2017 NATIONAL CANNABIS SUMMIT

SCIENCE, POLICY AND BEST PRACTICES

SUMMARY OF PROCEEDINGS

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Executive Summary

Since 1996, 29 states and the District of Columbia have legalized the medical use of cannabis, and eight states plus the District of Columbia have legalized use for nonmedical purposes. Rates of cannabis use are increasing, and Americans are using more potent cannabis in a greater variety of ways (e.g., edibles, concentrates) than a generation ago. The combination of these trends may have significant impacts on public health, safety, and wellbeing. Yet given how quickly cannabis laws, use patterns, and products have evolved, it has been challenging for researchers, policymakers, and regulators to develop scientifically sound responses.

To facilitate advances in the science of cannabis and its regulation, Advocates for Human Potential, Inc., the Addiction Technology Transfer Center Network, and the National Council for Behavioral Health convened the National Cannabis Summit: Science, Policy, and Best Practices, a three-day meeting that took place in Denver, Colorado, in August 2017. The Summit had 473 participants and featured 57 presentations that focused on emerging research and epidemiological data, law and policy, prevention, public health and safety, and the science of cannabis. This summary report provides an overview of central takeaway points and lessons learned during the Summit.

The report is divided into three sections. The first section addresses the state of the science concerning cannabis's impact on health, wellbeing, and safety, and the second focuses on issues related to cannabis policy, regulation, and strategies to promote public health as cannabis laws evolve. The third section concludes the report with a summary of points that emerged from Summit presentations and discussions concerning steps that researchers and policymakers can take to advance cannabis science and policy in the age of legalization.

Key Summit findings concerning cannabis's impact on health, wellbeing, and safety were that:

- Cannabis can have adverse acute effects and serious impacts on the health of long-term users. Adolescents and pregnant women, in particular, are at increased risk of serious problems related to cannabis use.
- Driving while under the influence of cannabis threatens public health and safety, but existing measurement techniques and data systems do not adequately capture the extent of drugged driving and its consequences.
- The treatment of cannabis use disorder (CUD) is difficult, and current evidence-based treatments for it are behaviorally focused. A significant proportion of individuals who experience difficulties with cannabis use are able to achieve natural recovery without specialty care.
- Cannabis has significant therapeutic potential, with the strongest evidence for its use to manage nausea associated with cancer chemotherapy, AIDS-associated wasting syndrome, glaucoma, and spasticity and pain associated with multiple sclerosis. Promising evidence also points to cannabis as a less harmful alternative to opioid analgesics for many patients.

Key Summit findings concerning cannabis policy and regulation were that:

- A broad range of policy and regulatory options for cannabis have not yet been tried in the United States.
- Major considerations for cannabis policy and regulation concern cannabis products, production and manufacture, sales, distribution, promotion, use, taxation and revenues, public health and safety, enforcement, and whether there are differences in how medical and nonmedical cannabis are regulated.
- Edible products present a high risk of harm, and products specifically designed to appeal to youth should be highly regulated or banned.
- Close monitoring and regulation of cannabis manufacturing are needed because many manufacturers lack safety knowledge and there are significant gaps in regulatory infrastructure concerning cannabis.
- Regulations concerning sales, distribution, and promotion can potentially help limit cannabis-related harms.
- It remains unclear what taxation strategies for cannabis are optimal for generating revenue while protecting public health and safety.
- Policies and practices developed from efforts to limit youth use of other substances (e.g., tobacco, alcohol) can be adapted to inform cannabis prevention efforts.
- Many state and local governments lack the expertise and resources needed to enforce cannabis regulations in their jurisdictions.
- To align public health and public policy, it may be beneficial to bring a public health voice to cannabis policymaking, to implement legalization gradually, and to make it possible to reverse reforms if necessary.

Key Summit findings concerning directions for future research were that additional research is needed on:

- The impact of alternative and more potent forms of cannabis
- The impact of cannabis when used with other substances
- Treatment for and recovery from CUD
- Prevention of use
- Measuring cannabis-related impairment
- The medical benefits of cannabis and cannabinoids
- Determining which cannabis policy approaches lead to optimal population-level health and safety outcomes

Key Summit findings concerning future policy directions included the importance of:

- Implementing policies that facilitate cannabis research
- Facilitating comprehensive data collection as early as possible
- Creating standards and guidance to inform state and local policy
- Exploring alternative economic models to structure the cannabis industry
- Identifying regulatory models that promote public health and safety

Introduction

The United States is undergoing a historic sea change regarding cannabis. Since California began permitting medical use of cannabis in 1996, 28 other states plus the District of Columbia have legalized medical use, and eight states plus the District of Columbia have legalized use for nonmedical purposes. Approximately 63% of Americans currently live in states or territories that permit medical cannabis, and more than 21% live in parts of the country that have legalized recreational use. The number of U.S. residents who report past-month cannabis use increased 52% from 2002 to 2015, and a large share of these individuals consume the drug frequently; in 2015, more than 40% of past-month cannabis users reported having used the drug on more than 20 of the previous 30 days.[6, 9, 19, 21, 38]

