>> Thank you, Bob and Ned, for that wonderful introduction. And good morning, colleagues and welcome to the National Cancer Institute, Cannabis, Cannabinoids, and Cancer Research Symposium. It is with great excitement that we are able to have this symposium. And even though we cannot be together in person at this time, we hope that this conference will go a long way in highlighting the significant scientific contributions of scientists working in the area of cannabis and cancer and will be a great learning experience for us all.

 Close to 1100 individuals registered for this meeting and so some will probably tune in and out over the course of this meeting. But this underscores the great deal of interest in this topic. So, who registered? The almost 1100 people include cancer advocates, students, scientists, from government, academia, and industry, clinicians, and members of the general public with an interest in this topic. The proliferation of laws across the United States governing the use of cannabis necessitates that we engage in activities to understand its impact on health. And over the next several minutes, I'll provide an overview of NCI’s recent efforts and you’ve heard some from Ned and Bob in cannabis and cancer research, underlining how we got to this point of having this symposium. Next slide.

 In 2017, the National Academies of Sciences, Engineering, and Medicine published a report on the health effects of cannabis, cannabinoids, highlighting the state of evidence and recommendations for research. The National Cancer Institute was one of the sponsors of this report, along with our partners across NIH as well as the CDC. Several of our symposium speakers were members of the 16-member committee that reviewed the scientific evidence with respect to a wide range of health outcomes. Regarding cancer, the committee concluded that there are research gaps concerning cannabis or cannabinoids and treating cancer in general and cancer associated anorexia aphasia syndrome. There was some evidence for its effectiveness for chronic pain and treatment of chemotherapy induced nausea and vomiting, but more research is needed in this area. In addition, as Dr. Hashibah (ph.) will highlight, there’s a need for more robust epidemiologic studies to determine the effects on the development of cancer. Next slide.

 In general, the committee’s recommendations centered around addressing current research gaps, which emphasize the need for national cannabis research agenda that includes clinical and observational research, health policy and health economics research, and public health and public safety research. And this highlights the multidisciplinary aspect that’s required to tackle these tough scientific questions. They also recommended identifying actionable strategies to improve research quality and promote the development of research standards and benchmarks. They also highlighted the potential for improvements and data collections efforts and the enhancement of surveillance capacity. And you’ll hear later on today Dr. Schauer talk about some of those efforts. And also proposing strategies for addressing the current barriers to the cannabis research agenda, which we will hear later on in the symposium. This symposium will likely highlight research that has occurred after this report was published in 2017, so we’re really looking forward to that. Next slide please.

 Over the last five years, NCI has funded around 16 grants focusing on cannabis, cannabinoids or the endocannabinoid system. Some examples of research funding include the co-use of marijuana with tobacco. And, as you’ve heard, they have some of the same carcinogenic properties, as well as other substances – used with other substances. We also funded research that looked at the contextual environment that could influence use, particularly among adolescents and young adults. This represents about 25% of the total cost of funding associated with cannabis and cancer. And these grants are funded from the Division of Cancer Control and Population Sciences.

 In addition, NCI has funded basic research to understand the efficacy of proliferally (sic) restricted cannabinoids against cancer pain and the anticarcinogenic effect of cannabis-derived compounds. A little more than 40% of grant funding supported research where cannabis was not the focus, but a component of the grant, the most significant being NCI’s contribution to the collaborative research on addiction at NIH led Adolescent Brain Cognitive Study, or ABCD Study, which will collect information on adolescent use of marijuana and other substances on brain development. NCI is a participant in this, as well as other NIH institutes primarily led by NIDA. Next slide please.

 NCI is also participating with our partners at other NIH institutes and centers on initiative to develop therapeutic potential of the endocannabinoid system for pain treatment and is interested in applications related to the treatment of tumor related pain conditions like metastatic bone pain, for example. Dr. Alexis Bakos and the Division of Cancer Prevention is NCI’s scientific contact. This funding opportunity is still open and it expires on September 8, 2021. Next slide please.

 And as Bob mentioned, in July of 2018, NCI’s Division of Cancer Control and Population Science organized a cannabis and cancer research interest group, including program scientists across NCI. Its goal was to coordinate NCI activities and develop and implement a research agenda related to cannabis and cancer. This group assessed the scientific landscape and engaged in strategic visioning to prioritize the science. And we would begin with cancer patients, as you’ve heard from both Ned and Bob, and engaged with international groups of experts to fully appreciate the ongoing science. Next slide.

 And as Dr. Sharpless (ph.) mentioned earlier, in September of this year, NCI provided research support for cancer centers to conduct a survey of ambulatory care patients to understand the prevalence and patterns of cannabis among this group. The investigators will collect well needed information on the current and past use of cannabis, including the frequency and duration of use, how they’re using it, if they’re smoking it, if they’re using tinctures, if they’re taking edibles, and what’s the therapeutic reasons for the use? Investigators will also assess patients’ perception of harm or benefit and discussions with and recommendations made by clinical providers. Next slide please.

