The Public Health Framework of Legalized Marijuana in Colorado

Tista Ghosh, MD, MPH, Mike Van Dyke, PhD, Ali Maffey, MSW, Elizabeth Whitley, RN, PhD, Laura Gillim-Ross, PhD, and Larry Wolk, MD, MSPH

On January 1, 2014, Colorado became the first state in the nation to sell legal recreational marijuana for adult use. As a result, Colorado has had to carefully examine potential population health and safety impacts as well as the role of public health in response to legalization. We have discussed an emerging public health framework for legalized recreational marijuana. We have outlined this framework according to the core public health functions of assessment, policy development, and assurance. In addition, we have discussed challenges to implementing this framework that other states considering legalization may face. (*Am J Public Health*. Published online ahead of print November 12, 2015: e1–e7. doi:10.2105/AJPH.2015.302875)

As one of the first 2 states to legalize recreational (nonmedical) marijuana, Colorado has been compelled to carefully examine potential impacts to the health and safety of the public. Medical marijuana has been legal in Colorado since 2000, and marijuana use was initially viewed as an individual patient–doctor decision that was outside the scope of population-based surveillance and public health policy. This view began to change when the commercial production and distribution of medical marijuana became permissible in 2009. However, it was the legalization of marijuana for adult nonmedical use in late 2012 that prompted a closer examination of marijuana's potential public health impact.

On January 1, 2014, Colorado became the first state in the nation to allow sales of recreational marijuana. The current legal status of marijuana has compelled the Colorado Department of Public Health and Environment (referred to as the department hereafter) to assess the knowledge gaps related to marijuana and develop reasonable policies to protect vulnerable populations. This "social experiment" has further required Colorado to define core public health functions as they pertain to legalized recreational marijuana. In doing so, the primary goals have been to implement policies to mitigate potential harmful consequences of legalized marijuana and to collect the necessary data to measure possible negative and beneficial effects on the population.

Legalization has highlighted a broad set of issues resulting from the multiple means of marijuana use (e.g., smoking, edibles, concentrates), the lack of a mature regulatory structure, and the complications of conflicting state and federal marijuana laws. The breadth of issues evolving from the legalization of marijuana has compelled Colorado's governmental agencies to work collaboratively to establish a retail sales system that respects the intention of the voters while striving to mitigate negative outcomes. With coordination and direction from the Governor's Office of Marijuana Coordination, experts from a variety of state agencies—including individuals in public and environmental health, transportation, human services (which includes child protective services and behavioral health), health care coverage and access, public safety and law enforcement, revenue, and education—have been working together on marijuana-related issues.[1] This broad, multisector collaboration has been essential for addressing the wide variety of concerns associated with marijuana legalization and for ensuring consistent messaging across the state.

Public health sector professionals have adopted a similar multidisciplinary approach. As local and state health agencies have defined their marijuana-related roles, secondhand smoke prevention specialists have gotten together with environmental health and food safety experts, acute and chronic disease epidemiologists, toxicologists, laboratorians, maternal–child health and health communications experts, and poisoning and injury prevention specialists. Together, this diverse group of professionals has developed a public health framework for legal recreational marijuana.

We have presented this public health framework. Our main objectives are to share the framework, highlight challenges to implementing this framework, and provide guidance to public health agencies in other localities where marijuana legalization is being considered. We have outlined this public health framework for marijuana according to the core functions of public health.[2] These include (1) assessing health issues through monitoring and investigation, (2) developing policy through education and community partnerships, and (3) providing assurance through enforcement, a competent workforce, and evaluation (Figure 1).

ASSESSMENT

As part of the assessment function, the department has been broadly charged with monitoring patterns of marijuana use and the health effects of use.[3] The department is implementing these tasks by incorporating marijuana-related questions into existing population-based surveys and the state trauma registry, passive surveillance of hospitalizations and emergency department discharges, and pilot surveillance projects on special at-risk populations such as pregnant women and children at risk for accidental ingestion. In addition, the department has convened a scientific review panel, with expertise in fields such as neonatology, pulmonology, toxicology, pharmacology, and psychiatry. This group has systematically reviewed the literature on the potential adverse health effects of marijuana and has provided recommendations on further improving surveillance efforts.