The cannabis Americans are using is also becoming more potent, and the ways that the drug is consumed have become more diverse. Historically, the levels of Delta-9 Tetrahydrocannabinol (THC, the main psychoactive chemical in cannabis) have been approximately 2% to 4%, but the THC levels in most cannabis today are approximately 16% to 20%. Furthermore, new forms of cannabis—such as edibles and concentrates—have made it possible to consume cannabis with THC levels as high as 80% to 90%.[2, 20, 21, 25, 36, 38]

The combination of these trends may significantly impact public health, safety, and wellbeing. Yet given how quickly cannabis laws, use patterns, and products have evolved, it has been challenging for researchers, policymakers, and regulators to develop scientifically sound responses. The knowledge base, data infrastructure, and regulatory capacity needed to evaluate the impact of the shifting cannabis environment is still insufficient, and many critical questions about how to best adapt to the new cannabis environment are still unanswered.[6, 7] However, stakeholders across the nation—particularly those who live in states and municipalities that have legalized nonmedical use—are rapidly learning valuable lessons about cannabis, the impact that policy changes may have on individuals and communities, and strategies to safeguard public health in the age of cannabis legalization.

To facilitate advances in the science of cannabis and its regulation, Advocates for Human Potential, the Addiction Technology Transfer Center Network, and the National Council for Behavioral Health convened the National Cannabis Summit: Science, Policy, and Best Practices, a three-day meeting that took place in Denver, Colorado, in August 2017. The Summit brought together leaders from public health, research, regulatory agencies, law enforcement, and community-based organizations from 43 states to discuss findings from the most recent research on cannabis and share their recent experiences working to promote safety and health as cannabis laws change. The Summit had 473 participants, and featured 57 presentations, including keynotes, workshops, interactive lunch and learn discussions, and poster sessions. These presentations focused on emerging research and epidemiological data, law and policy, prevention of use, public health and safety, and the science of cannabis.

The purpose of this summary report is to provide an overview of central takeaway points and lessons learned during the Summit. The report highlights scientific developments, clinical interventions, policy approaches, and regulations that can promote public health, wellbeing, and safety as cannabis laws evolve. It also points to directions for research and policy development that Summit presentations and discussions highlighted as potential ways to inform science and policy related to cannabis in the future. Throughout the text, references indicate which presentations and/or discussions were the sources of the information and perspectives presented, and a list of referenced presentations is provided at the end of the report.

The report is divided into three sections. The first section addresses the state of the science concerning cannabis's impact on health, wellbeing, and safety, and the second focuses on issues related to cannabis policy, regulation, and potential strategies to promote public health in the era of cannabis legalization. The third section concludes the report with a summary of points that emerged from Summit presentations and discussions concerning steps that researchers and policymakers can take to advance cannabis science and policy in the age of legalization.

Cannabis's Impact on Health, Wellbeing, and Safety

Cannabis contains more than 540 chemical compounds, more than 100 of which are cannabinoids. Cannabinoids trigger activity in parts of the brain that control memory and cognition, movement coordination, pain regulation, immunological function, appetite, and motivation; they also impact other receptors located throughout the body. Cannabis's most powerful effects are associated with two compounds—Delta-9 Tetrahydrocannabinol (THC) and cannabidiol (CBD). THC is the chemical that produces the "high" associated with cannabis, generating sensations of euphoria, calmness, enhanced mood, relaxation, intoxication, analgesia, and increased appetite. CBD is not psychoactive, but it has shown significant promise for use in medical care. The action of these two chemicals—as well as many other compounds—give cannabis significant potential to cause harm but also allow it to be an effective tool in the treatment of certain medical conditions. Most research on cannabis and its effects has focused on smoked cannabis with relatively low concentrations of THC. There are still significant gaps in knowledge about the potential harms and benefits associated with the more potent cannabis and different forms of the drug (e.g., edibles, concentrates).[16, 21, 38, 40]

Cannabis-Related Harm

Cannabis can have adverse acute effects and serious impacts on the health of long-term users. Acute THC intoxication can have negative impacts on mental health, including impairments in cognition, memory, and decision-making, and it can trigger anxiety, paranoia, and hallucinations. In addition, THC intoxication is associated with increased heart rate and orthostatic hypotension. Long-term use of cannabis is associated with many physical and psychiatric problems, though further research is needed to establish whether persistent cannabis use is the cause or effect of many observed negative outcomes. Problems related to sleep, diet, and lung functioning are commonly associated with long-term cannabis use, and increased apathy, difficulty concentrating, cognitive problems, and anxiety are common mental health symptoms associated with prolonged and regular use. Upon cessation of use, most individuals regain full cognitive functioning. However, evidence suggests that it may be difficult for a significant proportion of individuals who use cannabis to limit their use; more than 40% of cannabis users report using the drug daily or almost daily, and approximately 9% of adults who use the drug have CUD.[2, 16, 21, 30, 34, 36, 38, 40]