 Twelve awards were made across the United States with varying laws governing cannabis use. And at the conclusion of the study, we will have robust data on at least 12,000 cancer patients with a variety of tumor types and a diversity by geography, age, gender, and race ethnicity. And as Bob mentioned, this are really the beginning. These are cross-sectional data, of course, collecting survey data on cancer patients and their use. We will have information on tumor types and the therapeutic use. And I think this data is just the beginning, as Bob mentioned, to allow us to have some robust data on cannabis use among cancer patients. And these data will be good for generating further hypotheses regarding cannabis use among cancer patients. Next slide please.

 With regard to engaging the scientific community, NCI’s Division of Cancer Treatment and Diagnosis organized a well-attended cannabis and cancer speaker series. Speakers of this seminar series will also speak during the symposium, so we’re looking forward to that. Next slide please.

 So, over the next four days, here we are at the symposium. We will hear talks that highlight the science of cannabis and cancer from ideology to cancer survivorship. During each session, we will hear more about the gaps in research and opportunities for filling those gaps. Each session will have a series of presentations and a 30-minute panel discussion where your questions and comments submitted through the webinar chat feature will be addressed. The full agenda, including speaker biographies and abstracts, are located on the meeting website. And this symposium is being recorded and will be posted to our website after editing. You will be notified by email when it is available for you to view. A summary of science through a series of manuscripts will be submitted to a scientific journal or a special issue related to this topic. And at the end of the symposium, you will receive a short survey designed to evaluate this meeting. Please take a few minutes to complete it, as it will help us in planning future symposia. So, during day one, we will feature sessions focused on nonmedical cannabis use and cancer epidemiology, as well as cancer and the cancer patient. And over the next few days, there will be two sessions per day, including cancer symptom and treatment side effect management, both preclinical and clinical, following cancer biology and prevention, cancer treatment, and preclinical and clinical as well. And then at the end, we will talk about navigating these research challenges for cannabis research and you’ve heard a little bit about that earlier from Ned. And following that, we will have a panel discussion consisting of the conference cochairs who will summarize their sessions and talk about research directions for the future. Next slide please.

 So, I just want to take a minute to acknowledge the many people who helped put this symposium together, helped plan this symposium, whether you sat on a scientific committee for planning or whether you planned logistics. It couldn’t have happened without this tremendous team effort. It couldn’t have happened without this phenomenal team of colleagues. And I also want to acknowledge the Cannabis and Cancer Research Interest Group, some of whom were on the planning committee for this symposium. In addition, we would like to thank all of our meeting external cochairs and speakers, NCI’s internal meeting planning staff, and ICF for technical support and guidance. And most of all, I’d like to thank all of you for attending and engaging in this symposium. Next slide please.

 Now, I have the honor to introduce our keynote speaker. Dr. Gillian Schauer is a Senior Consultant to a number of federal and state agencies, working on tobacco and cannabis policy, epidemiology, and research translation. Her consulting includes working with the U.S. Center for Disease Control and Prevention and other organizations, as well as a number of U.S. states. She founded the multistate Collaborative for Public Health and Cannabis, a group that convenes representatives from states to share lessons learned. Dr. Schauer has an affiliation as a research scientist at the Alcohol and Drug Abuse Institute at the University of Washington, and serves as codirector of the University of Washington Tobacco Studies Program. She has more than 60 peer review publications on cannabis, tobacco, and co-use and was a senior editor on the 2020 Surgeon General’s report on smoking cessation. She earned her Ph.D. from Emory University in Behavioral Science and a Master of Public Health from the University of Washington. Please join me in welcoming Dr. Gillian Schauer who will speak on cannabis policy, epidemiology, and research in an era of legalization.

>> Good morning, everyone. I want to thank Dr. Sharpless and Dr. Kreuel (ph.) for their wonderful opening remarks and I want to thank Dr. Ellison and all of the folks of the National Cancer Institute who worked so hard to pull together this important and I think very timely research symposium. I’m honored to be the speaker to kick off our few days together. My name’s Gillian Schauer and I’m a Senior Consultant working with a number of state and federal agencies on issues of cannabis policy, cannabis data monitoring, and research translation. And I will be speaking with you this morning about those issues. I do not have any disclosures. I have not taken industry funding, nor do I take industry funding currently. And I want to thank and acknowledge the state and federal agencies who’ve supported my work over the past many years and in particular the states who have contributed to some of the data I'll be sharing with you today. I want to make sure to emphasize that the findings and conclusions of my presentation are my own and do not necessarily represent any official position of the agencies with whom I consult.

 So, I’m hoping that my presentation can serve as a bit of a foundation to carry you through the next few days of this symposium. I’m going to be talking about sort of the lay of the land of policy in the U.S. I'll give a brief overview of health effects and epidemiology that future speakers will expound on greatly. And then I'll spend most of my time going into depth to give a sense of what the cannabis policies on the ground here in the U.S. look like to give some context for the research discussion that will take place in the coming days. I will of course also emphasize the policy challenges that exist for research as well.

 I want to start by just emphasizing some terminology that I'll use. You’ll likely hear a number of different terms throughout the next few days: marijuana, cannabis, weed, medical, recreational. I will be using the term cannabis. Marijuana as a term has a racial derogatory nature dating back to the Mexican Revolution. And so, I'll be using cannabis, but I want to make it very clear when I use cannabis, I am not referring to hemp. I will be very explicit to say hemp when I am talking about a policy that relates to hemp. So, if I don’t say hemp, please assume that I am not talking about hemp. And then in terms of using the term recreational legalization or use, I will not be using that term. I'll instead be using terms like nonmedical or adult use or retail cannabis use. Recreational connotates fun and enjoyment and is not as descriptive as the types of policies that we actually see on the ground here in the U.S.