Monitoring Prevalence of Use

To monitor patterns of marijuana use, the department sought to use existing health behavior surveys to estimate prevalence by county or health district. The major issue with this strategy was a lack of validated surveillance

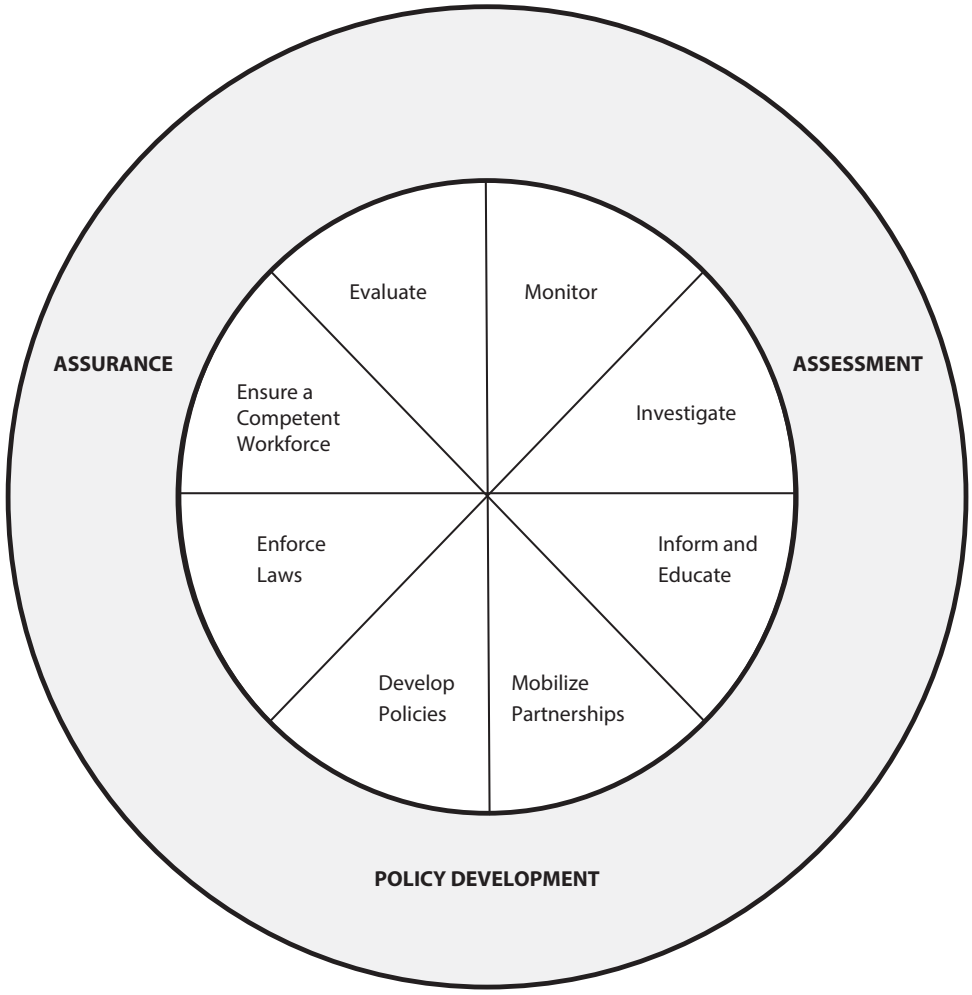

FIGURE 1—Public health framework for legalized marijuana: Colorado Department of Public Health and Environment, 2015.

questions related to marijuana. In the absence of validated questions on frequency and dosage, methods of use, behaviors while impaired, storage of marijuana products at home, cultivation and manufacturing of marijuana products, and more, the department relied on literature reviews and stakeholder feedback to outline initial surveillance questions.

Because of a lack of funding sources before revenue collection, the department was unable to collect baseline data before the January 1, 2014, implementation of the retail production and sales system. Since that time, however, the department has added questions to a variety of population-based surveys that monitor behaviors. These include the Behavioral Risk Factor Surveillance System, which focuses on adult behaviors, the Pregnancy Risk Assessment Monitoring System, which focuses on behaviors during pregnancy, and other population-based surveys that focus on behaviors in youths, such as the Youth Risk Behavior Surveillance System, which is implemented through the Healthy Kids Colorado Survey.