Certain populations are at increased risk of serious health, psychiatric, and social problems if they use cannabis. In particular, cannabis can be harmful to adolescents and young adults because of its impact on their still-developing brains. Adolescence is a critical time for brain development, and cannabis interferes with processes that are essential for the development and maintenance of brain health. Consequently, individuals who use cannabis during adolescence or young adulthood are at increased risk of cognitive–emotional impairments and psychosis. Longitudinal studies indicate that neurocognitive impairments associated with cannabis use during adolescence can persist into adulthood, even after users abstain for long periods of time. Adolescent cannabis exposure also has negative impacts on learning, memory,

educational outcomes, career achievement, and life satisfaction, and more than one-quarter of adolescents who use cannabis develop CUD.[2, 16, 21, 38]

Pregnant women and their fetuses are also at risk of developing serious problems from cannabis use. Cannabis use is associated with increased risk of labor complications, preterm delivery, and low birthweight, and children who are exposed to cannabis in utero may suffer from impairments in learning, memory, and school performance later in life. Emerging research also shows that among older adults who use cannabis, a significant proportion report daily or near-daily use, putting their health and wellbeing at risk.[10, 16, 23, 38]

Driving while under the influence of cannabis also threatens public health and safety. Cannabis adversely affects tracking skills and reaction times, and its use is associated with increased risk of motor vehicle accidents and moving violations. Data from states that have legalized the nonmedical use of cannabis indicate an increase in the proportion of accidents involving drivers who used cannabis. However, there is no consensus in the scientific community on what constitutes cannabis impairment or intoxication that is comparable to the measures of blood alcohol content that are used by law enforcement and prosecutors in drunk driving cases. Furthermore, existing data systems do not adequately capture the extent of drugged driving and its consequences. Researchers are in the process of developing a national dataset to capture drugged driving data and assessments that use biometrics to more accurately measure the impact that cannabis use has on driving.[13, 24]

Treatment of Cannabis Use Disorder (CUD) and Recovery

Treatment of CUD remains a challenge, though research has demonstrated that behavioral interventions such as motivational enhancement therapy, cognitive behavioral therapy, and contingency management are effective in decreasing the frequency of cannabis use and negative consequences associated with use. Currently, no medications have been approved for the treatment of CUD, though some pharmaceuticals have shown promise in research trials. For individuals who do not have CUD but may be amenable to changing their cannabis use behaviors, brief interventions that utilize motivational interviewing techniques can be effective.[16, 33, 36]

A significant proportion of individuals who face difficulties related to cannabis use achieve natural recovery, resolving their disorders without specialty care. More than half of people who have had problems related to cannabis use in the past report that they resolved their issues without formal treatment services. These individuals change their cannabis use behaviors because of the social pressure, health concerns, or negative impact that cannabis has on their lives. Having activities to turn to that are not related to cannabis, avoiding people or situations that are likely to trigger cannabis use, and support from friends and family are factors that are helpful in facilitating natural recovery for these individuals. Rates of natural recovery are higher among cannabis users than individuals who have disorders related to alcohol or other drugs, but this may change as the use of more potent cannabis becomes more widespread.[22]

Cannabis's Therapeutic Potential

In addition to being pleasant for individuals who use recreationally, cannabis also has significant therapeutic potential. Currently, there is strong evidence for the use of cannabis and cannabinoids in the treatment of nausea associated with cancer chemotherapy, AIDS-associated wasting syndrome, spasticity and pain associated with multiple sclerosis, and intraocular pressure associated with glaucoma. Modest evidence supports the use of cannabis as an anticonvulsant and anti-inflammatory and potentially in the treatment of certain types of tumors. Some research has also supported the use of cannabinoids for the

treatment of chronic neuropathic non-cancer pain, but these studies have been short-term and only demonstrated modest effects. Notably, in states that have made cannabis available for medical use, there have been decreases in patient-reported use of opioid medications, opioid prescriptions, opioid use disorder treatment admissions, and opioid-related deaths. These findings indicate that cannabis may be an effective and potentially less harmful alternative to opioid analgesics for many patients, but further research is needed to draw definitive conclusions on this point.[2, 4, 21, 34–36, 38]

Cannabis Policy and Regulation

Under the federal Controlled Substances Act, cannabis is a Schedule I substance, meaning that it is illegal to manufacture, sell, distribute, or possess, and the federal government does not recognize it as having any legitimate medical use. The outright ban on cannabis at the federal level (with minor exceptions for research) has created a void in knowledge about cannabis policy and effective regulation. Thus, states and municipalities that have legalized cannabis are serving as policy and regulatory laboratories, with authorities creating and testing the impact of their own homegrown approaches to cannabis policymaking. Under legalization, jurisdictions have established policies regarding cannabis products (production, potency, purity), their distribution, their promotion, their use, taxation, and enforcement of regulations. However, the range of options used to legislate medical and recreational cannabis use at the state and local levels has been relatively narrow, and heretofore untested policy approaches to cannabis legalization may be beneficial. Nonetheless, stakeholders and policymakers in several parts of the nation—particularly those that have legalized recreational use—have developed promising strategies to limit potential harms and promote public health as cannabis's legal status has evolved.[7, 19, 27, 38]

The Range of Policy and Regulatory Options

Voters and legislatures across the nation have been swayed by a variety of arguments to legalize cannabis. The failure of prohibition to eliminate widespread use, high rates of incarceration associated with drug-related offenses, the need to improve access to medicinal cannabis, and the allure of tax revenue associated with legalization have spurred cannabis policy reform efforts across the country.[21, 29]

