

Retesting and remediation

All adult use states allow licensees to request retesting if dried flower fails testing. In most cases, the product must pass two additional tests to be sold, otherwise, it is destroyed. Most states also allow licensees to request remediation for certain types of testing failures (e.g., failure for total mold on dried flower). In cases of remediation to a processed marijuana product (e.g., concentrate or extract), additional testing is required in line with the new product type (e.g., mycotoxin, residual solvents, etc.)

Post-market testing

Post-market testing (or pulling a finished product from the retail shelves for random testing) can be an important way to ensure that products contain what they say the contain, and that the shelf-life of the product has not compromised product safety. For example, a number of states have begun to find heavy metals in vaping cartridges that have been on the shelves of retail stores for a certain period of time, suggesting possible leaching from cartridge components.[82–84] Currently, CA, CO, IL, ME, NV, OR, and WA all have the authority to conduct post market testing. However, in most states, that authority has not yet been or is not regularly exercised.

Packaging and Labeling Requirements

Universal symbol

When CO and WA launched their adult use marketplaces, there was nothing required on products to denote that they contained marijuana (beyond required labeling of cannabinoid content). This resulted in the possibility for accidental consumption and overconsumption by both children and adults. CO was the first state to develop a "universal symbol" denoting that the product contained marijuana. This symbol was required on both packaging and on the edible itself (marked, stamped, or otherwise imprinted), so that even if the edible was separate from its package, it would remain clear that it contained marijuana. Now, a total of eight adult use states require a universal symbol on products (CA, CO, MA, ME, MI, NV, OR, WA). With the exception of MA and ME, who use the same symbol, all universal symbols differ across states. Figure 2 shows the universal symbols by state.

Figure 2: Universal Symbols Denoting Cannabis Products, by State

Warning labels

All ten adult use states require warning labels on marijuana products. All state warning labels contain language that the product is only intended for use by persons age 21 years and older, and most contain language to "keep away from children." However, many of the other warnings differ. In all states, all warnings the state has in rules and regulations (see Table 3) are required to be displayed on all marijuana product packages (with some differentiation for edibles – where the delayed intoxication warning is also required by most states, and dried flower – where a warning about smoking is also required in WA). No states have rotating warning labels or graphic warning labels. Warnings are typically a small sticker or printed box on packaging. The font size is small and may be difficult to read. Some states (e.g., NV) require additional warnings to be posted in the retail store. While not covered in this report, Canada has rules and regulations that require a large, yellow warning label with rotating health warnings. This approach, which is now being mirrored by some U.S. medical states (e.g., RI) is likely to more effectively communicate warnings and risks to consumers.

Table 3: Topics included on warning labels, by state

	Keep away from children	Pregnancy/ breastfeeding	Delayed intoxication*	Driving/ machinery/ impairing	Addictive/ dependence risk	General health risks	Unlawful outside of state	Smoking is hazardous**
AK	X	X		X	X	X		
CA	X	X	X	X		X		
CO	X	X	X	X		X	X	
IL		X		X	X		X	X
MA	X	X	X	X		X		
ME	X	X		X		X		
MI	X			X				
NV	X		X		X		X	
OR	X			X				
WA	X		X	X	X		X	X

*Typically, for manufactured cannabis products only (e.g., edibles, beverages). **For combusted products only

Figure 3: Sample warning labels, by state:

Two states (WA and MI) also require a poison control number to be included on packaging. WA has a specific graphic logos (a hand, see Figure 3) denoting that the product is not safe for kids and including the poison control phone number.

Child-resistant packaging

When adult use markets opened in CO and WA, strict child-resistant packaging was not required. However, after poison centers and hospital emergency departments reported a sharp increase in the number of people – mostly children – reporting with accidental ingestion of marijuana products,[85,86] CO and WA moved to require child-resistant packaging for all products. [76,87] Rules included the use of opaque packaging that would not allow the product to be seen without opening the packaging material and required packages to be child-resistant and resealable for multiple-use products. In cases where dried flower or other products are placed into a contain that is not child-resistant, a child-resistant exit package must be used. Now all adult use states require child resistant packaging for marijuana products, in accordance with Title 16 C.F.R. 1700 of the U.S. Poison Prevention Packaging Act. Most require tamper-evident, child-resistant, resealable, and opaque or light resistant packages.

Other labeling requirements

Adult use states require a variety of additional items on labels, including the cannabinoid content, list of all non-marijuana inactive ingredients (usually in descending order by weight), allergen information, nutritional information, and track and trace number and/or batch number.
A number of states provide optional, recommended labeling as well, including the harvest or production data and "best by" date. All adult use states prohibit health or benefit claims, or false claims. A number prohibit the use of the words "organic" or "candy" on labels (e.g., AK, CO, WA). States may also prohibit certain fonts that may be appealing to youth (e.g., cartoon-like fonts).

Other packaging requirements

Beyond child-resistant packaging, the most common packaging requirement across adult use states is that packaging cannot appeal to youth. States have operationalized this, with most prohibiting the use of shapes and images that could appeal to youth or people under 21 years of age (e.g., cartoons, animals, toys, celebrities, images depicting youth or youth consumption). Most states also prohibit the use of a state seal or any insignia that may make people believe the product was produced by or endorsed by the state. WA state is the only adult use state to preapprove all packaging for marijuana-infused products. NV preapproves product logos or graphics. While time-intensive, these steps can help enforce rules that packaging not be appealing to youth or mislead the public.

Plain packaging

An alternative to preapproving all packaging to ensure that it does not appeal to youth would be to set standards for what a package can include (and state that everything else is unapproved). Plain packaging provides a standard for this. Plain packaging, which is used in a number of other countries for tobacco products, requires the use of approved, neutral colors, standard fonts, and often small preapproved branded

elements on packages.[9,40] To date, no adult use states are following plain packaging, though all require the use of opaque packages. Again, while outside the scope of this report, Canada has instituted plain packaging, including the use of a small brand element (that must be equal to or smaller than the universal symbol).

Packaging and labeling challenges

A number of packaging and labeling challenges have arisen over the years that adult use markets have been open in states. These include problems with what to require in terms of labeling on small products (e.g., individually packaged candies, vape cartridges, etc.). States have come up with a variety of solutions to this problem, including the use of accordion labels and requirements that the universal symbol be as close to the marijuana as possible (e.g., stamped on edibles, vape cartridges, etc.) to continue to communicate that the product contains marijuana even in cases where packaging has been removed. Packaging and labeling regulations and rule changes can be costly to the industry and cause environmental waste, and the industry may lobby against them for these reasons. However, certain packaging and labeling changes have been taken in states to date and may still be needed to better protect public health and safety.

Marketplace Characteristics

Retail stores

In all states with a legal adult use marketplace, marijuana retail stores are required to be standalone, marijuana-only stores, and cannot sell other products (including drug paraphernalia in some states, like WA). In all states, stores have mandatory ID checks upon entry, and compliance with underage ID checks is remarkably high (>90%, for example, in WA).[88] The number of retail outlets varies greatly across states, with WA limiting retail outlets based on county size and factors, and OR (for example) allowing market forces to control the number. OR has more than double the number of marijuana retailers per capita compared to WA.[89] The number of retail cannabis stores can translate into lower costs (not just monetary, but time, transportation costs) for use, and can be associated with heavier use patterns and greater dependence.[36,41,42] However, with too few stores, the illicit market could continue to thrive.

All states have some zoning requirements in place for retail stores – typically that they cannot be located within 500 to 1000 feet of locations that children might frequent (e.g, schools, daycares, community centers, etc.). These zoning policies can typically be changed by localities as well, so may differ across states. Importantly, some research has found that, in part because of zoning restrictions and a lack of density restrictions, many retail marijuana stores are clustered in neighborhoods with low socioeconomic status.[41,42] This has detrimental impacts for public health as well.[9]

Some states (e.g., AK, MA, WA) limit the number and/or size and/or display of retail store signs. For example, WA allows two signs identifying the retail outlet on premise and as billboards, limited to sixteen hundred square inches; AK allows three signs not to exceed 4,800 square inches. MA prohibits external signs that are illuminated beyond the period of 30 minutes before sundown until closing. Retail stores in a number of states have been required to post public health warnings and placards coinciding with EVALI in the fall of 2019, and now coinciding with COVID-19.