 So, let’s dive into this fast-moving policy train that we’ve all been on here in the U.S. This is a map of the states as of this month, 2020, and it shows the 36 states in green and blue and D.C. that have legalized comprehensive medical cannabis programs. And you can see that 15 of those states and D.C. have also legalized adult use cannabis. So, those are the states in blue. And then you can see the states in yellow have legalized low THC or CBD cannabis use and there are three states – Idaho, Nebraska, and Kansas – where really use of cannabis is not legal in any way, shape or form.

 Now, interestingly, if I was to provide this map in 2015, so just five years ago, we would only have had four states in blue, four adult use states, and we would have had 14 states in gray where no cannabis use of any kind was legal. So, this has indeed been a fast-moving policy train. In particular, as emphasized by what happened this past November. So, we saw five states with ballot measures for legalization of cannabis that came before voters and all of those ballot measures passed. So, we saw Montana, Arizona, South Dakota, and New Jersey voters legalize adult nonmedical use. And we saw South Dakota and Mississippi voters legalize medical use. In addition, since the election, a number of governors and state legislatures have come out and declared that they are marching towards legalization of adult use in the coming months. Those states include New York, Connecticut, Rhode Island, Pennsylvania, and Virginia, all on the Eastern corridor, and New Mexico. So, lots happening in this space in terms of policy. So, given that, what do we know about the health effects of cannabis? And how far ahead is the policy train compared to the science train in this case?

 I want to start by talking about the therapeutic effects of cannabis and cannabinoids and I want to emphasize cannabinoids, which are individual compounds in the cannabis plant. Because some of the research that underscores the therapeutic benefits of cannabis is actually derived from studies of individual cannabinoids. So, so far, the most promising evidence that we see in terms of therapeutic use is for use for relief of certain types of chronic pain. It does not appear to be very effective for acute pain and really the research suggests only certain types of chronic pain. But there is that science. For relief of nausea, for relief of patient recorded symptoms for multiple sclerosis, for use in rare seizure disorders like Dravet’s and some evidence for sleep. Of course, state policies for medical cannabis use are authorizing much broader use than what the science supports. And you can easily go online and in single click be taken to articles that will talk about how cannabis cures cancer and can improve diabetes glucose control and can replace opioids and a host of things that are not rooted in science. And so, I think the consumer education in this space is lacking and there’s often a much broader understanding of the therapeutic uses of marijuana or cannabis than the science supports.

 I would be remiss if I didn’t talk about the FDA approved drugs. There are two FDA approved synthetic THC drugs comprises three brands and then there’s one FDA approved cannabis plant derived CBD drug for rare seizure disorders. So, there is a body of evidence around some therapeutic use and certainly much more that we can learn here. And I expect the speakers in the coming days will talk about that.

 Let’s shift to talk about the health risks of cannabis use and in particular the acute effects. We know that using cannabis can have short-term impairments to memory, learning, and attention. We know that it can impair motor coordination and reaction time, which has been associated with an increase in motor vehicle crash. We know for THC in particular, use of high doses of THC, especially among naïve users, can result in acute psychosis and paranoia. And again, in particular, use of high levels of THC can alter judgment and increase likelihood or risk-taking behaviors, risk-taking sexual behaviors, injury prone behaviors, etc.

 Let’s shift to a bit more complicated side of the coin: the long-term health effects. And I want to stop and say that I think you can find a study to support whatever you want to say almost about the long-term effects of cannabis. And so, as a science community, we really need to be holding up the really strong reviews that are being done and have been done as a source for public health partners and researchers to reference. In particular, there’s a 2017 review by the Natural Academy of Sciences, the health effects of cannabis and cannabinoids, that is quite comprehensive. The State of Colorado under statute is required every two years to provide an update on health effects related to cannabis and they have a number of excellent reports on their CDP to their Public Health Agency website. And then the WHO has also produced a review in 2016. So, there are a number of sources we can go to.

 I also think it’s important to note that I think what we know about the long-term health effects of cannabis this point is probably less than we knew about the long-term health effects of tobacco in 1964 when the first Surgeon General’s report on smoking and lung cancer came out. And that’s because almost all of what I’m about to cover with you is based on association and not causality. And so, there’s much more science that’s needed and this entire symposium will focus on some of the challenges that have existed to getting that in the past.

 So, what do we know? We know that using cannabis can change the way the brain develops and can lead to cognitive development delays and issues and related outcomes. The extent of that we are still learning very much about and NIH, in fact, is supporting longitudinal studies to help us understand more about how cannabis changes the brain and the impacts of those changes. That appears to be particularly strengthened as use increases and the earlier the somebody initiates cannabis use. So, earlier initiation, the brain has a lot more development to happen.