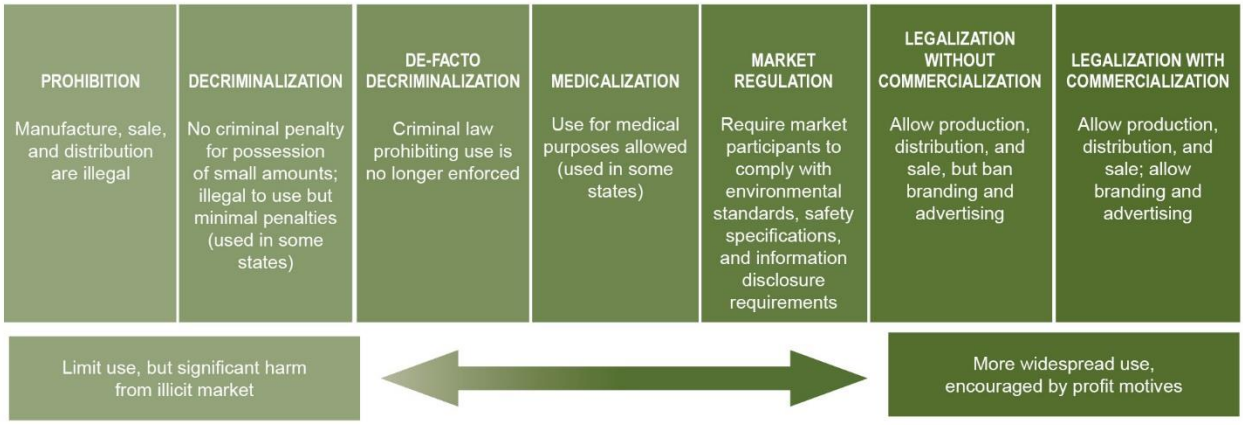
Often, advocates of reform have argued that by regulating cannabis "just like alcohol," legalization can minimize the health and social harms associated with the drug. Such arguments, though intuitively appealing, fail to account for the tremendous toll that alcohol, as currently regulated, takes on society. Alcohol accounts for more cases of substances use disorders than all other psychoactive substances combined. Currently, alcohol is the third leading cause of preventable death in the United States, and its use is involved in approximately three million arrests each year. Overall, federal, state, and local tax revenues from alcohol sales total $15 billion each year, whereas the economic burden associated with alcohol use is $250 billion. Thus, although cannabis legalization may be beneficial in some respects, there is reason to be cautious about upholding alcohol control as a model of success.[21]

The experience from alcohol and tobacco has highlighted that when not closely regulated, producers and sellers of psychoactive substances may prioritize profits over public health. Approximately 80% of the cannabis consumed in the United States is used by daily or near-daily users. Consequently, to increase sales, cannabis businesses have strong market incentive to encourage regular use. If not closely regulated, the cannabis industry may pursue its economic interests by undertaking aggressive marketing campaigns, lobbying to loosen regulations, and trying to obfuscate evidence that their products can cause harm, much like the alcohol and tobacco industries have done in the past.[7, 21, 27, 30, 36]

To avoid the pitfalls of widespread and unfettered commercialization, policymakers may consider a wide range of retail and regulatory models and approaches to manage cannabis distribution, use, and availability. Historically, the United States has only used two relatively extreme approaches to controlling psychoactive substances—absolute prohibition and full legalization with few restrictions. Each of these approaches has its drawbacks. Outright prohibition can lead to significant health and social problems because of the issues associated with the black market it engenders, as has been demonstrated by the United States' experience with cannabis, cocaine, heroin, and methamphetamines. Conversely, legalization with few restrictions creates space for industry to encourage use to increase profits, also at great costs to public health and safety. A range of policy options between these two extremes exists, but few have been tried in the United States (see Figure 1). Middle-ground policies such as decriminalization, market regulation, and medicalization may be able to enhance public health while limiting the health and social problems associated with cannabis.[7, 9, 20, 21]

FIGURE 1

Range of Cannabis Policy Options (adapted from [21])



The relative merits and drawbacks of different approaches are largely subjective because different stakeholders have divergent goals for cannabis policy. Crime reduction, social stability, safe access for medical use, economic growth, and enhanced tax revenues are all commonly cited reasons for cannabis policy reform, whereas concerns about cannabis's potential impact on public health and safety need to be considered as potential downsides to legalization. The question of which policy options are optimal largely depends on which benefits stakeholders and policymakers choose to prioritize and how they weigh them against the potential health and safety costs of legalization. Policymakers have a wide array of policy and regulatory issues to consider as they devise strategies to optimize the benefits of cannabis legalization while minimizing its harms (see Table 1).[12, 20, 21, 28, 34]

State Policies and Lessons Learned

In states where legalization has been approved by ballot initiatives, legislation has been highly influenced by the interests of cannabis industry advocates, who have pushed for policies and regulations that are less stringent. In states where legalization has occurred through legislative processes, policy formation has been less influenced by industry and slowed by deliberate and more conservative approaches that prioritize public safety, restricted access, and more gradual implementation.[19, 28]

TABLE 1

Considerations for Cannabis Policy and Regulation [12, 20, 21, 28, 34]