Annual or biannual data collection will allow the department to establish a delayed baseline for the prevalence of marijuana use and to monitor changes in use patterns over time. Monitoring these patterns will allow the state to better focus prevention efforts on populations at the highest risk for adverse effects stemming from marijuana use. The department plans to add questions in future surveys to further characterize the frequency and methods of marijuana use and evaluate unintended consequences of legalization.

Monitoring Health Effects

To monitor health impact, the department has started to analyze data on marijuana-related hospitalizations, emergency department visits, payer claims, mortality, and birth defects on an annual basis to identify possible trends in acute and chronic health effects. In addition, self-reported marijuana use has been added to the statewide trauma registry. The department is also working with other state agencies to explore better data sources for driving while under the influence of drugs and for blood test results that are higher than the recently established 5 nanograms per milliliter blood limit for delta 9 THC (tetrahydrocannabinol),[4] the psychoactive ingredient in marijuana. Colorado has no current systematic method to collect accurate reports on the

numbers of suspected and confirmed marijuana-related driving while under the influence of drugs cases in the state. The national Fatality Analysis Reporting System confirms only the presence of a drug in the driver of a fatal crash, not the level of impairment associated with the drug, and does not capture data on serious injury crashes.[5]

The department and local public health agencies have also started pilot surveillance sites around the state to monitor ski or recreational injuries related to marijuana use in resort communities and to monitor unintentional poisonings in younger children. Poisonings among younger children are of particular interest, because a recent Colorado study found an increase in such poisonings after the legalization of medical marijuana in the state in 2000,[6] and recent reports from Children's Hospital Colorado indicate an increase in the number of children hospitalized in 2014 over the previous year.[7]

Another surveillance concern is related to acute health effects through contamination or overconsumption. The medical literature reports that marijuana can be contaminated by bacteria, mold, and chemicals such as pesticides, lead, ammonia, and formaldehyde.[8–22] The department is working with emergency departments, the Rocky Mountain Poison and Drug Center, and local health agencies to explore real-time systems that can capture an "outbreak" related to contaminated marijuana products, which will enable state agencies to remove those products from the market as quickly as possible. Foodborne illness follow-up questionnaires have also been changed to routinely include questions regarding the consumption of edible marijuana products.

After legalization, Colorado made national news related to residents', tourists', and newscasters' overconsumption of edible marijuana products. Initial regulations for edible marijuana products sold on the recreational market specified a single serving size of 10 milligrams of THC and a maximum of 100 milligrams of THC per single packaged food item, such as 1 cookie.[23] The resulting fact that 1 serving could only be one tenth of a cookie, combined with the delayed onset of the effects of THC after eating, contributed to overconsumption. This in turn led to increases in calls to the poison control center,[24] increased anecdotal reporting of overdoses,[24] and 3 high profile deaths.[25,26] On the basis of these concerns, regulations were changed to ensure easier identification of serving size portions in a single edible or drinkable product.[27] Additionally, the department developed an enhanced relationship with the Rocky Mountain Poison and Drug Center to monitor call volume on this issue.

Challenges to Assessment

There are numerous ongoing challenges to public health assessment related to marijuana. One challenge in Colorado is the lack of robust baseline data on adult marijuana use and attitudes before the implementation of legal recreational marijuana in 2014. Another major challenge has been the lack of validated survey questions and widely accepted definitions to capture prevalence, frequency, and type of marijuana use. This challenge has been further underscored by emerging methods of use in the legalized market, including edibles, vaporizing, and the use of concentrates. Monitoring for changes in marijuana-impaired driving has been hampered by the lack of a comprehensive database of blood THC measurements and a lack of consistency in testing when alcohol and marijuana are used together.

With regard to monitoring for health impacts, Colorado has faced some challenges with using administrative data sets such as hospital discharge and emergency department data. One example is the lack of specific *International Classification of Diseases, Ninth Revision*[28] codes for hospitalization records related to marijuana use and the inconsistent application of these codes. Another example is the lack of consistency in collecting marijuana use frequency, timing, and methods related to hospitalizations and emergency department visits.

POLICY DEVELOPMENT

Immediately after the legalization of recreational marijuana, the department was involved in developing policies and regulations to protect the public's health and safety. The department was a member of the initial task force that developed recommendations and regulations that built on the successes of the past 50 years of public health progress to reduce the prevalence of tobacco use, exposure to secondhand smoke, and alcohol-related problems.