 Cannabis use disorder is also possible from using cannabis and, again, is more likely among early initiates and people who use in a higher frequency of use pattern. The understanding of the Gateway hypothesis is, I think, still evolving and there’s not clear science to suggest that using cannabis leads to use of a number of other substances. But for people who are using other substances, there’s science to suggest that there’s an association between cannabis use and dependence or abuse on those other substances. There’s a body of research around cannabis use and respiratory effects, most notably bronchitis. And there’s emerging use on cannabis use in pregnancy right now. Most of the science appears to be related to lower birth weight in babies born to mothers who use cannabis during pregnancy.

 And then there’s an established body of research around mental health outcomes. And this is where we potentially have the most research, in particular related to schizophrenia. And it appears that using cannabis, particularly if you initiate young and again have heavier patterns of use, can lead to a diagnosis of schizophrenia. It may be that these diagnoses are happening in people who are already prone to schizophrenia, but it leads to an earlier and more severe diagnosis. We’re still understanding more about the implications there.

 There are a host of other mental health associations with cannabis use: a small increase in depression, some increase in anxiety associated with cannabis use, especially social anxiety, and then cannabis use has been associated with worsening with some of the symptoms of other mental health disorders.

 So, you didn’t hear me mention a number of things: cardiovascular disease, cancer, which is of course of interest for the symposium. And that’s because the science either insufficient or unclear. And I think that’s really the case for cancer and I’m anxious to hear the esteemed speakers throughout the next few days and their take on it. But really the area that we know the most about cancer for is an association with non-seminoma testicular cancer. The evidence around lung cancer and other types of cancer is still unclear and/or insufficient. So, I think there’s a lot of potential for the group participating in this symposium to think through some of the goals for research and helping us get a better understanding there.

 So, why don’t we know more? Well, there have been a number of barriers to research and to doing research with real world products. Researching a Schedule 1 substance has been challenging and most of the studies being done are not using the types of products that are now readily available to people in states with legal markets. And those products may have different health outcomes than, say, smoked cannabis plant, for example. So, lots of potential to improve the ability that people have to do research in this space.

 I think we have a number of gaps in data monitoring and epidemiology right now. If we think about how we’ve learned much of what we know about the health effects of tobacco, it’s been from very carefully designed epidemiological studies. With regard to cannabis though, our federal surveillance systems are still lacking some basic questions, including for the most part mode of use. Most of the big surveillance systems aren’t asking are people smoking cannabis, vaping it, eating it, etc.? We also don’t have well tested indicators for a number of areas and some of that is because we need to do the work and some of it is because we don’t know how to get the information. So, with regard to type of product, is somebody using a product that’s high in THC or high in CBD? Early data is suggesting that people may not even know what they’re using and so it may not matter whether or not we have a well-tested question if people don’t know the answer to it. That’s a challenge.

 We also haven’t been successful in developing very brief questions that could be on large population-based surveys to understand the amount and quantify the amount that people are using. Marijuana is or cannabis is a heterogeneous product or plant with lots of different products, I should say. And so, getting at the amount which is so important for the dose related health effect studies has been challenging. There’s also an overlap with other substances, notably tobacco as you’ll hear more about in the next session, as well as alcohol. You know, tobacco and alcohol can be responsible for a number of the health effects I just reviewed. And so, deducing what is due to marijuana and what is due to tobacco has been challenging in the science.

 Evolving patterns of used products and modes of use is, I think, a really important one to underscore. In this newly legalized marketplace, we see people consuming cannabis differently than they did before. We see more frequent patterns of use. We see a wider range of products. And we see a number of modes of use that maybe weren’t just prevalent before that are, that all may have impacts for our understanding of the health effects of cannabis and need to be considered in studies.

 So, let’s talk briefly about who uses cannabis. And I’m using the term marijuana here because that’s what the surveillance system uses. So, this looks at past 30-day marijuana use by age. It’s data from the National Survey on Drug Use and Health. And we can see that over time, young adults have been the most prevalent age group in terms of marijuana use and that that use has been – or that prevalence has been increasing over time. We see a small uptick among older adults, age 26 and older. Around 2010, 2009, 2010, we see that uptick kind of start. Incidentally, that’s when the Ogden Memo that allowed for medical marijuana marketplaces or medical cannabis marketplaces to be established in states, that’s when that occurred. And then we see this relatively flatline among youth, ages 12 to 17. But this really just looks at past 30-day use, any use. And because of what I just showed about the health effects, we know already that some of those health effects appear to be associated in a much higher way with high frequencies of use.

 So, let’s look at that. These data show daily or near daily marijuana use by age among past month users and we can see again that young adults have tended to have the highest prevalence of daily or near daily use with about 40% of past month marijuana users who are 18 to 25 reporting daily or near daily patterns of use. We see an increase that’s been happening in older adults and then we see again this relatively flatline trend in youth age 12 to 17. Most of these data I’m presenting are very similar in the states that have legalized adult use. So, they have also seen a relatively flatline trend in past month youth, for example.

 But before we pat ourselves on the back as a public health community and conclude that the policy changes that are happening are not leading to increases in youth use, I think we need to consider what’s happening in the broader context. And I want to credit Dr. John Caulkins at Carnegie Mellon with first putting this idea in my brain, that we are really looking at one of the healthiest generations in sometime in terms of substance youth, with a number of indicators that have declined over the past two decades, including alcohol use, binge drinking, even use of elicit substances has been on a bit of a decline. There are only two areas for which we haven’t seen this decline and that’s with regard to cannabis use and e-cigarette use or vaping. And, of course, there’s an interrelationship between those. And so, it may be that the policies that are being implemented are resulting in more of a flatline trend when we otherwise would have seen a declining trend. It’s hard to know. But there’s definitely something going on there that warrants attention.