CANNABIS PRODUCTS: What types of products will be made available (cannabis flower, edibles, concentrates)? What limits will there be on potency? What controls will there be on pesticides and fungicides?
PRODUCTION AND MANUFACTURE: Who can produce and manufacture cannabis and cannabis products? Are home grows allowed?
SALES, DISTRIBUTION, AND PROMOTION: Who can sell/distribute cannabis? What regulations are in place for retail distributors? What regulations are in place for delivery services? How is the product tracked? What are the labeling and packaging requirements for different cannabis products? What limits will there be on publicity and advertising?
USE: Who is allowed to use? Are there time/place/manner restrictions on use?
TAXATION AND REVENUE: How will cannabis be taxed? How will taxes be calculated (by weight, by potency, etc.)? How will public revenues from cannabis taxation be spent?
PUBLIC HEALTH AND SAFETY: What steps will be taken to safeguard public health? How will use by vulnerable populations (youth, pregnant women) be monitored and regulated? How will driving under the influence of cannabis be defined and measured?
ENFORCEMENT: Who will enforce various aspects of cannabis regulation? What will the penalties be for violations?
MEDICAL VS. NONMEDICAL: Will there be differences in how medical and nonmedical cannabis are regulated and controlled? What will these differences be?

To date, there is insufficient evidence to determine which policies or regulations are best suited to promote public health, wellbeing, and safety as cannabis laws are reformed.[20, 29, 38] However, at the Summit, policymakers and stakeholders shared their perspectives on promising practices and early lessons learned about cannabis regulation, as well as ways to design it to promote public health, which are described below:

Cannabis Products

- Edible products present a high risk of overdose and harm, particularly for youth. Consequently, there may be public health benefits to regulating these products more strictly than other forms of cannabis. Such regulations may include requirements for child-safe packaging, clear labeling, individual wrapping for each serving, as well as bans on edible products that are designed to appeal to children.[1, 20, 21, 30, 34]
- Limiting THC concentrations or allowing only low-THC/high-CBD products can potentially limit the negative health and safety impacts of legalization.[19, 20, 30, 34]

Production and Manufacture

- Some manufacturers prioritize profits over product safety when producing cannabis and cannabis-related products, so close monitoring and regulation are needed.[9]
- Manufacturers may lack safety knowledge, and there are significant gaps in the regulatory infrastructure needed to fully monitor the integrity and safety of cannabis products. In large part, this is because of cannabis's continued status as a Schedule I drug under the federal Controlled Substances Act. Because it remains on Schedule I, the growth, manufacture, and sale of cannabis are illegal according to the federal government, so the Environmental Protection Agency and the Food and Drug Administration have not developed policies, procedures, or guidance on how to

ensure the safety and integrity of cannabis products. Due to the lack of nationally recognized standards, it has been challenging for manufacturers, policymakers, and regulators to determine the best practices and ideal standards for cannabis growth and manufacturing. To address this issue, ASTM International has formed a committee on cannabis to develop standards for cannabis testing, cultivation, and quality assurance. Further information about the ASTM standards is available at https://www.astm.org/COMMITTEE/D37.htm.[3, 25]

Sales, Distribution, and Promotion

- Regulations on cannabis retail businesses can potentially help limit cannabis use. Promising regulatory steps include limitations on the quantity of cannabis storefronts and preventing them from clustering in neighborhoods; restrictions requiring cannabis outlets to be in low visibility areas far from places that youth frequent; limiting cannabis outlets' hours of operation; requiring cannabis outlets to be free-standing establishments (e.g., not located in malls or restaurants); not licensing cannabis distribution in places that sell other foods, pharmaceuticals, alcohol, or tobacco; requiring prominent in-store warnings concerning the health and legal risks associated with cannabis; and banning self-serve cannabis shops.[9, 27, 30]
- Limiting signage and advertising can potentially help limit use, particularly among youth. Possible regulations in this area could include limiting advertising to media that only target adults and not allowing advertising that reaches minors; prohibiting sponsorship of sporting events or concerts; banning certain types of promotion—such as advertisements that utilize animals or cartoon figures—that appeal to youth; and circumscribing the health claims that cannabis advertisers can make about their products. However, such limitations may face challenges from the cannabis industry as violations of its right to free speech, and it is currently unclear how restrictive limits of advertising and signage regulations can be.[1, 17, 27, 30]
- Ensuring that there are minimum costs for cannabis can help limit access and use among youth. Potential strategies to ensure that cannabis is not too accessible include limitations on discount promotions and cannabis happy hours.[20, 27]
- As a Schedule I substance that the federal government considers completely illegal, cannabis lacks federal standards for labeling and packaging requirements. However, the Council on Responsible Cannabis Regulation (CRCR) has brought together a group of public health experts, legal professionals, cannabis regulators, and cannabis industry representatives to develop guidelines on how to ensure that cannabis packaging and labeling protect public health and safety. This process led to the development of 20 recommendations concerning product organization, the presentation of cannabis facts on packaging, cannabinoid labeling, universal symbols concerning a target population, and a product activation timeline (how long it takes to feel the effects of a product). The full list of recommendations is included the CRCR's report, *Cannabis Packaging and Labeling: Regulatory Recommendations for States and Nations*, which is available at http://www.crcr.org/resources.[39]