In addition to the licensees, employees who work in the retail stores (often referred to as "budtenders") have to undergo state background checks and often have to obtain a license or agent card prior to employment. So far, no states require mandatory state-sponsored training for budtenders (who are often the source of information on all things marijuana-related for people purchasing the product). CO has an optional "Responsible Vendor Training" program that, if completed, allows licensees to waive certain fees.[90] WA requires a training for budtenders who want to discuss medicinal marijuana with purchasers (since WA's marijuana retail market is combined for adult use and medicinal sales).[91]
Despite the fact that few states have training requirements, training budtenders to understand the state of the science around cannabis remains important for public health, given the influence they have with marijuana users.[92,93]

Online ordering

None of the states with legal adult use marketplaces allow online ordering and mailed delivery. However, a growing number of states now allow online ordering for pick up or delivery (see Delivery section below). In these states, retail licensees can make their menu available online (provided their website has some age verification). Adults 21 years and older can order from the menu, and often pay online and either pick up their order at the retail store, or have it delivered (if the state offers delivery).

Delivery

Delivery of marijuana products exists in a number of medical states, based in part on the conceptualization that some people may be too sick to get their medicinal marijuana in person. States have also considered delivery as a possible step to cut down on the illicit market and a potential way to discourage impaired driving. Finally, some states (e.g., MA) have explored delivery licenses as licenses that require less capital to operate and thus may be more available to social equity applicants (see the section on Social Equity). On balance, no research exists to suggest whether delivery might also increase youth access or diversion.

Commercial or retail marijuana delivery exists in five adult use states (CA, MA, MI, NV, OR) and is pending in CO (scheduled to begin for adult use in 2021; medical delivery is already operational). In states where delivery is legal, delivery is typically allowed only to private residences. It remains illegal to deliver to certain public places (e.g., hotels, casinos, publicly owned land or buildings) and to federal buildings. Patrons can typically either call in an order and pay for it over the phone, or order online. Depending on the state, delivery operators can be separate licensees (under a separate delivery license) or can be from a licensed retail store. States have different requirements in place to safeguard delivery workers and the product they are delivering (e.g., maximum amounts of marijuana that can be delivered at one time, required numbers of people in a delivery vehicle, mandatory training for delivery workers, mandatory reporting for delivery orders). ID checks are required upon delivery. Data are not available on the potential public health impacts from delivery. It is possible that delivery could decrease impaired driving. It is also possible that delivery could lead to underage access.

Curbside pick up

Prior to COVID19, no states (medical or adult use) had curbside pick-up available. However, in response to broader state guidance around business operations during COVID19, and to minimize potential indoor exposures, all states with adult use marketplaces are now allowing curbside pick-up of marijuana. Some states (e.g., WA) have other measures in place (e.g., that no one <21 years of age can be in the car, that sale areas much be stationary and physically designated on the property, etc.) to attempt to minimize potential public health harms (like product diversion, changes to social norms, etc.) that may occur as a result of curbside pick-up. Many of these temporary rules are now becoming permanent in states for a variety of reasons, including time limits on emergency rules and the duration of COVID19 precautions needed here in the U.S.

Banking

The banking system in the U.S. is regulated by federal law. Because marijuana remains federally illegal, banks risk charges of aiding and abetting a federal crime or money laundering if they do business with marijuana licensees. [94] In states with legal adult use marketplaces, the marijuana industry has identified some banks (often Credit Unions) that will do business with them and has leveraged third parties that have created various payment apps and prepay cards. But, overall, the remaining federal illegality of marijuana has resulted in an industry that is largely cash-based (including for payroll for employees and acceptance of payment from patrons), which poses public safety harms including burglary and robbery. In the city of Denver, CO, for example, while cannabis businesses account for less than 1% of all businesses, they have comprised 10% of all reported burglaries from 2012 to 2016. [95] While the U.S. Congress has debated and passed safe banking bills that could impact states with legal marijuana, nothing has been brought to a vote by the U.S. Senate. [96]

Advertising

Restrictions on industry advertising

Advertising and marketing is an important way that commercial industries reach youth, and can alter social norms, lead to initiation, and facilitate heavier use patterns. [8,9] The United States protects commercial speech in the first amendment of the U.S. Constitution, though constitutional scholars disagree on how protections apply to speech about a federally illicit substance. [97–99] Advertising can occur through billboards, radio/TV/print sources, sponsorships, and social media. While a number of medical marijuana states have broad scale advertising bans in place prohibiting the use of all or most of these outlets (e.g., DE, FL, HI, LA, OH, UT, VT, RI), no adult use states have outright banned advertising through these mediums.

Many adult use states have set standards that advertising is only permitted if 71.6% of the viewers can reasonably be expected to be ages 21 years and older. This standard is drawn from a standard that the alcohol industry set for themselves [100] and may be based in part on the fact that early regulators of marijuana in U.S. states were also regulating alcohol (e.g., in WA, OR, AK). However, this may not be the best approach to protect public health and avoid youth exposure to advertisements, given that the standard still allows for up to nearly 30% of the audience to be under 21 years of age.

While advertising is broadly allowed (and print ads and TV/radio ads for marijuana retailers and products can be seen in most states with legal adult use markets), some states have restrictions in place. In CA, ME, and WA, there are restrictions on billboards. In CA, billboards cannot be placed on interstate highways or state highways that cross state boarders. In ME, billboards are not permitted for any businesses, including marijuana businesses. In WA, billboards are restricted to the store name, location, and hours. Five states (MA, ME, NV, OR, WA) now require warning statements on ads (e.g., ranging from warnings in line with product warning labels, to warnings that marijuana is for use by those 21 and over only – keep out of reach of children). Six states (AK, CA, IL, ME, NV, WA) also have zoning policies prohibiting advertising within 1000 feet of a child-related or community-based location (locations vary by state). Similar to packaging and labeling restrictions, most states prohibit images that could appeal to youth, that depict consumption, or that use the cannabis leaf. However, all of these restrictions pertain only to entities the state licenses for marijuana (e.g., producers, processors, and retailers). A number of third-party marijuana advocacy groups advertise as well (e.g., Leafly, Weedmaps, etc.) and are not subject to any state restrictions. This has presented a challenge to regulators and to public health.

Public education

As a commercial industry, the marijuana industry has far more funding to market their products and disseminate their messages than public health does. Public health agencies in adult use states have had extremely limited funding (if any) for essential public education work. Public education about marijuana and its possible effects is particularly important for disproportionately impacted populations, like youth and pregnant women.[101] Education about the actual policy is also needed as the policy is changing (e.g., don't drive high, where products can/cannot be used, etc.), and education is needed even when a policy has been implemented (e.g., on safe usage, safe storage from kids, risk of certain high potency products, etc.).[31,55,102]

Five states (AK, CA, CO, OR, WA) have had public education campaigns targeting youth, parents and trusted adults for youth, pregnant and breastfeeding women, and the general adult public. Campaigns in states have focused on educating people about the legalization policies (e.g., CO's "Good to Know" campaign), encouraging youth to delay initiation (CO's "Protect What's Next" campaign, OR's "Stay True to You" campaign, and WA's "Be Your Selfie" campaign), and encouraging the general population to use marijuana in safer ways (e.g., "Drive High, Get a DUI" campaigns in multiple states, CO's "Responsibility Grows Here" campaign, and AK's "Responsible Consumer" campaign). In addition, efforts have been undertaken by states (primarily CO) to educate clinicians who serve pregnant and parenting women, and all six of the aforementioned states have factsheets and websites to reach priority populations with key public health messages. Due to the limited funding available, very few of these efforts have been evaluated, and none have had long term evaluations.

Public Use and On-Site or Social Consumption

In states that have legalized adult use marijuana, it has effectively been legalized only for people who own their own home, since use in rental properties and federal or state housing is generally not permitted, and states have banned general public consumption of marijuana (though fines are extremely low for consuming marijuana in public in most cities – it is a civil infraction, and some local law enforcement have openly said they won't ticket for public marijuana use [103]). Regulators and law makers have also faced pressure to provide places where tourists can use marijuana. Based on primarily on these two issues, states have explored options to provide other spaces for people to consume marijuana.[104]

Consuming cannabis in any public space is currently prohibited in ME, NV, OR, and WA. Public smoking does not occur in MA either (though the regulatory body has authorized a license for social consumption, but MA state law needs to be amended before any licenses can be granted, and that has not occurred). CA and IL have pushed the issue to locals and allow exemptions to the statewide clean indoor air act, if localities approve (and some localities in both states have approved exemptions). In IL, the local exemption can allow for on-site consumption at marijuana retail stores, and in licensed smoke shops.

Statewide licenses for social or on-site consumption are available in AK, MI, and CO. In AK, the state will only issue an onsite consumption license if there is a local endorsement in place.[105] Consumption is allowed inside marijuana retail stores, in isolated consumption areas that must be separated by walls and a secure door, have a "smokefree" area for employees to monitor the area, and have a ventilated system that is separate from other areas of the retail store. Consumption is limited to dried flower and vaping. Consumption by any method is allowed in an outdoor area if it is obscured from view, not located by air intake vents, and approved by the surrounding property owners.