 So, let’s talk briefly about how cannabis is consumed. Cannabis can be consumed in a number of ways. Of course, there are the combusted ways using joints, pipes, bongs, bowls that many may be already familiar with. Use in blunts, which are hallowed out cigars filled with dried plant matter and spliffs, which are tobacco and marijuana cigarettes and are really the predominant way of consuming in Europe and in other countries. Those still exist. We have seen, however, an increase in other types of consumption, especially since policies have liberalized here in the U.S. Vaporizers for marijuana have been around for some time, three-four decades at least for the Volcano, which you see pictured. Early cannabis vaporizers though from the 70’s and 80’s vaporize dried plant matter. And what we’ve seen in the last 5 to 10 years is really an increase in electronic vaping devices that look very similar to what we see used for tobacco products. Some of those can used dried plant matter called dried herb vaping. It’s almost like a heat not burn type technology that’s been around for some time in the cannabis marketplace. But most of them are using concentrated oils that can be 60, 70, 80, up to 90 percent in some cases THC, which is a very potent product and we don’t yet know the full effects of that.

 There are edibles and beverages as well and you can see all the pictures and pretty much anything you can imagine there is possible. The real public health issue with those is the delay of onset. And I'll talk later about some of the public health interventions that have sought to rein that in. Dabbing is a mode that I think many of us had not heard a lot about until legal marketplaces began to open. Dabbing uses extremely concentrated products, concentrated THC products that can be 90-95% THC. And you put the THC on a heated metal element and inhale and get a very potent, very rapid high from inhaling. And so, I think we know very little about these. They’ve not been widely studied. It’s extremely concentrated product and we need to learn much more about the health effects of dabbing, particularly as it appears to be increasing. And then there are a range of other ways that you can consume cannabis. Many that align with other ways of consuming medical products like metered dose inhalers, suppositories, pills, tinctures, etc.

 So, how are people actually consuming? These are data from the 2016 BRFSS and I wish we had more recent data we could analyze and present, but, sadly, we don’t. So, these data found that about a third of users in 2016 from the 12 states that use this marijuana module, a third of users had multiple modes that they had consumed marijuana in during the past month. You can see that 90% of past month marijuana users, almost 91%, reported smoking it as one of the modes. So, smoked is still the predominant way that people are consuming it. About a quarter reported eating it. About a fifth reported vaping it. And 15% reported dabbing it. So, I think these modes are going to be very important to think about as we seek to understand the potential implications for cancer.

 So, now I’m going to drill into the policy and talk about how it varies across states and I’m really going to focus on what variables I think matter most for protecting public health and safety to give a context for the research that will be discussed through the rest of the symposium. So, this is a list of the 15 states and the District of Columbia that have legalized adult or nonmedical marijuana use and you can see the year that it legalized and the percent support if it was a ballot measure. In the case of Vermont and Illinois, both of those legalizations were legislative. They were not through ballot measures. And then you can see the delay before the retail marketplace opened if there is a retail marketplace. So, the District of Columbia is not permitted to have a retail marketplace, so they do not have one approved. And Vermont only just this past October had a legislative approval for a marketplace. They had previously had legal adult use but with no market. And you can see there’s a delay of between 12 and 24 months, in some cases slightly longer between when legalization passes and when a marketplace opens. And that may sound like a lot of time, but for states to stand up all of the functions of a brand new marketplace without federal standards and engagement in a lot of cases is a huge lift and public health is often not at the top of mind as they’re trying to check things off of their list to get a market open. And I think that’s really import context as we think about the policies that we have in place right now.

 So, I think the first big question in terms of protecting public health and safety is what regulatory scheme is chosen? And this is from work that John Caulkins and Beau Kilmer have put forward. You can see there are a range of policy options that could be chosen to legalize cannabis, all the way from complete prohibition and sanctions, which is sort of where we were, to a complete repeal of prohibitions without any regulation in place at all. And you can see really the options in the middle are probably likely to have some public health and safety protections that come with them. While cannabis policy looks very different across all of the U.S. states, there’s one thing they have in common: all adult use states to date have chosen a standard commercial model for legalization. And that presents inherent challenges to protecting public health and safety.

 So, within that framing, let’s talk about who regulate cannabis. Initial regulators in the early states tended to be liquor, alcohol, beverage control boards, Departments of Revenue, Finance, Taxation. And I think that’s important to acknowledge because a lot of the policies that we’ve seen have been drawn from alcohol. And so, that may be one of the reasons that, especially in the early states, a number of the regulators for alcohol also became regulators for cannabis. Public health has rarely had a role in regulating adult use, which is very different than medical use. I'll talk about that in a bit. Public health has only had a role in two states and that role has sunsetted or is sunsetting. There’s been a trend towards standalone regulators in states, standalone marijuana regulatory agencies or commissions. We now see four or five adult use states that have that place or are moving in that direction. And then local jurisdictions have a regulatory role in most states, but it’s usually limited to just zoning and enforcement of code and policy. It’s not often broad enough to allow for a lot of local experimentation. There are some exceptions to that. California in particular has given a lot of local oversight over policies. And that makes for interesting research potential as well.