Use

- Allowing onsite consumption of cannabis in retail outlets may accelerate the normalization of cannabis use and violate employee protections concerning smoking in workplace environments. However, it remains unknown if prohibiting onsite consumption would lead to other unanticipated problems, such as increases in driving while under the influence of cannabis.[18, 20]
- The impact of secondhand cannabis smoke on non-cannabis users warrants consideration, and regulations similar to those covering tobacco use in public places and shared living spaces may be appropriate for cannabis.[18, 20]

Taxation and Revenues

- In some states, cannabis legalization has been economically beneficial because it has stimulated the creation of jobs in the cannabis industry and helped facilitate increases in tourism.[12]
- It remains unclear whether taxing cannabis by price, by weight, or by potency is the best way to generate public revenue from cannabis while also protecting public health and safety. Other forms of taxation—such as taxation on advertising—also have potential to help raise revenues from cannabis legalization.[28]
- Funds from cannabis revenues originally slated for public health, substance use prevention, and treatment have often been diverted from these purposes. Advocacy is needed to ensure that revenues designated for public health and safety are not siphoned off to fund other public services or budgets.[17, 19, 34]

Public Health and Safety

- Across the country, even in jurisdictions that have legalized nonmedical use, many public health agencies lack the funding, expertise, and resources needed to conduct vital research and public health promotion activities concerning cannabis.[34]
- Policies and practices developed from efforts to limit youth use of other legal substances (e.g., alcohol, tobacco) can be adapted to inform cannabis prevention efforts. These practices include policies designed to (1) limit the availability/accessibility of substances, (2) prohibit and prevent sales to minors, (3) educate the public and address community perceptions about substance use, and (4) collect and monitor prevention program performance data to inform quality improvement and program development activities.[9, 27, 30]
- Enhancing the public's understanding of the potential harms associated with cannabis may help encourage safe cannabis use and lead to reductions in use. However, it is critical to ensure that prevention messages are well tailored for specific populations. When developing prevention curricula, promising practices include the engagement of diverse stakeholders, segmentation of audiences into different target populations, listening to population perspectives on prevention messaging, testing messages on target audiences, and using data/feedback to continuously adapt prevention messaging to optimize its effectiveness.[2, 6, 11, 15, 27, 30, 32]
- Potentially effective strategies for educating youth about cannabis-related risk and reducing use include the use of messaging that incorporates youth culture, the development of youth refusal skills, enhancing youth motivation and capacity to resist social pressures, and providing fact-based education. The most promising prevention programs for youth incorporate several of these approaches and strategies.[6, 11, 15, 32]

- Emerging best practices in public education, prevention, and early intervention campaigns include focusing on providing fact-based health and legal information, having a balanced tone, employing humor when appropriate, and utilizing several types of media (television/radio, print media, social media). It is particularly important for campaigns to be fact-based and unbiased, since many people have become skeptical of anti-drug campaigns and messaging from the past.[6, 11, 15, 32, 34]
- Due to challenges measuring impairment from cannabis while driving, arrests and convictions do not reflect the true prevalence of drugged driving. Consequently, it remains difficult to evaluate the impact of measures and policies designed to limit driving under the influence of cannabis.[9, 13]
- Individuals involved in the sale of cannabis—dispensary staff or "budtenders"—can potentially be strong allies in efforts to ensure safe cannabis consumption. Cannabis salespeople can help promote public health by refusing to sell to minors, educating consumers about the risks of use, having conversations with customers to see if their cannabis use is problematic, refusing service to customers who are intoxicated, and educating consumers who use cannabis medically about how to consume the drug as safely and effectively as possible.[1, 4, 31]

Enforcement

- Many state and local governments lack the expertise and resources needed to enforce cannabis regulations in their jurisdictions. Education for both law enforcement and the general public about new cannabis regulations will be essential to ensuring effective enforcement.[27, 29, 34]
- State and local enforcement challenges have been exacerbated by the fact that cannabis legalization has occurred rapidly with little time for planning or capacity building.[29, 34]
- Since there are no national models or federal guidance on enforcing cannabis regulations other than prohibition, states and municipalities need to rely on lessons learned in other states and communities when creating their cannabis control regimes.[30]

Aligning Public Health and Public Policy

Cannabis legalization has been a rapid and tumultuous process in many states, and it has been difficult to ensure that public health considerations are policymaking priorities. Summit participants reported that public health was often a minority voice in initial state and local decisions concerning cannabis since industry advocates tended to be more numerous and vocal in policy planning and implementation processes. Furthermore, many policymakers charged with crafting public health responses to cannabis legalization have had relatively little experience with cannabis, making it difficult for them to effectively respond to pressure for minimal regulation coming from the cannabis industry.[27, 29] In presentations and discussions at the Summit, two main themes emerged in discussions of how to ensure that public health is adequately safeguarded as cannabis is legalized: (1) bringing a public health voice to cannabis policymaking after legalization and (2) making gradual, reversible reforms.