The *Guide to Community Preventive Services* (or *Community Guide*) summarizes evidence-based strategies to prevent or reduce public health concerns. The key recommendations to reduce tobacco use include increased unit price, smoke-free policies, comprehensive control programs, community mobilization, mass-reach health communications, and strict retailer licensing and enforcement.[29] The *Community Guide* also recommends increased taxes, limited hours of sale, regulating retail outlet density, and enhanced enforcement of licensed retailers.[30] A recent article published in the *American Journal of Public Health*, "Developing public health regulations for marijuana: lessons from alcohol and tobacco,"[31] recommended that policymakers apply effective tobacco and alcohol prevention strategies to the legalization of marijuana, strategies similar to those listed in the *Community Guide*.[29,30]

Colorado policymakers and the public implemented many of those recommended policy strategies, including increasing the unit price of marijuana by passing a 15% excise tax on the wholesale product and a 10% sales tax to increase the price of marijuana. These taxes are applied only to marijuana that is sold for recreational use and not to sales of medical marijuana.[32]

Colorado lawmakers and voters passed policy strategies that promote healthy environments and prevent the modeling of substance use for children and adolescents by applying existing smoke-free policies and public consumption bans to marijuana. Policymakers added marijuana to Colorado's Clean Indoor Air Act to prevent exposure to secondhand smoke from both tobacco and marijuana in public places.[33] Additionally, public and open consumption of marijuana, including edibles, was explicitly prohibited by the voter-approved Amendment 64 to Colorado's Constitution.[34,35]

Policymakers passed strict regulations of the retail environment that are closely aligned with the recommendations from the *Community Guide* and the *American Journal of Public Health* article. Colorado restricted marijuana use, possession, and cultivation to adults aged 21 years or older.[34] Colorado's laws on youth access to marijuana were strengthened, making it a drug felony offense if an adult more than 2

years older than the minor gives or sells the minor any marijuana or related products.[35] Furthermore, Colorado Minor in Possession laws for alcohol now include marijuana, ban the possession of drug paraphernalia, and apply Good Samaritan laws.[36]

In addition, age and other sales restrictions have been used. Colorado's Marijuana Enforcement Division rules ban the presence of anyone younger than 21 years in the retail store and limit the hours of operation of retail marijuana licensees to 8:00 AM to midnight. The law requires identification at point of purchase for proof of age, and it is illegal to sell marijuana to someone younger than 21 years.[37] Local governments can restrict hours of sales even further and can restrict retail stores to limited locations in their communities far from schools and other youth centers, if local governments choose to allow the sale of marijuana at all.[37] Furthermore, the Colorado Department of Revenue will implement a responsible vendor program to educate retail store employees about marijuana's health impacts, safety practices, and the importance of restricting youths' access to marijuana products.[38]

Additionally, with stakeholder and community input, Colorado established rules on packaging, labeling, and product safety requirements equal to or exceeding those of tobacco products for recreational marijuana products. Packaging cannot appeal to children or youths younger than 21 years or use cartoon characters. Strict requirements have been placed on advertising, including outright bans on Internet pop-up advertisements and any type of advertisement that targets minors. Advertising is only allowed via television, radio, print, Internet, or event sponsorship when it can be documented that less than 30% of the audience is younger than 21 years. Outdoor advertising is prohibited other than signs that identify the location of a licensed retail marijuana store.[37]

As recommended by the *American Journal of Public Health* article,[31] Colorado laws established a legal limit for marijuana-impaired driving. Colorado's limit is set at 5 nanograms per milliliter of delta 9 THC in whole blood.[39] The Colorado Department of Transportation has implemented a Drive High, Get a DUI campaign to educate the public on the law and to prevent impaired driving.[40] Additionally, Colorado law enforcement agencies are assessing data collection and infrastructure modifications to better track trends in the rate of marijuana-impaired driving in the state.

Education

Lawmakers tasked the state public health department with implementing mass-reach health communications through the release of a statewide public awareness and education campaign on the recreational marijuana laws, which was launched January 2015.[41] The Good to Know Colorado campaign's targeted messages educate all Colorado residents and visitors about safe, legal, and responsible use of marijuana. Key messages educate the public about the health effects of marijuana and key laws that prevent youth marijuana initiation. Additional messaging promotes safe storage, warns about marijuana use during pregnancy and while breastfeeding, and educates on the dangers of underage marijuana use.