In MI, rules designate a consumption establishment license that is available to anyone (it is not limited to existing retail licensees), with a local approval requirement.[106] The license allows for marijuana consumption (of any licensed marijuana product) in an adult only commercial space. Similar to AK, the space must have a "smokefree" area for employees to monitor consumption, must be physically separated from other areas of the space where smoking is prohibited, and must have a separate ventilation system. Marijuana can only be distributed or sold onsite if the social consumption licensee also has a license as a marijuana retailer or a microbusiness. Marijuana products are allowed to be delivered to the social consumption establishment.

In CO, the state legislature passed a bill in 2019 to allow for licensed marijuana "hospitality businesses."[107] The rules use an "opt-in" approach and require a local law and local approval. Employees are required to complete the CO "responsible vendor training" (see the section on Retail Stores) and must be able to reasonably monitor consumption. The rules permit consumption of specific amounts of dried flower, concentrate, or THC-containing edibles. Indoor and outdoor consumption are permitted (provided outdoor consumption is obscured from view). The rules also legalized a "mobile premise" (e.g., a car or bus), provided it have ventilation to ensure that air is not circulated into the driver's area. Some restricted food sales are permitted, and the license can be granted to a food establishment, provided the marijuana consumption area is isolated from the rest of the food establishment. In the case of all three states, they expressly prohibit the use of alcohol or tobacco.

Importantly, these policy decisions will have implications for public health and safety. Marijuana secondhand smoke appears to have many of the same constituents as tobacco smoke,[44] and animal models show it can cause some of the same health harms. [45] Furthermore, because marijuana and tobacco can be combined in many of the same products,[78,108] and increasingly marijuana and tobacco products look alike,[109] enforcement of the prohibitions on tobacco use will be extremely challenging. It is very possible that these exceptions to state clean indoor air policies for marijuana could effectively allow for use of tobacco products in indoor public spaces again, which would result in substantial human harms.[110]

Impaired Driving

While the evidence is clear that use of marijuana, and THC specifically impairs attention, coordination, reaction time, and tracking performance, and leads to increase risk of motor vehicle crash,[2] the science is not clear on how this risk varies across different types of users, including new users and chronic users. Marijuana-impaired driving is illegal in all ten states with adult use marketplaces. However, policymaking around setting thresholds for driving while under the influence of marijuana challenging. THC is metabolized quickly, but because it is fat soluble, it remains in the body for a long-time following consumption. Studies show that occasional cannabis users have been found to have blood levels that decline below 5ng/ml in just a few hours (e.g., as long as it can often take to get someone who was stopped for possible impaired driving to a precinct for a blood draw).[111]Chronic users, on the other hand, may have accumulated THC in fatty tissue that is released back into the blood and may result in detectable THC levels long after the last use.[112] Furthermore, drivers impaired by marijuana may also be impaired by other substances, complicating both research and enforcement.[113,114]

Five states (AK, CA, MA, ME, OR) have no per se laws[e] in place for marijuana. MI has a zero-tolerance policy (driving with any detectible THC is not permitted), NV has a per se THC limit of 2ng/mL, IL and WA have per se THC limits of 5ng/mL, and CO has a "reasonable inference"[f] for THC 5ng/mL.[57,115] Although per se THC limits exist in a number of states, current roadside tests cannot definitively identify recent THC consumption. THC can be present for more than 24 hours in oral fluids, so the current test for marijuana-related impairment is a blood test. If someone is suspected of impaired driving and marijuana is the suspected substance, officers can perform visual and field sobriety tests (e.g., eye tracking, pupil dilation), but typically need to bring the individual into an office for a blood test to meet per se criteria. In some states, police officers are being trained to draw blood at the roadside to avoid what can be lengthy delays in getting suspected impaired drivers into the precinct for a blood draw.[116] In other states, officers are advised to stop searching for additional impairing drugs if the individual exceeds the per se level for alcohol impairment (personal communication with state health officials, 2016), which could result in an underestimation of the prevalence of marijuana impaired driving.

Social Justice and Social Equity

For decades, black and brown communities in the U.S. have been disproportionately arrested for marijuana possession and use. Legalization did not resolve these disparities and created a profitably industry that has largely shut out black and brown communities.[8,46,117] For example, evaluation data from WA showed that initial efforts to legalize without specific social equity measures in place reduced overall arrests but did not reduce the disparity of arrests between black versus white people.[118]

States are early in their learnings around how best to foster social equity and remedy past law enforcement actions, but policy actions may include: automatic expungement of marijuana-related convictions, commuting marijuana-related sentences, funding and promoting recidivism reduction programs, and providing priority job training, capital, and licensing for those in communities that have been disproportionately impacted by the criminalization of marijuana to help them pursue careers (in and outside of the marijuana industry).[117] In the past three years, a number of adult use states (CA, CO, IL, MA, MI, and NV) have implemented provisions that seek to foster more social equity, including state grants for local jurisdictions with equity programs (CA) and fee waivers, loans, training/TA, and/or priority licensing to equity applicants for marijuana licenses (CO, MA, MI). These efforts are a starting place, but both advocates and regulators would likely agree that much more is needed.

[e] A "per se" limit is a limit above which a person can be deemed formally to be intoxicated.

[f] A "reasonable inference" limit means that in instances where THC is identified in a driver's blood in quantities of 5ng/ml or higher, it is permissible to infer that they are under the influence.

Energy Requirements

Growing and producing marijuana can take a toll on the environment, especially in terms of electricity and water usage, and waste. While this is a fairly recently recognized concern and a relatively nascent policy area for states, at least six adult use states (CA, CO, IL, MA, ME, OR) have programs to regulate or score licensee applicants on water usage, waste disposal and recycling, and electrical equipment.

Treatment and Prevention

Many of the health effects of marijuana use are made worse by initiating use earlier.[2] In addition, marijuana dependence exists and may be exacerbated by the types of products that become more prevalent in a legalized marketplace. Providing access to evidence-based treatment for adult who want to cut down on or stop using marijuana is important. Five states (AK, CA, IL, MA, OR) have excise tax allocations for mental health and substance abuse treatment, and the initial ballot measure and statute in WA state required the development of a helpline that was not abstinence-only,[119] following Australia's Cannabis Information Helpline model.[120,121] However, resources for treatment have typically been a small proportion of allocated funds from excise taxes in adult use states, and treatment approaches in the U.S. have not evolved to a population level – like the Australian model, or what has been developed for treating nicotine dependence, for example.[122]

Data Collection and Monitoring

Collecting baseline data and collecting ongoing data on everything from adverse event reporting, accidental ingestions, use patterns, and changing sales trends is important to understand how policy changes impact health and safety.[10,123] While some level of public health data collection is occurring in all ten states with legal adult use markets, few states had data collection mechanisms in place that pre-dated adult use legalization, and no states had data collection mechanisms in place that pre-dated medical marijuana legalization, though some national data sources can be used to obtain state-level data. As such, evaluating the true impacts policy has had on a host of public health and safety outcomes has been challenging. Putting data collection systems into place well in advance of any cannabis policy changes to gain an understanding of baseline use patterns is vital.[10,123,124] Continuing to fund data collection and monitor changes to trends over time can inform policy changes and subsequent policy making.[10] Triangulating data sources (e.g., looking at policy data with population-based data sources, or looking at syndromic surveillance data with market-data sources) can provide an even more comprehensive picture.[10,123,124]

EVOLUTION OF MARIJUANA REGULATORY POLICY ACROSS STATES

The policy details reviewed above are current as of July 2020. However, that section of this report is likely to be out of date in just a few months, given the rapid evolution of marijuana policy in the U.S. While scientists and public officials have not speculated on the reasons for the rapidly changing policy climate, there may be several reasons why policies, even within a single state can change so quickly.

First, this is still an extremely nascent policy area. U.S. states have been the first to experiment with a commercial marketplace for the sale of marijuana. Policies have jump-started an industry that is growing and evolving rapidly. Policy and public health knowledge are outpaced by the evolution of the industry, including new products and formulations, new additives, and new modes of consumption. With that growth comes more sophistication, as the industry becomes more aware of what is needed to foster further growth. At the other end of the spectrum, as the market grows, so does the scientific knowledge around the potential risks of marijuana use, and public health becomes more aware of the policies that are most likely to safeguard public health and safety. State regulators are also learning more about which policies are working and which policies need to be changed or strengthened because they are not achieving the desired effect or need to adapt to an evolving marketplace. This necessitates near constant updating to existing policies and has resulted in most states having a least annual rulemaking to revise, adapt, and develop new rules to keep pace with new learnings.