- ***Bringing a public health voice to cannabis policymaking after legalization*:** Historically, advocates of public health—particularly those concerned with the potential harms associated with increased cannabis use—have either opposed legalization or advocated for legalizing only medical use. However, as has been illustrated in ballot initiatives and legislatures across the country, the public supports legalization, and legalization will likely continue to proceed in states and municipalities nationwide. Continued steadfast opposition to legalization is inadvisable, as it may be an unwinnable battle. Instead, public health advocates and stakeholders can have a positive influence by actively participating in the process of forming policies and regulations that protect public health and safety as states legalize cannabis. Summit participants stated that to do this, it is

essential for advocates of public health to build bridges with other stakeholders—policymakers, law enforcement, faith-based organizations, business leaders, community organizations, patient groups, and even advocates of the cannabis industry itself—to find areas of common ground. Particular areas where public health may have shared interests with other stakeholders include decisions about allocating cannabis revenues for substance use prevention and treatment, policies concerning the marketing of cannabis to youth, drugged driving, ensuring safe access for patients who use cannabis to manage medical conditions, and the need to develop less punitive approaches to the treatment of individuals with substance use disorders. A broad array of stakeholders, policymakers, and community members have significant interest in these issues, and public health can play a leading role by bringing these concerns to the forefront of discussions about cannabis regulation. The earlier public health becomes engaged in cannabis policymaking, the more likely it will be able to exert a positive influence on the process.[6, 14, 26]

- ***Gradual and reversible reforms*:** It remains largely unknown what impact specific cannabis policies and regulations will have, so it is prudent to proceed with reform cautiously. If regulations are too loose, they could have detrimental impacts on public health and safety, and policymakers would need to respond by tightening controls. However, experience with tobacco and alcohol has shown that once psychoactive substances are made freely available, it becomes extremely difficult to restrict their availability and use. Voters and policymakers are wary of measures that seem to restrict freedoms and behaviors, and industry lobbyists can devote significant resources to public relations and political campaigns that support their commercial interests. Thus, if cannabis is broadly deregulated, it will be very difficult to bring it back under control, no matter how compelling the public health interest may be. Consequently, Summit participants concurred that as states and municipalities implement legalization, they should do so cautiously, liberalizing controls over the production, manufacture, sale, and consumption in a gradual manner. This way, if loosened regulations prove problematic for public health or safety, policymakers can slow the process of reform, and make midcourse adjustments. Ideally, policymakers would also implement mechanisms that allow the reversal of policies that cause harm. For example, by inserting sunset clauses into policies and regulations, policymakers can create space to end policies and regulations in the event that they have negative effects.[7, 9, 20, 29–30]

Future Directions for Research and Policy

Summit presentations and discussions highlighted several key areas where further research and/or regulatory changes are needed. This section briefly summarizes themes that emerged during the Summit concerning questions about cannabis and health that researchers need to answer, as well as steps that policymakers and regulators can take to promote public health and evidence-informed policy in the age of cannabis legalization.

Summit presentations and discussions highlighted that for researchers, areas that need further study include the following:

- ***The impact of alternative, and more potent, forms of cannabis*:** Most cannabis consumed today is more potent than the substances used in research that serves as the basis of most knowledge about cannabis's short- and long-term effects. Furthermore, cannabis is consumed in a variety of ways—through edibles and concentrates—that have scarcely been studied. Short-term and long-term studies are needed to determine the impacts of consuming higher potency cannabis, and of consuming cannabis in different forms, on health, safety, and wellbeing.[15, 38]

- ***The impact of cannabis when used with other substances*:** Most research on cannabis studies the effects of the drug when used in isolation, but often cannabis is used in conjunction with alcohol, tobacco, and/or other psychoactive drugs. Research is needed to examine both the short-term and long-term impacts of cannabis when combined with these other substances.[38]
- ***Treatment for and recovery from CUD*:** Given the high rates of frequent cannabis use, the increasing THC potency of cannabis, and shifts in public policy that are making cannabis more widely available, it is critical for the scientific community to develop the evidence base concerning treatment for CUD, early interventions for CUD, and CUD recovery. In addition to research on behavioral and pharmacological interventions, further inquiry into the natural course of CUD and natural recovery is needed to inform medical and public health responses to cannabis use.[16, 22]
- ***Prevention of use*:** Legalization has created a critical need for effective cannabis use prevention programs, and in many states, it is also generating funding that can be used to support prevention efforts. However, there are still significant gaps in prevention science, and most of the prevention strategies currently being utilized have not been rigorously tested. Research is also needed to determine if strategies that enhance knowledge of cannabis-related risk and harm lead to reductions in the frequency or intensity of cannabis use.[5, 30, 32, 33, 38]
- ***Measuring cannabis-related impairment:*** It remains difficult to measure cannabis impairment since measures of THC in blood do not correlate to levels of inebriation. Similarly, it is difficult to measure cannabis intoxication. This creates serious challenges for law enforcement and the judicial system when considering how to define "drugged driving." Further research is needed in these areas so that authorities can have measures akin to those used to define drunk driving for use in cases where drivers may be impaired by cannabis.[8, 13, 15, 24]
- ***Medical benefits of cannabis and cannabinoids*:** Scientific and methodological challenges—the complexity of the plant, the differences in routes of administration, and the difficulty inherent in blinding studies involving a psychoactive substance—continue to impede research on cannabis's therapeutic potential. Advances in research are needed to develop better knowledge about cannabis and its therapeutic potential.[21, 38]
- ***Policy*:** It remains unknown what policy approaches lead to optimal population-level health and safety outcomes for jurisdictions that legalize cannabis. The definition of "successful" policy is largely subjective, depending on what outcomes—reduced use, improved access to medical use, crime reduction, revenue generation, economic growth—are considered measures of success. Though the states that have legalized cannabis are generating important information about how policy impacts these outcomes, it remains too early to interpret much of these data. Moreover, experience has shown that conclusions drawn from population-level studies that have small sample sizes and measures and short durations may be circumspect. Future research that is more robust and comprehensive is needed to answer questions about the strengths and weaknesses of different policy and regulatory approaches.[15, 30, 37, 38]