Educational materials provide more information about safety concerns with eating or smoking marijuana products, reducing secondhand marijuana smoke exposure, and the harms of combining marijuana with other substances. Prevention messaging campaigns are one of the few evidence-based interventions shown to increase awareness of harms and reduce marijuana use at the population level when integrated with community-, school-, and family-based prevention efforts.[42] In the first 5 months of the campaign, there were approximately 85 million media impressions across the state and more than 200 000 visitors to the campaign Web site (GoodToKnowColorado.com). The department has partnered closely with other state agencies that fund local substance abuse prevention coalitions and programs to integrate educational materials and youth prevention messaging into all Colorado communities.

Additionally, the department is conducting statewide formative research to help craft media messages geared toward youths, pregnant and breastfeeding women, and Latinos. These culturally responsive and age-appropriate engagement efforts will launch soon. Lessons learned from tobacco prevention efforts will guide marijuana-related messaging, particularly with regard to preventing youth initiation.[43] All campaigns will be closely evaluated for impact and efficacy.

To ensure consistent statewide messaging, the department has created a Web portal (Colorado.gov/marijuana) that coordinates messaging across all state agencies, including the Department of Transportation's impaired driving messages, the Department of Education's messaging for adolescents and parents, the Department of Revenue's information on licensing and enforcement, and the public health department's own information on health impacts. The Web site also links to all health-related research and public education materials created for the use of parents, community agencies, schools, and health care providers.

The department is also engaging in educational efforts targeted at specific groups. For example, the department offers producers of edible products access to its food safety trainings to help reduce the risk of foodborne illness. Although there is no way to guarantee safety when adding a drug to food, educating producers about food safety will, at a minimum, reduce the risk of contamination with certain bacteria and viruses. In addition, as the scale of marijuana cultivation, product manufacturing, and sales expands in Colorado, education to prevent occupational injuries and illnesses becomes increasingly important.

As federal resources are limited, the department has taken the lead role in convening a multidisciplinary task force on occupational health to assess the physical and chemical hazards and potential health effects associated with this industry. This task force consists of industrial hygienists, safety professionals, and occupational medicine physicians as well as marijuana industry representatives. The goals of this task force are to establish policies and best practices to prevent adverse health effects and to disseminate this information throughout the marijuana industry.

Challenges in Policy Development

One of the most significant challenges for policymakers in Colorado is the discordant regulations for recreational and medical marijuana. Legalization proponents suggested that a legal recreational system would reduce the number of medical marijuana registrants. However, the opposite has been observed over the first year of legalization, with the number of

medical marijuana registrants continuing to grow.[44] There are several policy differences between recreational and medical marijuana that likely limit the transition of users, including higher possession limits, higher grow limits, the ability to designate a caregiver to grow the user's plants, exemption from excise and sales taxes, and the ability to obtain a medical registration card for those younger than 21 years.[45]

For these reasons, it is likely that Colorado will continue to have a large medical marijuana program. The strong medical marijuana advocacy community and the increasingly blurry line between medical and recreational use will continue to make this a challenging environment for policy development. Current state policy priorities are to harmonize the packaging and laboratory testing requirements of medical and recreational marijuana.

Policy development is also hampered by the unique patchwork of federal, state, and local laws on marijuana. Research to assess both the beneficial and the adverse health effects of marijuana is often difficult to conduct because of marijuana's Schedule I drug designation applied by the US Drug Enforcement Agency.[46] Public universities are reluctant to participate in marijuana-related research owing to concerns about federal funding and their ability to comply with the Drug Free Schools and Communities Act.[47] Organizations providing prevention programming may be restricted from accepting marijuana tax funds because of ambiguity in federal funding requirements for other activities. Furthermore, some local governments in Colorado have chosen to restrict marijuana sales, possession, and use in their jurisdictions.