Second, state policy change can occur rapidly with the changing of state government leadership (from one party to another, from a political leader with one vision to a leader with a different vision). Changes in the composition of state legislatures can also quickly impact policy. For example, changes have recently occurred to cannabis policies in Colorado – the first market to open in the U.S. These changes have come in part due to a new legislature and a new Governor elected in 2018 who hold different priorities on cannabis and take a different approach to cannabis-related policy.[125]

Third, rapid policy change can follow certain health-related occurrences. For example, after poison centers reported surges in calls about accidental consumption of cannabis by children, states moved quickly to require universal symbols on marijuana products, to ban certain edibles that might appeal particularly to children (e.g., gummies), and to require childproof packaging. Similarly, following EVALI, states moved quickly to enact emergency rules banning certain excipients and diluents, and to consider permanent regulation of additives in marijuana vaping products. Finally, as marijuana businesses were deemed "essential" in all adult use states during COVID19 emergency orders, state regulators swiftly developed recommendations and emergency rules to try to make operations as safe as possible in the current climate.

Despite the rapid evolution of marijuana policies within U.S. states, a certain "copy and paste" phenomenon has existed as well. State regulators are often new to marijuana and – though they typically have regulatory expertise – they may not have pre-existing marijuana subject matter expertise. In almost all cases, they have been asked to set up an entire marketplace and draft all needed rules and regulations in a matter of a year or two. In that situation, borrowing from states that have come before is often the starting place, resulting in aspects of policy that look very similar across states, but are similar not because they represent the best policy, but rather because they represent pre-existing policies that were available for quick adoption.

As the number of states with legal marijuana has grown, regulators have sought to engage in increased dialogue on certain policy areas through the creation of groups like the Regulators Roundtable. This type of roundtable approach can strengthen policy and build knowledge and expertise among existing and future regulators.

DIFFERENCES IN MEDICAL MARIJUANA LEGALIZATION POLICIES

While early medical marijuana programs were developed somewhat organically given federal policy challenges[18] (e.g., without retail licensing, required lab testing, product oversight, or packaging and labeling regulations), increasingly, medical marijuana programs in U.S. states are focused on developing regulations that safeguard public health and the safety of patients accessing products through the program. Medical marijuana programs in the U.S. are typically funded from program fees rather than excise taxes, and thus have a much smaller regulatory budget. Many medical marijuana programs are regulated through Departments of Public Health (unlike adult use programs). A wide range of policy approaches exist in medical marijuana programs, and differences exist between all state medical programs.

Some states restrict the number of licensees and dispensaries, while others do not. Some states restrict the use of certain forms of marijuana (e.g., edibles, combusted products), while others do not. Based on a variety of often political factors, states typically authorize medical use for a wider array of conditions than the science currently supports. Though marijuana cannot be "prescribed" in any state – it can only be recommended, some states require pharmacists or clinicians to dispense medical marijuana products, while others have dispensaries that employ "budtenders" and look and feel similar to those in adult use states. Some states have optional or required registries of patients, while others do not. Most states require some lab testing of products. Some states preapprove all products and packaging/labeling while others do not have any preapproval processes in place. A number of medical states require plain packaging of marijuana products. Only a handful of medical states require a universal symbol on products. Most states require some sort of warning label – though warnings vary widely across states. A handful of medical states have broad bans on marijuana related advertising.

Similar to adult use marijuana regulations, medical regulations are constantly changing as states learn more about what regulations are protecting public health and safety, and perhaps – as states attempt to shore up regulatory loopholes in advance of subsequent state policy change, given that medical marijuana approaches often pave the way for the framework that the state adapts for adult use.[55]

HEMP LEGALIZATION IN THE U.S.: A COMPLICATING POLICY FACTOR

In 2018, the Agriculture Improvement Act (the Farm Bill),[126] passed by congress and signed into law, removed hemp[g] from the definition of marijuana in the U.S. Controlled Substances Act, effectively legalizing cannabis products containing no more than 0.3% THC on a dry weight basis. The Act gave state Departments of Agriculture the opportunity to set rules and regulations for hemp cultivation, in accordance with the U.S. Department of Agriculture (USDA). In the event that states opt not to file plans with the USDA for hemp regulation, the USDA plan will be implemented.

Almost immediately, a proliferation of cannabidiol (CBD) products became available in various retail outlets (gas stations, coffee shops, grocery stores, smoke shops, etc.) across the country. Both federal and state rulemaking has taken time, and in the interim, hemp-derived CBD products have been largely unregulated in terms of product claims, safety, contaminants, and advertising. Departments of Agriculture in states remain the primary hemp regulators, and very few state marijuana regulators are engaged in hemp regulation. This has resulted – in most states – in a confusing policy landscape wherein few restrictions exist for hemp products compared with marijuana products – despite the fact that in many cases, it is difficult to tell them apart. Access to hemp products abounds, and the lines between hemp and marijuana are being blurred. This is important in terms of protecting public health and safety. It does not matter how well-regulated marijuana products are if hemp products are regulated with vastly different (and less restrictive) rules for things like testing, packaging and labeling, and advertising.

SUMMARY AND CONCLUSIONS

This report summarizes eight years of policy and public health knowledge since Colorado and Washington became the first states in the U.S. – and the first jurisdictions in the world – to begin to develop and implement policies around a commercial marketplace for marijuana. Since 2012, eight additional U.S. states have legalized the commercial sale of marijuana – most following fairly closely in line with the frameworks laid out by WA and CO, though each making subtle changes along the way, based on scientific, public health, and policy learnings; political pressures; and a bourgeoning industry. U.S. states will continue to advance and evolve marijuana regulatory policy – perhaps even in the face of a future federal legalization. In November of 2020, four additional states – Arizona, Montana, New Jersey, and South Dakota will vote on adult use legalization. A number of other states, including New York, Rhode Island, Connecticut, and Pennsylvania have publicly expressed interest in legalizing legislatively. Two additional countries (Canada and Uruguay) have also legalized marijuana – with Canada taking a federal approach that has differences from the preceding U.S. state legalization frameworks, but is essentially still a commercial approach, and Uruguay taking a very different approach with public health and medical principles driving regulations.

These various regulatory approaches should be carefully studied and compared – taking note of the potential benefits and/or harms to public health and safety from different regulatory frameworks. Ultimately, when one regulatory approach is selected – whether for medical legalization or adult use legalization – it becomes challenging to change course, even in the face of new scientific information that may be gleaned. This may be particularly true when the initial regulatory framework that is selected results in a commercial industry, as has been demonstrated with tobacco.[122] Collecting and triangulating data – both preceding policy change and following policy change can be an effective way to identify unexpected implications from certain policies.[10,123]Data should include population-based data sources, syndromic surveillance, evaluation data, quality control data, and testing data (among other sources).[10,123] Focusing on developing a public

[g] Defined as all parts of the plant Cannabis sativa L. that contain < 0.3% THC concentration on a dry weight basis.

health approach to any pre-existing medical marijuana policies is also an important consideration in advance of adult use policy change,[31] as policy can be hard to roll back once in place – even if only for medical products.

Given that this is such a nascent policy area –learnings exist, but true best practices are not yet clear. It can be helpful to consider policy best practices from other substance use areas – including tobacco, alcohol, and perhaps even opioids. Still, marijuana has important differences from all of these substances,[109] and a "copy and paste" approach is not likely to lead to thoughtful regulation. Policy from other substance use areas should be consulted, studied, and then adapted. Learnings should ideally be shared across countries as different regulatory approaches are undertaken and as science evolves, in order to develop best practices. But for countries that legalize adult use marijuana before best practices exist, regulating with a focus on how best to protect public health and safety – from social justice and social equity concerns, to the protection of vulnerable populations like youth and pregnant women, to the prevention of heavy use and dependence – is warranted.

REFERENCES

1. Substance Abuse and Mental Health Services Administration. Results from the 2018 National Survey on Drug Use and Health: Detailed Tables, Prevalence Estimates, Standard Errors, P Values, and Sample Sizes. Published online 2019. Accessed May 29, 2020. https://www.samhsa.gov/data/report/2018-nsduh-detailed-tables

2. National Academies of Sciences Engineering and Medicine. *The Health Effects of Cannabis and Cannabinoids: Current State of Evidence and Recommendations for Research*.; 2017.

3. Colorado Department of Public Health and Environment. Monitoring Health Concerns Related to Marijuana in Colorado: 2018. Published online 2018. Accessed August 29, 2019.