Summit presentations and discussions highlighted that policymakers and regulators can take the following steps to promote health and implement evidence-based policies as cannabis legalization continues:

- ***Facilitate cannabis research:*** A major reason there are so many gaps in knowledge about cannabis and is its impacts is federal policy. Because cannabis remains a Schedule I substance, there is a complex and lengthy registration process for researchers seeking access to the drug for

studies. Furthermore, the federally supplied cannabis samples made available to researchers are not as potent as the cannabis that is available to patients in real-world dispensaries and cannabis shops. Consequently, it is difficult to conduct federal cannabis-related research, and it is unclear if this research, when completed, creates findings that are relevant to the current cannabis environment. These issues hinder research into the long- and short-term impacts of cannabis, the treatment of CUD, and the potential therapeutic benefits of cannabis. If changes to facilitate research at the federal level are not forthcoming, states that have legalized cannabis can potentially take the lead by crafting regulations and designating resources to support cannabis-related research.[29, 34, 35, 38]

- ***Facilitate comprehensive data collection as early as possible:*** To evaluate the impact of cannabis reform, it is essential to collect comprehensive cannabis use data and to have baseline data that predates the implementation of legalization. Yet in states that have undergone legalization, most available measures come from longitudinal surveys that are not focused on cannabis and that do not ask critical questions concerning frequency of use; methods of administration; intensity of use; and the impact of cannabis use on health, wellbeing, and safety. To inform policy and answer questions about cannabis legalization's impact, more nuanced measures of cannabis use and its consequences are needed.[9, 15, 34, 37]
- ***Create standards and guidance to inform state and local policy:*** The federal government stipulates that the only acceptable cannabis policy is prohibition, so there are no national standards for cannabis production, manufacture, safety, purity, packaging, labeling, or marketing like there are for other consumer products. States and municipalities often lack expertise in these areas and do not have the capacity to conduct the research necessary to create evidence-based policies on their own. To guide states as they implement cannabis reforms, it would be helpful for policymakers in states that have already undergone legalization and/or cannabis experts to craft model policies and regulations that can be used as starting points for local policy and regulation. The Council on Responsible Cannabis Regulation's *Cannabis Packaging and Labeling: Regulatory Recommendations for States and Nations* is an example of this type of guidance. Similarly, standards for cannabis testing, cultivation, and quality assurance—such as those being developed by ASTM International—may be beneficial.[3, 7, 20, 25, 39]
- ***Explore alternative economic models to structure the cannabis industry:*** To date, U.S. states that have implemented cannabis reforms allowing nonmedical use have adopted just one economic model for the cannabis industry, structuring it to become a competitive market composed of for-profit enterprises. However, there are many other potential economic models, such as restricting supply to nonprofit organizations, co-ops, for-benefit corporations, governments, or government-controlled authorities. Industry structure can have a significant impact on the outcomes of policy reform. The potential benefits and drawbacks of different economic structures needs to be further examined to determine which models are most likely to produce positive health and safety outcomes.[7, 20]
- ***Identify regulatory models for psychoactive substances that promote public health and safety:*** Governments in the U.S. have historically implemented relatively extreme approaches to alcohol and drug regulation, implementing complete prohibition or full legalization with relatively little restriction. However, very little is known about the impact of alternative regulatory models—particularly those that fall between the extremes of outright prohibition and full legalization with commercialization—on public health and safety. Knowledge and lessons learned from alcohol and

tobacco regulation can potentially shed light on how to best regulate cannabis, and valuable information about regulation may emerge from the natural experiments in policy development and implementation that are ongoing in states and different countries. Comprehensive and rigorous research is needed to identify how regulations can be used to promote public health and safety in jurisdictions that reform their cannabis control regimes.[7, 20, 42]

CONCLUSION

The 2017 National Cannabis Summit sparked invaluable and timely dialogue about the state of the science of cannabis and knowledge about how to best regulate the drug in the age of legalization. Summit presentations and discussions brought out a vast array of knowledge concerning cannabis and potential best practices for cannabis policy but also highlighted how much work researchers and policymakers still need to do in these areas. By elucidating lessons learned to date and pointing toward issues where further research and innovation are needed, the Summit highlighted where we are as a nation with cannabis regulation and where we need to go to promote public health, wellbeing, and safety in the age of cannabis legalization.

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