ASSURANCE

Enforcement is a role that public health often plays, particularly in relation to restaurant and environmental inspections. With regard to marijuana, the major public health goals of enforcement are to ensure a product free of contaminants that is packaged in child-resistant packaging and properly labeled. To streamline the regulation of the marijuana industry, typical public health enforcement functions such as product and food safety have been incorporated into the overall inspection and enforcement strategy of the Colorado Department of Revenue, which also has the critical job of ensuring the seed to sale tracking of marijuana to prevent diversion.[37] The Colorado Department of Revenue is inspecting all growers, infused product manufacturers, and retail outlets. Some of the public health-related aspects of these inspections will include food safety issues, pesticide use, proper product labeling, proper product packaging, and safe marijuana extraction procedures.

Similar to the recommendations for tobacco and alcohol prevention of the *Community Guide*[29] and the *American Journal of Public Health* article on marijuana laws,[31] the marijuana enforcement strategy will include periodic evaluations to ensure that retail outlets are not selling to individuals younger than 21 years.[37] Although the Colorado Department of Revenue has regulatory authority on these issues, the department has worked with the Colorado Department of Revenue to apply standard food safety and food handler training recommendations to the marijuana-infused product industry.

In addition, the department has provided assurance by inspecting and certifying recreational marijuana testing facilities. Recreational marijuana testing facilities are to perform potency and contaminant testing on marijuana plants, concentrates, and edibles. The department's laboratorians have developed a testing facility certification process aimed at protecting public health by ensuring quality testing. Laboratory subject matter experts in molecular testing, food microbiology, and chemical testing are participating in testing facility inspections and providing recommendations to improve the reliability of testing. However, significant challenges remain, because of a lack of national standards on marijuana testing and a lack of proficiency testing and reference laboratories.

Ensuring a Competent Workforce

To ensure a competent and informed public health workforce, the department is establishing a network of local public health professionals. This process has started by identifying primary marijuana points of contact at each county or city health department. Frequent communications are sent to this network that outline local trends, resources, and research. The department also conducted key informant interviews with local public health officials to identify new or emerging issues around the state. Furthermore, the department has hosted a marijuana-specific educational conference for local and state public health professionals to learn about and discuss marijuana-related public health topics.

In addition, the department is working to ensure that health care providers are well informed about marijuana-related topics. The department has convened panels of experts to develop clinical guidelines for screening pregnant and pediatric patients for marijuana use. The department will also engage with hospital emergency departments to inform them of potential acute events associated with contaminated products via informational alerts through the department's emergency management system.

Evaluation

Finally, evaluation is another major component of the assurance function of public health. The department will closely evaluate all data collection and surveillance efforts for efficacy and benefit. The department has also contracted with a local university to evaluate the effectiveness of its marijuana education campaigns in increasing accurate knowledge of recreational marijuana laws, health impacts of marijuana use, safe storage practices, and preventive behaviors.

Additionally, the evaluation will assess changes to Colorado residents' perceptions of risk related to problematic use of marijuana across the state, including use during pregnancy or while breastfeeding, youths' use of marijuana, secondhand marijuana smoke exposure in the home, marijuana-impaired driving, and public use of marijuana products. To evaluate these outcomes, the evaluator will use surveillance data, telephone surveys, community-based surveys to reach targeted populations, and analytics on postmedia buys and the Web site to determine reach across target audience subgroups.

Challenges in Assurance

Despite the work of public health to address marijuana surveillance and prevention since the legalization of recreational marijuana in November 2012, the department did not receive any funding until April 2014. At that

time, the state provided minimal funding for staff time for surveillance and to convene the panel of health experts.

The department received approximately $7 million from the marijuana tax cash fund beginning July 1, 2014, to fund personnel, surveillance, data purchasing, and media campaigns.[41] In the absence of that funding, staff absorbed this work on top of their existing tasks and responsibilities. The department recommends that states considering legalization identify funding for surveillance and staff time as early as possible to begin establishing baseline data and convening stakeholders to address marijuana legalization from the public health perspective.

CONCLUSIONS

The issues related to the legalization of marijuana require a robust regulatory and public health framework consistent with the core public health functions of assessment, policy development, and assurance. Because of the lack of a federal infrastructure for regulating marijuana, state health departments often find themselves in new roles with little resources or support. Furthermore, the breadth of public health issues associated with marijuana requires close collaboration among state agencies responsible for marijuana (and often liquor) enforcement, public safety, agriculture, and behavioral health. These issues also necessitate multidisciplinary collaboration among health department programs, including staff members who work in disease surveillance, behavioral risk factor surveys, the public health laboratory, injury and poisoning prevention, and food safety, among others.