4. World Health Organization. *The Health and Social Effects of Nonmedical Cannabis Use*.; 2016.

5. Barry RA, Glantz S. A Public Health Framework for Legalized Retail Marijuana Based on the US Experience: Avoiding a New Tobacco Industry. *PLOS Medicine*. 2016;13(9):e1002131. doi:10.1371/journal.pmed.1002131

6. Richter KP, Levy S. Big marijuana--lessons from big tobacco. *N Engl J Med*. 2014;371(5):399-401. doi:10.1056/NEJMp1406074

7. Pacula RL, Kilmer B, Wagenaar AC, Chaloupka FJ, Caulkins JP. Developing public health regulations for marijuana: lessons from alcohol and tobacco. *Am J Public Health*. 2014;104(6):1021-1028. doi:10.2105/AJPH.2013.301766

8. Kilmer B. How will cannabis legalization affect health, safety, and social equity outcomes? It largely depends on the 14 Ps. *American Journal of Drug and Alcohol Abuse*. 2019;45(6):664-672. doi:10.1080/00952990.2019.1611841

9. Caulkins JP, Kilborn ML. Cannabis legalization, regulation, & control: a review of key challenges for local, state, and provincial officials. *American Journal of Drug and Alcohol Abuse*. 2019;45(6):689-697. doi:10.1080/00952990.2019.1611840

10. Carnevale JT, Kagan R, Murphy PJ, Esrick J. A practical framework for regulating for-profit recreational marijuana in US States: Lessons from Colorado and Washington. *International Journal of Drug Policy*. 2017;42:71-85. doi:10.1016/j.drugpo.2017.03.001

11. Caulkins JP, Kilmer B. Considering marijuana legalization carefully: insights for other jurisdictions from analysis for Vermont. *Addiction*. 2016;111(12):2082-2089.

12. Krystal H. The misclassification of medical marijuana. *Journal of the American Academy of Psychiatry and the Law*. 2018;46(4):472-479. doi:10.29158/JAAPL.003790-18

13. Mead A. Legal and regulatory issues governing cannabis and cannabis-derived products in the United States. *Frontiers in Plant Science*. 2019;10. doi:10.3389/fpls.2019.00697

14. Krystal H. The misclassification of medical marijuana. *Journal of the American Academy of Psychiatry and the Law*. 2018;46(4):472-479. doi:10.29158/JAAPL.003790-18

15. Curren B. It's Time to Remove Cannabis from the Federal Drug Schedules. *Forbes*. Published online 2018. Accessed June 19, 2020. https://www.forbes.com/sites/bencurren/2018/12/17/its-time-to-remove-cannabis-from-the-federal-drug-schedules/#51d80a076a93

16. U.S. Department of Justice - Drug Enforcement Administration; *Maintaining Marijuana in Schedule I of the Controlled Substances Act: Background, Data, and Analysis: Eight Fabors Determinative of Control and Findings Pursuant to 21 U.S.C. 812(b)*.; 2016.

17. Caulkins JP, Hawken A, Kilmer B, Kleinman MA. *Marijuana Legalization: What Everyone Needs to Know*. Oxford University Press; 2012.

18. Lee MA. *Smoke Signals: A Social History of Marijuana – Medical, Recreational, and Scientific*. Scribner; 2012.

19. Ogden DW. *Memorandum for Selected United States Attorneys: Investigations and Prosecutions in States Authorizing the Medical Use of Marijuana*.; 2009.

20. Cole JM. *Memorandum for All United States Attorneys: Guidance Regarding Marijuana Enforcement*.; 2013.

21. Putka S. Maine: Adult Use Cannabis Sales Are Finally In Sight. *Cannabis Wire*. https://cannabiswire.com/2020/03/16/maine-adult-use-cannabis-sales-are-finally-in-sight/. Published March 16, 2020. Accessed July 22, 2020.

22. *Article 18, Section 16 of the Colorado State Constitution: Personal Use and Regulation of Marijuana*.; 2012. Accessed July 22, 2020. https://www.fcgov.com/mmj/pdf/amendment64.pdf

23. Ferner M. Amendment 64 Passes: Colorado Legalizes Marijuana for Recreational Use. *Huffpost*. https://www.huffpost.com/entry/amendment-64-passes-in-co_n_2079899. Published 2012. Accessed July 22, 2020.

24. *Washington State - Initiative Measure No. 502*.; 2012. Accessed July 22, 2020. https://sos.wa.gov/_assets/elections/initiatives/i502.pdf

25. Room R. Legalizing a market for cannabis for pleasure: Colorado, Washington, Uruguay and beyond. *Addiction*. 2014;109(3):345-351. doi:10.1111/add.12355

26. Room R. Cannabis legalization and public health: legal nicities, commercialization, and countercultures. *Addiction*. 2014;109:352-359.

27. Lenton S. New regulated markets for recreational cannabis: public health or private profit? *Addiction*. 2014;109:352-357.

28. Reuter P. The difficulty of restricting promotion of legalized marijuana in the United States. *Addiction*. 2014;109:352-357.

29. Kilmer B. Recreational Cannabis — Minimizing the Health Risks from Legalization. *New England Journal of Medicine*. 2017;376(8):705-707. doi:10.1056/NEJMp1614783

30. Hickenlooper GJ. Experimenting with pot: the state of Colorado's legalization of marijuana. *The Milbank quarterly*. 2014;92(2):243-249. doi:10.1111/1468-0009.12056

31. Ghosh TS, Vigil DI, Maffey A, et al. Lessons learned after three years of legalized, recreational marijuana: The Colorado experience. *Preventive Medicine*. 2017;104:4-6. doi:10.1016/j.ypmed.2017.02.021

32. Caulkins JP, Kilmer B, MacCoun RJ, Pacula RL, Reuter P. Design considerations for legalizing cannabis: lessons inspired by analysis of California's Proposition 19. *Addiction*. 2012;107(5):865-871. doi:10.1111/j.1360-0443.2011.03561.x

33. Pacula RL, Powell D, Heaton P, Sevigny EL. Assessing the effects of medical marijuana laws on marijuana use: the devil is in the details. *J Policy Anal Manage*. 2015;34(1):7-31.

34. Caulkins JP, Kilborn ML. Cannabis legalization, regulation, & control: a review of key challenges for local, state, and provincial officials. *The American Journal of Drug and Alcohol Abuse*. 2019;45(6):689-697. doi:10.1080/00952990.2019.1611840

35. Pacula RL, Powell D, Heaton P, Sevigny EL. Assessing the Effects of Medical Marijuana Laws on Marijuana Use: The Devil is in the Details. *Journal of Policy Analysis and Management*. 2015;34(1):7-31. doi:10.1002/pam.21804

36. Budney AJ, Borodovsky JT. The potential impact of cannabis legalization on the development of cannabis use disorders. *Preventive Medicine*. 2017;104:31-36. doi:10.1016/j.ypmed.2017.06.034

37. Schauer GL, Njai R, Grant-Lenzy AM. Modes of marijuana use – smoking, vaping, eating, and dabbing: Results from the 2016 BRFSS in 12 States. *Drug and Alcohol Dependence*. 2020;209:107900. doi:10.1016/j.drugalcdep.2020.107900

38. Barrus DG, Capogrossi KL, Cates SC, et al. *Tasty THC: Promises and Challenges of Cannabis Edibles*.

39. Rosenthal E, Downs D. *Beyond Buds - Marijuana Extracts: Hash, Vaping, Dabbing, Edibles & Medicines*. Quick American Archives; 2014.

40. Goodman S, Leos-Toro C, Hammond D. The impact of plain packaging and health warnings on consumer appeal of cannabis products. *Drug and Alcohol Dependence*. 2019;205:107633. doi:10.1016/j.drugalcdep.2019.107633

41. Morrison C, Gruenewald PJ, Freisthler B, Ponicki WR, Remer LG. The economic geography of medical cannabis dispensaries in California. *International Journal of Drug Policy*. 2014;25(3):508-515. doi:10.1016/j.drugpo.2013.12.009

42. Freisthler B, Gruenewald PJ. Examining the relationship between the physical availability of medical marijuana and marijuana use across fifty California cities. *Drug and Alcohol Dependence*. 2014;143:244-250. doi:10.1016/j.drugalcdep.2014.07.036

43. Canadian Centre on Substance Abuse. *Cannabis Regulation: Lessons Learned in Colorado and Washington State*.; 2015. Accessed May 29, 2020.