 Let’s talk briefly about where the taxes are and where they go and why this is important for research as well. So, the retail excise tax varies widely across states from about 10 to 15% in a number of states, all the way to 37% in Washington. And I should just mention that New Jersey, I believe, is going to have an excise tax of 6%, so they will be at the low end. It’s interesting to note though that while Washington has a 37% excise tax, I think Oregon’s is 17% and yet you can still find three-dollar grams in both states. So, the market is deciding which price they think the consumers can bear and finding a way to get to that price regardless of some of the big differences in excise tax. But certainly, price and taxation is an area that stands to potentially influence behavior.

 So, Alaska is the only state with no user-based excise tax and Illinois is the first state to try a tiered tax based on THC content. So, in Illinois, if you purchase concentrates or processed edible type products, you’ll be paying a higher tax rate than if you purchase flour. And that will be very interesting to study and see how that might change consumption patterns and behavior as well.

 What do taxes fund? You can see a variety of things listed here. I think it’s important to note that a number of states do have money coming towards public health efforts, although that money is often not much and not protected and may be supplanting other funds. There’s also funding going to mental health and substance abuse or treatment. And then you’ll see that four states have funding for research: California, Colorado, Michigan, and Washington. In the case of California and Washington, this really takes the shape of funding going to in-state universities for research. In Colorado and Michigan, this is taking more the shape of research programs that are funding specific types of research in ways that model off of NIH funding approaches. So, I mention that because I think it’s important for researchers in the field to be aware of the fact that some states are funding research out of their tax dollars and that there are some opportunities to explore important questions through those mechanisms.

 So, how is the market structured? I think this is another critical question for public health. We typically see three different license types: a cultivator, a processor, and a retailer. So, that means you can grow or you can process it into something or you can sell it. Increasingly though, we see two other license types springing up. One is for delivery and there’s not a lot of research on the potential public health outcomes from delivery. Actually, getting somebody to deliver your marijuana or cannabis to you much like Uber would for food, for example. It may be that delivery prevents some impaired driving. It may also be that delivery leads to potential youth access and diversion. So, more to learn on that one. And then I'll talk about social consumption in a bit.

 Vertical integration is another important question from a public health perspective. This means that somebody can grow the product, they can process the product and they can sell the product. And, of course, being able to do all three, you may be a bigger operator. You may also have lower costs and so that can impact price. Vertical integration is allowed but not required in almost all states. Washington is the one state that does not allow it.

 And then adult use home grow, that means that you can grow the plant for nonmedical purposes at your home – is allowed in all states except for Washington and Illinois. And that can be important for public health as well because of the potential for diversion or youth access and also because products grown at home aren’t subject to the same testing requirements that states have.

 So, what’s legal in states? Most states have a legal limit of one ounce or an equivalent of seven to eight grams of the concentrate. And you can see from the picture, one ounce is quite a bit of marijuana. There are two states, Massachusetts and Oregon, that have higher home possession limits. In terms of the types of products, while we have seen medical states really restrict certain product categories in some cases, we have not seen that in adult use states. So, almost all products are allowed on the adult use marketplace. There are some limitations that I'll talk about around appealing to youth. And then California and Washington have some requirements that edible products can only be shelf staple and part of that is around food inspection challenges. But we see all types of concentrates and vaping oils and beverages and edibles on these marketplaces. Vermont’s legislation that passed in October was the first to try to set a cap on potency on THC. And they will have a 60% cap, so THC cannot exceed 60%, which would reduce the types of concentrate products that we tend to see in other marketplaces. So, that will be an interesting case to observe. And then we’ve seen all states converge on a serving size for edible products and part of that’s around helping to avoid over consumption and helping to prevent accidental consumption in high doses. So, states have culminated on either 10 mg or 5 mg. I think we have four states now that have 5 mg: Alaska, Oregon, Massachusetts, and Vermont. And in many of those states, the serving size has to be individually packaged as well.

 So, what’s allowed to be in the products themselves? This is a question that I didn’t think a whole lot about until E Valley (ph.) happened. And I think that was an eyeopener that in particular the vaping products, the vape oils that were being sold that were highly concentrated THC also had a number of other excipients and diluents that had been added to them for a variety of reasons that I don’t have time to get into. We’ve also seen an increase, I think, in the use of flavors or terpenes, again, primarily in these vape oils. So, terpenes are naturally occurring in the cannabis plant. They give the plant the aroma and flavor. But what’s happening is they are either being extracted from the cannabis plant or they are being extracted from other plants or made synthetically and being added back into vape oils, often at much greater ratios than they would naturally occur in the plant. And, as you can see, many of the flavors, even if they are inherent to the cannabis plant, might be particularly appealing to youth. There are a number of other additives that can potentially come with terpenes as well. Many states are now working on getting better ingredient disclosure. Terpene manufacturers often claim trade secrets and so we may not know all of the components that are included in terpenes that are added and some of those may have important public health and safety implications. So, a lot to learn in this space as well.