As other states confront these issues, it will be important to consider these public health roles in advance to align and preallocate future tax funding with anticipated needs. Particularly important lessons learned include the thoughtful collection of baseline marijuana use data through population-based surveys before legalization and the timely development of public health campaigns for youth prevention and responsible use for adults.

A major success of the Colorado experience was the close involvement of public health officials during the development of marijuana regulations, allowing a proactive approach to implementing important public health policy interventions such as advertising and sales restrictions, child-resistant packaging, and protections to prevent secondhand smoke exposure. Finally, the first year of legalization in Colorado has demonstrated the need for the continued engagement of public health in marijuana-related issues to promote timely policy changes as new health issues arise. ■

About the Authors

All of the authors are with the Colorado Department of Public Health and Environment, Denver.

Correspondence should be sent to Tista Ghosh, MD, MPH, Colorado Department of Public Health and Environment, 4300 Cherry Creek Drive S, Denver, CO 80246 (e-mail: tista.ghosh@state.co.us). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

This article was accepted August 17, 2015.

Contributors

T. Ghosh was the primary author and conceptualized and drafted the article. M. Van Dyke, A. Maffey, E. Whitley, and L. Gillim-Ross contributed to drafting and revising the article. T. Ghosh, E. Whitley, and L. Wolk approved the final version of the article.

Acknowledgments

We thank Jeff Lawrence and Elyse Contreras of the Colorado Department of Public Health and Environment.

Human Participant Protection

No protocol approval was necessary because this study did not involve human participants.

References

1. Senate Bill, 13-283 (CO 2013).
2. Centers for Disease Control and Prevention. Core functions of public health and how they relate to the 10 essential services. Available at: http://www.cdc.gov/nceh/ehs/ephli/core_ess.htm. Accessed June 17, 2014.
3. Colo. Rev. Stat. §25-1.5-110.
4. Colo. Rev. Stat. §42-4-1301.
5. National Highway Traffic Safety Administration. 2007 National Roadside Survey of Alcohol and Drug Use by Driver, Drug Results. 2009. Available at: http://www.nhtsa.gov/Driving+Safety/Research+&+Evaluation/2007+National+Roadside+Survey+of+Alcohol+and+Drug+Use+by+Drivers. Accessed September 16, 2015.
6. Wang GS, Roosevelt G, Heard K. Pediatric marijuana exposures in a medical marijuana state. *JAMA Pediatr.* 2013;167(7):630–633.
7. Greater Access to Edible Marijuana Leads to Increase of Children Admitted to Hospital. ABC 7News Denver; May 5, 2014.
8. Bloor RN, Wang TS, Spanel P, Smith D. Ammonia release from heated 'street' cannabis leaf and its potential toxic effects on cannabis users. *Addiction.* 2008;103(10):1671–1677.
9. Busse F, Omidi L, Timper K, et al. Lead poisoning due to adulterated marijuana. *N Engl J Med.* 2008;358(15):1641–1642.
10. Busse FP, Fiedler GM, Leichtle A, Hentschel H, Stumvoll M. Lead poisoning due to adulterated marijuana in Leipzig. *Dtsch Arztebl Int.* 2008;105(44):757–762.
11. Cescon DW, Page AV, Richardson S, Moore MJ, Boerner S, Gold WL. Invasive pulmonary aspergillosis associated with marijuana use in a man with colorectal cancer. *J Clin Oncol.* 2008;26(13):2214–2215.
12. Gilbert CR, Baram M, Cavarocchi NC. "Smoking wet": respiratory failure related to smoking tainted marijuana cigarettes. *Tex Heart Inst J.* 2013;40(1):64–67.
13. Hamadeh R, Ardehali A, Locksley RM, York MK. Fatal aspergillosis associated with smoking contaminated marijuana, in a marrow transplant recipient. *Chest.* 1988;94(2):432–433.
14. Harkess J, Gildon B, Istre GR. Outbreaks of hepatitis A among illicit drug users, Oklahoma, 1984–87. *Am J Public Health.* 1989;79(4):463–466.
15. Kagen SL, Kurup VP, Sohnle PG, Fink JN. Marijuana smoking and fungal sensitization. *J Allergy Clin Immunol.* 1983;71(4):389–393.
16. Krause G, Blackmore C, Wiersma S, et al. Marijuana use and social networks in a community outbreak of meningococcal disease. *South Med J.* 2001;94(5):482–485.
17. Kurup VP, Resnick A, Kagen SL, Cohen SH, Fink JN. Allergenic fungi and actinomycetes in smoking materials and their health implications. *Mycopathologia.* 1983;82(1):61–64.
18. Landrigan PJ, Powell KE, James LM, Taylor PR. Paraquat and marijuana: epidemiologic risk assessment. *Am J Public Health.* 1983;73(7):784–788.
19. McLaren J, Swift W, Dillon P, Allsop S. Cannabis potency and contamination: a review of the literature. *Addiction.* 2008;103(7):1100–1109.
20. Munckhof WJ, Konstantinos A, Wamsley M, Mortlock M, Gilpin C. A cluster of tuberculosis associated with use of a marijuana water pipe. *Int J Tuberc Lung Dis.* 2003;7(9):860–865.
21. Sullivan N, Elzinga S, Raber JC. Determination of pesticide residues in cannabis smoke. *J Toxicol.* 2013; Epub ahead of print.
22. Taylor DN, Wachsmuth IK, Shangkuan YH, et al. Salmonellosis associated with marijuana: a multistate outbreak traced by plasmid fingerprinting. *N Engl J Med.* 1982;306(21):1249–1253.
23. *Task Force Report on the Implementation of Amendment 64: Regulation of Marijuana in Colorado.* Denver, CO: State of Colorado; 2013.
24. Wang GS, Roosevelt G, Le Lait MC, et al. Association of unintentional pediatric exposures with decriminalization of marijuana in the United States. *Ann Emerg Med.* 2014;63(6):684–689.
25. Marijuana Edibles Blamed for Keystone Death. CBS Denver. March 25, 2015.
26. Two Denver Deaths Tied to Recreational Marijuana Use. CBS News. April 18, 2014.
27. Colorado Department of Revenue, Enforcement Division–Marijuana. *House Bill 14-1366 Marijuana Edibles Work Group Report.* Denver, CO; January 30, 2015.
28. *International Classification of Diseases, Ninth Revision.* Geneva, Switzerland: World Health Organization; 1980.