44. Moir D, Rickert WS, Levasseur G, et al. A comparison of mainstream and sidestream marijuana and tobacco cigarette smoke produced under two machine smoking conditions. *Chem Res Toxicol*. 2008;21(2):494-502. doi:10.1021/tx700275p

45. Wang X, Derakhshandeh R, Liu J, et al. One Minute of Marijuana Secondhand Smoke Exposure Substantially Impairs Vascular Endothelial Function. *J Am Heart Assoc*. 2016;5(8). doi:10.1161/JAHA.116.003858

46. Peltz J. Social equity a key issues in cannabis legalization movement. *The Associated Press*. https://www.detroitnews.com/story/news/nation/2019/05/19/pot-legalization-social-equity/39494821/. Published 2019. Accessed June 25, 2020.

47. Quinton S. Marijuana Bills Increasingly Focus on Social Justice. *Pew Trusts: Stateline Article*. https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2018/07/19/marijuana-bills-increasingly-focus-on-social-justice. Published 2018. Accessed June 25, 2020.

48. Langan PA. *The Racial Disparity in U.S. Drug Arrests*.; 1995. Accessed March 10, 2016. https://www.bjs.gov/content/pub/pdf/rdusda.pdf

49. Rahamatulla A. The War on Drugs has failed. What's next? Ford Foundation. Published 2017. Accessed May 14, 2019. https://www.fordfoundation.org/ideas/equals-change-blog/posts/the-war-on-drugs-has-failed-what-s-next/

50. Golub A, Johnson BD, Dunlap E. The Race/Ethnicity Disparity in Misdemeanor Marijuana Arrests in New York City. *Criminology & Public Policy*. 2007;6(1):131-164. doi:10.1111/j.1745-9133.2007.00426.x

51. il Public Act 101-0027. *Cannabis Regulation and Tax Act*.; 2019. Accessed July 23, 2020. https://ilga.gov/legislation/publicacts/101/101-0027.htm

52. Hall W, Lynskey M. Evaluating the public health impacts of legalizing recreational cannabis use in the United States. *Addiction*. 2016;111(10):1764-1773. doi:10.1111/add.13428

53. Pacula RL, Lundberg R. Why Changes in Price Matter When Thinking About Marijuana Policy: A Review of the Literature on the Elasticity of Demand. *Public Health Reviews*. 2013;35(2):2. doi:10.1007/BF03391701

54. Hunt P, Pacula RL. Early Impacts of Marijuana Legalization: An Evaluation of Prices in Colorado and Washington. *The Journal of Primary Prevention*. 2017;38(3):221-248. doi:10.1007/s10935-017-0471-x

55. Ghosh T, Dyke M van, Maffey A, Whitley E, Gillim-Ross L, Wolk L. The public health framework of legalized marijuana in Colorado. *American Journal of Public Health*. 2016;106(1):21-27. doi:10.2105/AJPH.2015.302875

56. Dilley JA, Hitchcock L, McGroder N, Greto LA, Richardson SM. Community-level policy responses to state marijuana legalization in Washington State. *International Journal of Drug Policy*. 2017;42:102-108. doi:10.1016/j.drugpo.2017.02.010

57. Lancione S, Wade K, Windle SB, Filion KB, Thombs BD, Eisenberg MJ. Non-medical cannabis in North America: an overview of regulatory approaches. *Public Health*. 2020;178:7-14. doi:10.1016/j.puhe.2019.08.018

58. Smart R, Caulkins JP, Kilmer B, Davenport S, Midgette G. Variation in cannabis potency and prices in a newly legal market: evidence from 30 million cannabis sales in Washington state. *Addiction*. 2017;112(12):2167-2177. doi:10.1111/add.13886

59. Schauer GL, King BA, Bunnell RE, Promoff G, McAfee TA. Toking, Vaping, and Eating for Health or Fun: Marijuana Use Patterns in Adults, U.S., 2014. *American Journal of Preventive Medicine*. 2016;50(1). doi:10.1016/j.amepre.2015.05.027

60. Hancock-Allen JB, Barker L, Vandyke ; Michael, Holmes DB. *Morbidity and Mortality Weekly Report Notes from the Field Death Following Ingestion of an Edible Marijuana Product-Colorado, March 2014*. Vol 64.; 2015.

61. Rittiman B. Denver deaths put focus on marijuana edibles. *USA Today*. https://www.usatoday.com/story/news/nation/2014/04/18/denver-death-marijuana-edibles/7887025/. Published 2014. Accessed June 24, 2020.

62. Colorado Marijuana Enforcement Division. Retail Marijuana Regulations: Regulation 1004 (B) and 1004.5 (B.2). Published online 2015. Accessed June 24, 2020. https://www.colorado.gov/pacific/sites/default/files/Adopted%20Rules%20Regarding%20the%20Retail%20Marijuana%20Code%20%20%28R103%2CR231%2CR234-235%2CR407%2CR604-605%2CR712%2CR1004-1004.5%2CR1006-1006.5%2CR1204%2CR1501-1503%29%2C%20Adopted%2009242014.pdf

63. Washington State Liquor Control Board. Washington State Register 14-10-044 Amendatory Section, filed 4.30.14, effective 5.31.14. Published online 2014. Accessed June 24, 2020. https://lcb.wa.gov/publications/rules/OTS-6471_1Final.pdf

64. Centers for Disease Control and Prevention. Outbreak of Lung Injury Associated with the Use of E-Cigarette or Vaping Products. Published 2020. Accessed August 10, 2020. https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html

65. Blount BC, Karwowski MP, Morel-Espinosa M, et al. Evaluation of Bronchoalveolar Lavage Fluid from Patients in an Outbreak of E-cigarette, or Vaping, Product Use–Associated Lung Injury — 10 States, August–October 2019. *MMWR Morbidity and Mortality Weekly Report*. 2019;68(45):1040-1041. doi:10.15585/mmwr.mm6845e2

66. Cinnamon Bidwell L, YorkWilliams SL, Mueller RL, Bryan AD, Hutchison KE. Exploring cannabis concentrates on the legal market: User profiles, product strength, and health-related outcomes. *Addictive Behaviors Reports*. 2018;8:102-106. doi:10.1016/j.abrep.2018.08.004

67. Sagar KA, Lambros AM, Dahlgren MK, Smith RT, Gruber SA. Made from concentrate? A national web survey assessing dab use in the United States. *Drug and Alcohol Dependence*. 2018;190:133-142. doi:10.1016/j.drugalcdep.2018.05.022

68. Chandra S, Radwan MM, Majumdar CG, Church JC, Freeman TP, ElSohly MA. New trends in cannabis potency in USA and Europe during the last decade (2008–2017). *European Archives of Psychiatry and Clinical Neuroscience*. 2019;269(8):997-997. doi:10.1007/s00406-019-01020-1

69. Colorado Department of Public Health and Environment. *THC Concentration in Colorado Marijuana: Health Effects and Public Health Concerns*.; 2020. Accessed August 17, 2020.

70. Stogner JM, Miller BL. Assessing the Dangers of "Dabbing": Mere Marijuana or Harmful New Trend? *Pediatrics*. 2015;136(1).

71. Chen H, Searles JS. Health considerations in regulating marijuana in Vermont. *Preventive Medicine*. 2017;104:7-9. doi:10.1016/j.ypmed.2017.06.004

72. Sabet K. Lessons learned in several states eight years after states legalized marijuana. *Current Opinion in Psychology*. 2021;38:25-30. doi:10.1016/j.copsyc.2020.07.018

73. NFuzed. THC Infused Metered Dose Inhalers: How Do They Work? Accessed August 24, 2020. https://nfuzed.com/thc-infused-metered-dose-inhalers-how-do-they-work/

74. Rogers K. You can now "snort" weed using this cannabis nasal spray. *Vice News*. Published online 2017. Accessed August 24, 2020. https://www.vice.com/en_us/article/evaxxw/cannabis-nasal-spray-cbd

75. Project CBD. Do Cannabis Suppositories Work? Published online 2019. Accessed August 24, 2020. https://www.projectcbd.org/medicine/do-cannabis-suppositories-work

76. Colorado Marijuana Enforcement Division. Colorado Marijuana Rules 1CCR 212-3. Published online 2019. Accessed April 12, 2020. https://www.sos.state.co.us/CCR/GenerateRulePdf.do?ruleVersionId=8439&fileName=1%20CCR%20212-3

77. Barry RA, Hiilamo H, Glantz SA. Waiting for the opportune moment: the tobacco industry and marijuana legalization. *The Milbank quarterly*. 2014;92(2):207-242. doi:10.1111/1468-0009.12055