 How are products tested? This could be a whole separate presentation, so I'll be very brief and say that in all states testing is done by third party labs and that’s partly due to the Schedule 1 designation of cannabis. Reference labs, which would be state run or public labs that could serve as an arbiter between different testing results across labs, those are relatively uncommon, again because of the Schedule 1 designation. So, there’s certainly lab shopping that happens. The labs that do the testing have as their clients the industry and so that can lead to lab shopping to try to get a higher THC read or something like that. I don’t think I have time to talk in detail about how products are tested or sampled, but there are variations across states. States are also testing for a variety of different things, especially with regard to mycotoxins. Not all states are testing for that. And states test for a variety of heavy metals, not all the same, and some states are still not testing for heavy metals, which have been detected again in particular in vaping devices. And then remediation for a product that fails testing is also common in states. Products in particular that fail for yeast or mold may be able to be made into a concentrate, for example, and retested through that mechanism.

 So, let’s talk about how products are labeled. You can see that seven states now have universal symbols in place for their products and that’s something that goes on the package to denote that the product contains marijuana or cannabis. Those are really important again in terms of preventing accidental consumption and helping people understand what’s in the product. So, that’s been a public health win, I would say in terms of policy that we didn’t see out the gate in Colorado and Washington and now we see as a standard. Warning labels are also required on products in all adult use states and these vary widely. I think this is an opportunity for public health to learn from some of what we’ve learned in the tobacco control realm. You can see some examples of these labels. They have a lot of things. They are fine print. They are hard to read and some early research is suggesting that consumers really aren’t focused on them and aren’t taking away information from them. So, that’s problematic.

 On the other hand, our neighbors to the north in Canada have a nationwide requirement, a federal requirement for these big yellow warning labels that have rotating warnings that accompany them and likely are reaching consumers with messages better than what we’ve seen here in the U.S. There are lots of other labeling considerations for public health: font size, color, whether or not products can make medical or health claims or have endorsements as well. And these are some of the topics we see states including on their warning labels. And you can see that warnings look different across every state as well. What are the potential implications of that for consumer understanding and awareness?

 How are products packaged is another important question for public health? We see all states now requiring child resistant packaging, often in opaque packages as well, which I think is, again, a public health win in terms of preventing accidental consumption. We also see all states have some language in statute that their products should not appeal to children and most states take this one steps further and say that products should not contain cartoons, should not depict the product, should not depict a youth consuming the product. But the enforcement on this is extremely challenging to decide where to draw the line and what really constitutes appeal to children. So, again, I'll point to our neighbors to the north. In the U.S., our adult use states have generally told licensees what they cannot do. They cannot appeal to youth and interpreting that is hard. In Canada they’ve told licensees what they can do and they have a plain package that you can see below that again probably has a lot of potential benefits for public health and standardization and enforcement.

 What requirements exist for retail stores? I’m short on time so I want to be quick here but mention that all states have some zoning setbacks. Few states have density caps though and it’s probably important, as we’re learning from research, that those are coupled together so that we don’t end up seeing a number of cannabis retail outlets all located in one low income, for example, neighborhood. So, zoning and density probably need to be coupled together a bit more. There are limits on what’s allowed to be sold in all states in stores and for the most part these are standalone marijuana only or cannabis only stores. They are also adult only retail stores with required ID checks at purchase, which would be a dream in tobacco control in terms of preventing youth access. So, I think that’s been a piece of policy that appears to be serving public health well. There’s an area of opportunity in terms of working with bug tenders, who are the people who actually sell the products. A number of states have found through qualitative work and focus groups that bug tenders are among the most trusted source of information about cannabis products, both medically and nonmedically used. And yet there are few if any programs in place to train bug tenders. There’s an optional program in Colorado. There’s a particular license that can be sought or an accreditation that can be sought in Washington State, but that’s an opportunity.

 Where are people allowed to consume the products? Again, a critically important question for public health and for cancer. We know well the dangers of secondhand tobacco smoke exposure. Early research out of the University of California and Matt Springer’s group is suggesting that we may be seeing some of the same health implications from secondhand marijuana smoke. But even if we don’t know that, rolling back clean indoor air policies will have implications for cancer. And so, what we’ve seen now is four states that are prohibiting and social or public consumption. Two states, California and Illinois, that are pushing it to the locals but don’t have a state licensing process. And then three states, Alaska, Colorado and Michigan, that are allowing statewide licensing with local approval for onsite or social consumption in retail stores in some cases, like Alaska, and in other spaces in the case of Colorado. Massachusetts currently allows it but it’s in violation of state law so it’s not happening there. And this is a tough one for state regulators because I think they’re being pushed in this way in part because of tourism, but also because legalization really only legalized the substance for people who own their own home because public use on the street is not allowed, like tobacco, for example. It creates a situation where people who rent or who live in federal housing live in a state where it’s legal but it’s not really legal without law enforcement for those individuals. So, it’s challenging, but certainly rolling back our clean indoor air policies will have dangerous implications for cancer and other health outcomes.