29. Community Preventive Services Task Force. Reducing tobacco use and secondhand smoke. 2014. Available at: http://www.thecommunityguide.org/tobacco/index.html. Accessed May 29, 2015.

30. Preventing Excessive Alcohol Consumption. *The Community Guide*. 2014. Available at: http://www.thecommunityguide.org/alcohol/index.html. Accessed May 29, 2015.

31. 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.

32. Colorado Secretary of State. Proposition AA Retail Marijuana Taxes; 2013.

33. Colo. Rev. Stat. §25-14-202.

34. CO Const. amend. 64 art. XVIII §16.

35. Colo. Rev. Stat. §18-18-406.

36. Colo. Rev. Stat. §18-13-122.

37. *Permanent Rules Related to the Colorado Retail Marijuana Code*. East Lansing, MI: Marijuana Enforcement Division; 2013.

38. Colo. Rev. Stat. §12-43.3-1101.

39. House Bill 13-1325 (CO 2013).

40. State of Colorado. Drive high get a DUI. 2014. Available at: https://www.codot.gov/safety/alcohol-and-impaired-driving/druggeddriving. Accessed June 17, 2014.

41. Senate Bill 14-215 (CO 2014).

42. Substance Abuse and Mental Health Services Administration. Strategies/interventions for reducing marijuana use. Available at: https://captus.samhsa.gov/sites/default/files/LitReview_Marijuana_Strategies_NE.pdf. Accessed May 15, 2015.

43. Prevention First. *Ineffectiveness of Fear Appeals in Youth Alcohol, Tobacco and Other Drug (ATOD) Prevention*. Springfield, IL; 2008.

44. Colorado Department of Public Health and Environment. Statistics MM. 2014. Available at: https://www.colorado.gov/pacific/cdphe/statistics-and-data. Accessed May 15, 2015.

45. CO Constitutional amendment 20 art. XVIII §14.

46. 21 U.S.C. §812(c)(c)(17).

47. 20 U.S.C. §7101 et seq.