78. Schauer GL, Rosenberry ZR, Peters EN. Marijuana and tobacco co-administration in blunts, spliffs, and mulled cigarettes: A systematic literature review. *Addictive Behaviors*. 2017;64:200-211. doi:10.1016/j.addbeh.2016.09.001

79. Downs D. 40% THC Flower?! How Lab Shopping and THC Inflation Cheat Cannabis Consumers. Leafly. Published 2019. Accessed August 17, 2019. https://www.leafly.com/news/strains-products/lab-shopping-thc-inflation-marijuana-2019-leafly-review

80. Lochhead C. Marijuana testing data points to lab shopping in Nevada. *Las Vegas Reivew-Journal*. Published online 2019. Accessed December 27, 2019. https://www.reviewjournal.com/news/pot-news/marijuana-testing-data-points-to-lab-shopping-in-nevada-1910269/

81. State of Alaska: Cannabis Testing Laboratory Compliance Document. Published online 2019. Accessed June 25, 2020. https://www.commerce.alaska.gov/web/Portals/9/pub/MCB/StatutesAndRegulations/CannabisTesting.pdf

82. Beadle A. Toxic Lead Discovered in California Vape Cartridges. *Analytical Cannabis*. Published online 2019. Accessed August 27, 2020. https://www.analyticalcannabis.com/articles/toxic-lead-discovered-in-california-vape-cartridges-311473

83. Bartlett J. Several vaping products contain lead, state tests find. *Boston Business Journal*. Published online 2019. Accessed December 29, 2019. https://www.bizjournals.com/boston/news/2019/12/20/several-vaping-products-contain-lead-state-tests.html

84. Adams D. Marijuana company will destroy $2.6M inventory of year-old vapes. *Boston Globe*. Published online 2020. Accessed August 27, 2020. https://www.bostonglobe.com/2020/08/14/marijuana/marijuana-company-will-destroy-26-million-inventory-year-old-vapes/

85. Kim HS, Monte AA. Colorado Cannabis Legalization and Its Effect on Emergency Care. *Annals of Emergency Medicine*. 2016;68(1):71-75. doi:10.1016/j.annemergmed.2016.01.004

86. Wang GS, le Lait M-C, Deakyne SJ, Bronstein AC, Bajaj L, Roosevelt G. Unintentional Pediatric Exposures to Marijuana in Colorado, 2009-2015. *JAMA Pediatrics*. 2016;170(9):e160971. doi:10.1001/jamapediatrics.2016.0971

87. Washington State Legislature. Title 314 WAC: Liquor and Cannabis Board. Published online 2020. Accessed August 27, 2020. https://apps.leg.wa.gov/wac/default.aspx?cite=314

88. Washington State Liquor and Cannabis Board. Marijuana Dashboard. Published 2020. Accessed August 26, 2020. https://data.lcb.wa.gov/stories/s/WSLCB-Marijuana-Dashboard/hbnp-ia6v/

89. Marijuana Venture. The Most Dispensaries Per Capita in the U.S.? Published 2020. Accessed January 28, 2020. https://www.marijuanaventure.com/the-most-dispensaries-per-capita-in-the-u-s/

90. CO Marijuana Enforcement Program. MED Responsible Vendor Training Program Provider Applicants. Published 2020. Accessed May 26, 2020. https://www.colorado.gov/pacific/enforcement/med-responsible-vendor-training-program-provider-applicants

91. Washington State Department of Health. Medical Marijuana Certified Consultant Requirements. Published 2020. Accessed June 26, 2020. https://www.doh.wa.gov/YouandYourFamily/Marijuana/MedicalMarijuana/ConsultantCertificationProgram

92. Baumbusch J, Sloan Yip I. Exploring New Use of Cannabis among Older Adults. *Clinical Gerontologist*. Published online March 29, 2020:1-7. doi:10.1080/07317115.2020.1746720

93. Peiper NC, Gourdet C, Meinhofer A, Reiman A, Reggente N. Medical Decision-Making Processes and Online Behaviors Among Cannabis Dispensary Staff. *Substance Abuse: Research and Treatment*. 2017;11:117822181772551. doi:10.1177/1178221817725515

94. Pantekoek K, Molitor B. Can Marijuana Dispensaries Use Traditional Banks?. FindLaw. Published 2020. Accessed August 25, 2020. https://public.findlaw.com/cannabis-law/starting-a-cannabis-business/can-marijuana-dispensaries-use-traditional-banks-.html

95. American Bankers Association. *The Public Benefits of Banking Cannabis Businesses*.; 2019. Accessed August 25, 2020. https://www.aba.com/-/media/documents/white-paper/cannabis-white-paper.pdf

96. Mitchell T. Perlmutter Pushes Senate to Consider Mairjuana Banking. Westword. Published 2020. Accessed August 25, 2020. https://www.westword.com/marijuana/house-members-push-senate-to-consider-marijuana-banking-11616331

97. Giewlow Jacobs L. *Regulating Marijuana Advertising and Marketing to Promote Public Health: Navigating the Constitutional Minefield*.; 2017. Accessed August 27, 2020.

98. Sullum J. Does the First Amendment Protect Marijuana Ads? *Forbes*. 2014;Feb. 19. Accessed August 27, 2020. https://www.forbes.com/sites/jacobsullum/2014/02/19/does-the-first-amendment-protect-marijuana-ads/#54ca83f36839

99. McVay R. Marijuana Advertising and the First Amendment. Harris Bricken Legal Issues, Business Basics, and Litigation Branch. Published 2015. Accessed August 27, 2020. https://harrisbricken.com/cannalawblog/marijuana-advertising-and-the-first-amendment/

100. U.S. Federal Trade Commission. *Self-Regulation in the Alcohol Industry: A Report of the Federal Trade Commission*.; 2014. Accessed July 31, 2020. https://www.ftc.gov/system/files/documents/reports/self-regulation-alcohol-industry-report-federal-trade-commission/140320alcoholreport.pdf

101. The Office of the Surgeon General. *U.S. Surgeon General's Advisory: Marijuana Use and the Developing Brain*.; 2019. Accessed January 6, 2020. https://www.hhs.gov/surgeongeneral/reports-and-publications/addiction-and-substance-misuse/advisory-on-marijuana-use-and-developing-brain/index.html

102. Brooks-Russell A, Levinson A, Li Y, Roppolo RH, Bull S. What Do Colorado Adults Know About Legal Use of Recreational Marijuana After a Media Campaign? *Health Promotion Practice*. 2017;18(2):193-200. doi:10.1177/1524839916677210

103. Young B. Seattle OKs $27 fine for smoking pot in public. *Seattle Times*. Published online 2013. Accessed September 20, 2015.

104. Schauer GL, Tynan MA, Marynak K. Self-reported exposure to, perceptions about, and attitudes about public marijuana smoking among US adults, 2018. *Addiction*. 2020;115(7):1320-1329. doi:10.1111/add.14955

105. 3 AAC 306: Regulations for the Alaska Marijuana Control Board . Published online 2020. Accessed August 25, 2020. https://www.commerce.alaska.gov/web/Portals/9/pub/MCB/StatutesAndRegulations/3%20AAC%20306%208.23.20.pdf

106. Michigan Department of Licensing and Regulatory Affairs: Marijuana Regulator Agency. Marihuana Licenses Rules. Published online 2020. Accessed July 26, 2020. https://www.michigan.gov/documents/mra/2019-67_LR_Marihuana_Licenses_694519_7.pdf

107. *CO HB19-1230: Marijuana Hospitality Establishments*.; 2019. Accessed January 26, 2020. https://leg.colorado.gov/bills/hb19-1230

108. Peters EN, Schauer GL, Rosenberry ZR, Pickworth WB. Does marijuana "blunt" smoking contribute to nicotine exposure?: Preliminary product testing of nicotine content in wrappers of cigars commonly used for blunt smoking. *Drug and Alcohol Dependence*. 2016;168:119-122. doi:10.1016/j.drugalcdep.2016.09.007

109. Schauer G. Cannabis and Tobacco: Seven Areas of Overlap that Matter to Public Health. In: Alcohol and Drug Abuse Institute's Cannabis Symposium, University of Washington; 2018. Accessed August 26, 2020. https://adai.uw.edu/mjsymposium/agenda2018.htm

110. U.S. Department of Health and Human Services. *The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General*. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention; 2006.