 What advertising is allowed, I think is another important question as we think about protecting public health and safety. And in all states, you can’t advertise therapeutic benefits or health effects. You can’t make false statements. Youth advertising is prohibited. But all states are allowing some sort of TV, radio, print, or internet ads. And the space for cannabis looks much more like the alcohol space than it does the tobacco space. You can see there are some restrictions on billboards. Some states requiring warnings. But advertising is out there in a way that it’s not for tobacco products. And in particular, third party groups are not subject to any state regulations. So, Weedmaps or Leaf Leaf, for example, they’re not subject to any regulations the state would have on advertising. And social media, I think, has been another space where states have struggled to figure out how to regulate a lot of brand advertising that occurs that can present challenges for protecting public health and safety. Many of the advertising provisions that we see in states were drawn from provisions that the alcohol industry drew up themselves to regulate advertising. For example, no more than 31% of the viewership was deemed to be under age, for example. But that means that a third of people who are potentially viewing your ads are under age. When worded that way, that’s probably not something that we would say is great for public health.

 I want to touch briefly on social equity provisions. Obviously, the enforcement of former drug policies has not happened equally across the board and certain populations and communities have been disproportionately impacted. And so, there’s been a move in policy in U.S. states to try to rectify this and that’s happened in a lot of ways, including trying to provide access to the new industry that’s developing in addition to expunging criminal records and trying to right the wrongs of past arrests, for example. I think this is an important topic for public health and for cancer because we know that when someone’s incarcerated, it changes almost all of their health outcomes and has some implications for cancer risk and cancer mortality as well. And I think there’s an opportunity for public health to do more in this space and to make sure that the dialogue is including discussion about the public health aspects of the disproportionate impact that’s happened. So, I hope that this will be an area that is continually discussed.

 There are a number of other policy issues that I don’t have time to get into much today. How to detect and approach impaired driving, which has a lot of challenges. What safeguards to put in place for environmental impacts? These are important for public health as well, but out of the scope of my comments today.

 Briefly, I will mention some details about medical legalization policies in the U.S., which look somewhat different from the adult used policies I just reviewed. On the medical side, the public health agency is often the regulator and there’s a wide range of regulations that we see in terms of some states that have a very restricted number of retail outlets and other states that don’t restrict that at all. Some states that are very restrictful in the types of products that are available. There are six states that don’t allow any edibles, for example, and there are six states that don’t allow any smokable products, and then other states that allow everything. The use of home grows varies whether or not products and packages for products are preapproved by the regulator or not varies. What is allowed to be in the products in terms of flavors or terpenes or approved additives. Registries, cards and fees also very widely. Who can dispense products? Some states have pharmacists, for example, or other clinicians engaged in actually dispensing products. What advertising is allowed? A handful of states have bans on any advertising for medical cannabis. And then whether or not lab testing is happening and for what? I talked about that there’s a wide range of indications and not all based on the science. And, importantly, I think what we’re doing on the medical side often creates a framework in states for adult use. So, we should not ignore the medical landscape.

 There are a couple emerging areas of cannabis policy that we should also be aware of. In particular, some changes that have happened to policy because of COVID. Most states are allowing some sort of curbside pickup and/or delivery and I think in many cases, those policies will become permanent without the usual exploration of the impacts that they might have on various outcomes that often occur before policy changes. States are also undertaking revised inspection approaches and some of those may become permanent as well.

 I don’t have much time to talk about hemp or CBD policy, but, as hopefully most of you are aware of, the 2018 Farm Bill effectively unscheduled hemp, which is defined as products with less than or equal to .3% THC. So, there’s an overlap in regulations and I think because consumers are not necessarily aware of what they’re consuming, whether it has THC or CBD or Delta-9 THC or Delta-8 THC, it becomes important to think about how policies are paralleling each other on the cannabis side and the hemp side and allowance, for example, of certain packages or types of products for hemp that are different than cannabis may create confusion. And we’ve seen increased marketing of certain cannabinoids, for which we know very little about CBG, CBA, Delta-8, Delta-10, etc. So, again, I think the effective legalization of hemp is a callout for even more research to better understand the safety of a range of cannabinoids that we haven’t previously looked at in depth.

 So, in conclusion, I would say that we’re still very early in this policy experiment and if you’ve seen one state, you’ve seen one state. There’s a lot of heterogeneity. There are similarities between cannabis and other products, like tobacco, alcohol, and prescription drugs. But there are also some big differences. And so, I think it’s important to take from what we’ve learned in approaching research in those other areas, but also recognize some of the big differences between cannabis and those other products. I think there are research challenges that have slowed our scientific work in this space and I know that many engaged in this symposium are aware of those and are working to try to create avenues that will facilitate quicker research.

 Policies are heterogeneous across states and within states. And so, research that engages policy really needs to acknowledge that it is not sufficient to just do binary modeling of whether there’s adult use in the state or not. There are a host of variables that need to be considered and some local level policies and bans that would impact findings. So, a much more careful eye I think is needed towards policy related research.

 We have a commercial model in the U.S. and yet consumer awareness and protection has generally not been a priority and consumers are, as early data suggests, not necessarily aware of the types of products they’re consuming, what’s in them, the effects that they might have, etc.

 And so, I think protecting public health and safety in the face of a rapidly evolving policy landscape and industry is challenging and, again, one of the reasons why I think this symposium is critically important. So, thanks again to the National Cancer Institute for pulling this together and for engaging me as a speaker. I am happy to hear from any of you and to keep the dialogue going. Thanks a lot. Take care, everyone.

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