111. Hartman RL, Brown TL, Milavetz G, et al. Effect of Blood Collection Time on Measured Δ9-Tetrahydrocannabinol Concentrations: Implications for Driving Interpretation and Drug Policy. *Clinical Chemistry*. 2016;62(2):367-377. doi:10.1373/clinchem.2015.248492

112. Desrosiers NA, Himes SK, Scheidweiler KB, Concheiro-Guisan M, Gorelick DA, Huestis MA. Phase I and II Cannabinoid Disposition in Blood and Plasma of Occasional and Frequent Smokers Following Controlled Smoked Cannabis. *Clinical Chemistry*. 2014;60(4):631-643. doi:10.1373/clinchem.2013.216507

113. Jewett A, Peterson AB, Sauber-Schatz EK. Exploring substance use and impaired driving among adults aged 21 years and older in the United States, 2015. *Traffic Injury Prevention*. 2018;19(7):693-700. doi:10.1080/15389588.2018.1479525

114. Weiss SRB, Wargo EM. Commentary: Navigating the complexities of marijuana. *Preventive Medicine*. 2017;104:10-12. doi:10.1016/j.ypmed.2017.06.026

115. Governor's Highway Safety Association. State Laws by Issue: Drug Impaired Driving. Published 2020. Accessed August 2, 2020. https://www.ghsa.org/state-laws/issues/drug%20impaired%20driving

116. PBS Newshour. Police are now taking roadside blood samples to catch impaired drivers. https://www.pbs.org/newshour/nation/police-are-now-taking-roadside-blood-samples-to-catch-impaired-drivers. Published 2019. Accessed November 12, 2019.

117. Adinoff B, Reiman A. Implementing social justice in the transition from illicit to legal cannabis. *American Journal of Drug and Alcohol Abuse*. 2019;45(6):673-688. doi:10.1080/00952990.2019.1674862

118. Firth CL, Maher JE, Dilley JA, Darnell A, Lovrich NP. Did marijuana legalization in Washington State reduce racial disparities in adult marijuana arrests? *Substance Use & Misuse*. 2019;54(9):1582-1587. doi:10.1080/10826084.2019.1593007

119. Washington State Initiative Measure No. 502. Published online 2011. http://sos.wa.gov/_assets/elections/initiatives/i502.pdf

120. Gates PJ, Albertella L. The Cannabis Information Helpline: Assessing Interest in the Medicinal Use of Cannabis in Australia. *Substance Use & Misuse*. 2017;52(12):1634-1638. doi:10.1080/10826084.2017.1298616

121. Gates PJ, Norberg MM, Copeland J, Digiusto E. Randomized controlled trial of a novel cannabis use intervention delivered by telephone. *Addiction*. 2012;107(12):2149-2158. doi:10.1111/j.1360-0443.2012.03953.x

122. U.S. Department of Health and Human Services. *The Health Consequences of Smoking -- 50 Years of Progress. A Report of the Surgeon General*. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2014. http://www.surgeongeneral.gov/library/reports/50-years-of-progress/full-report.pdf

123. Schauer G, Dilley J, Abramovici H, Weiss S, Grant A. Public Health Cannabis Monitoring and Surveillance in an Era of Legalization. In: *North American Cannabis Summit*. 2019.

124. Yates D, Speer J. Over and under-regulation in the Colorado Cannabis industry – A data-analytic perspective. *International Journal of Drug Policy*. 2018;59:63-66. doi:10.1016/j.drugpo.2018.06.001

125. Frank J. Meet America's First Pot Governor, Colorado's Jared Polis. *The Colorado Sun*. https://coloradosun.com/2019/01/07/americas-first-marijuana-governor-colorado-jared-polis/. Published 2019. Accessed August 29, 2020.

126. 115th U.S. Congress. *H.R. 2 - Agriculture Improvement Act of 2018*.; 2018. Accessed December 27, 2018. https://www.congress.gov/bill/115th-congress/house-bill/2

Appendix A: Links to current rules and regulations in each adult use state

Alaska	Link to statutes (AS 17.38): https://www.commerce.alaska.gov/web/Portals/9/pub/MCB/StatutesAndRegulations/AS17.38.pdf Link to regulations (3ACC 306): https://www.commerce.alaska.gov/web/Portals/9/pub/MCB/StatutesAndRegulations/3%20AAC%20306%208.23.20.pdf Link to cannabis testing compliance rules: https://www.commerce.alaska.gov/web/Portals/9/pub/MCB/StatutesAndRegulations/CannabisTesting.pdf Link to upcoming rule changes/rules open for comment: https://www.commerce.alaska.gov/web/amco/MarijuanaRegulations.aspx
California	Link to California Code of Regulations, Title 16: Division 42: Bureau of Cannabis Regulation: https://cannabis.ca.gov/wp-content/uploads/sites/13/2019/01/Order-of-Adoption-Clean-Version-of-Text.pdf Link to California Code of Regulations, Title 17, Division 1: Manufactured Cannabis Safety: https://www.cdph.ca.gov/Programs/CEH/DFDCS/MCSB/CDPH%20Document%20Library/DPH17010_FinalClean.pdf Link to California Code of Regulations Title 3: Food and Agriculture. Division 8: Cannabis Cultivation: https://static.cdfa.ca.gov/MCCP/document/CDFA%20Final%20Regulation%20Text_01162019_Clean.pdf Link to upcoming rule changes/rules open for comment: https://cannabis.ca.gov/cannabis-regulations/
Colorado	Link to Code of Colorado Regulations (CCR) 212-3: Marijuana Enforcement Division -Colorado Marijuana Rules: https://www.sos.state.co.us/CCR/GenerateRulePdf.do?ruleVersionId=8439&fileName=1%20CCR%20212-3 Link to Emergency Rules: https://www.colorado.gov/pacific/enforcement/med-rules
Illinois	Link to Cannabis Regulation and Tax Act (410 ILCS 705): https://www.ilga.gov/legislation/ilcs/ilcs5.asp?ActID=3992&ChapterID=35 Link to Emergency Rules: https://www.idfpr.com/forms/auc/68%20IAC%201291%20Adult%20Use%20Cannabis%20Emergency%20Rules.pdf General link to cannabis laws and rules: https://www.idfpr.com/profs/adultusecan.asp
Massachusetts	Link to Statutes M.G.L. c. 94G, Regulation of the Use and Distribution of Marijuana Not Medically Prescribed: https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXV/Chapter94G Link to Regulations 935 CMR 500.000: Adult Use of Marijuana: https://mass-cannabis-control.com/wp-content/uploads/2019/11/Fall_2019_Adult_Regs_500.pdf Link to all state cannabis laws: https://mass-cannabis-control.com/the-laws/
Maine	Link to Statutes: Title 28-B: Adult Use Marijuana: https://www.maine.gov/dafs/omp/adult-use/rules-statutes/title-28-b Link to Regulations: 18-691 C.M.R. – Adult Use Marijuana Program https://www.maine.gov/dafs/omp/adult-use/rules-statutes/18-691-C.M.R.-ch.-1 Link to all state adult use cannabis laws: https://www.maine.gov/dafs/omp/adult-use/rules-statutes' Link to rulemaking activity (past and present): https://www.maine.gov/dafs/omp/adult-use/rules-statutes/rulemaking
Michigan	Link to all state cannabis laws, statutes, rules, and regulations: https://www.michigan.gov/mra/0,9306,7-386-82631---,00.html

Nevada	Link to Chapter 453D – Regulation and Taxation of Marijuana: https://www.leg.state.nv.us/Nac/NAC-453D.html Link to Title 56, Nevada Revised Statutes, Chapter 678A – Administration of Laws in Relation to Cannabis: https://www.leg.state.nv.us/NRS/NRS-678A.html Link to Title 56, Nevada Revised Statutes, Chapter 678B – Licensing and Control of Cannabis: https://www.leg.state.nv.us/NRS/NRS-678B.html Link to Title 56, Nevada Revised Statutes, Link to Chapter 678D – Adult Use of Marijuana: https://www.leg.state.nv.us/NRS/NRS-678D.html Link to Nevada Cannabis Compliance Regulations – NCCR 1-14: https://3aenxi2dowkx1fsfejubgrx1-wpengine.netdna-ssl.com/wp-content/uploads/2020/08/Final-Effective-NCCR.pdf
Oregon	Link to Oregon Revised Statutes, Chapter 475B – Cannabis Regulation: https://www.oregonlegislature.gov/bills_laws/ors/ors475B.html Link to Oregon Administrative Rules – Chapter 845, Division 25 - Recreational Marijuana: https://secure.sos.state.or.us/oard/displayDivisionRules.action?selectedDivision=3873
Washington	Link to Washington Administrative Code (WAC) – Title 314: Liquor and Cannabis Board Rules: https://apps.leg.wa.gov/wac/default.aspx?cite=314 Link to WAC 314-55: Marijuana licenses, application process, requirements, and reporting: https://apps.leg.wa.gov/wac/default.aspx?cite=314-55