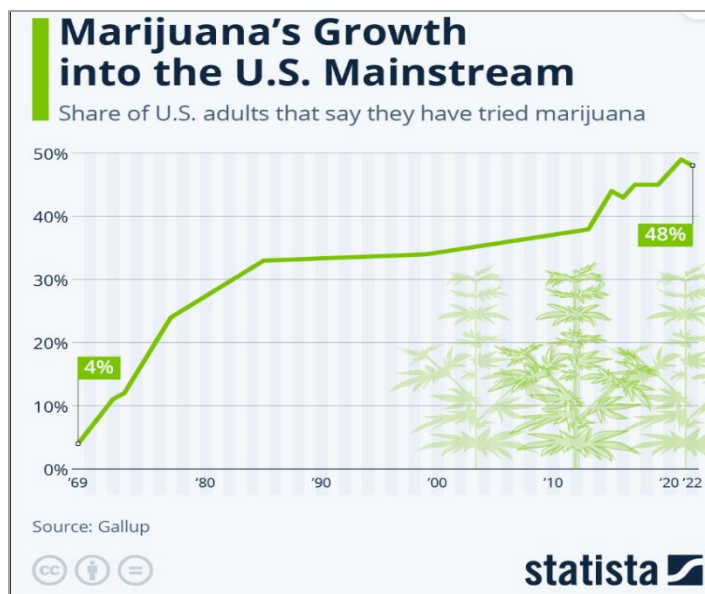


National Conference of State Legislators. State Regulated Cannabis Programs. *State Medical Cannabis Laws*. 2023, <https://www.ncsl.org/health/state-medical-cannabis-laws>

This policy supplement provides additional guidance (summarized in Table 2) for the American Heart Association in key policy areas related to cannabis, including legalization, public health infrastructure, workplace safety and drug testing, retail density, the cannabis marketplace, criminal and social justice, Food and Drug Administration (FDA) regulation of drugs and food and nutritional supplements, reducing youth use, drug testing for government assistance programs, school policy and expanding research at the federal and state levels. Table 3 summarizes the areas of intersection between marijuana and tobacco public policy.



Youth Uptake and Adult Use

Marijuana is the most commonly used federally illegal drug in the United States. Data from 2019 show that 48.2 million people, or about 18% of Americans used it at least once that year and recent data indicate these numbers are continuing to rise.⁴ Gallup Survey data reveal that 49% of adults in the US have ever tried marijuana.⁵

Of significant concern, results from the National Survey on Drug Use and Health and the most recent Monitoring the Future Survey show concerning rates of adolescent and young adult cannabis use and indicate it is the second most used drug in the U.S., behind alcohol use and ahead of nicotine vaping.^{6,7} According to the

[Chart: Marijuana's Growth into the U.S. Mainstream | Statista](#)

Monitoring the Future Survey, about 31% of 12th graders used cannabis within the previous 12 months

in 2022, with almost 21% reporting using vaping devices to consume cannabis.⁷ In the same survey, just over 6% of 12th graders use marijuana daily and 2% reported vaping marijuana daily.⁷ Between 2017 and 2019, cannabis use without vaping significantly declined, but vaping cannabis increased significantly across almost all adolescent groups.⁸ One analysis found that flavored vaping products, particularly candy/dessert, fruit, and fruit-ice combination flavors, were strongly correlated with adolescents' willingness to try vape products (nicotine or cannabis) versus non-flavored/tobacco-flavored products.⁹ This was also true for those who reported not using any nicotine or cannabis products, who expressed a preference for flavored products if they were ever to try vaping.⁹ For exclusive marijuana users, non-flavored vaping was preferred.⁹ In the 2020 Monitoring the Future survey, high school seniors had higher odds of vaping cannabis within the previous year in approved for medical use-only states versus prohibited states, but this was not true for adult recreational-use states.¹⁰ The authors expressed the reason for this was the greater availability of vaping products and perceived decreased risk.¹⁰

Background on Health Effects

Brain

During pregnancy, delta-9-tetrahydrocannabinol (THC) can enter the fetal brain through the mother's bloodstream. In addition, THC has been found in breast milk for several days after use.¹ The endocannabinoid

system is critical in the regulation of the stress response and anxiety.¹¹ In addition, a high density of cannabinoid receptors, called CB₁ and CB₂ is found in areas involved in cognition and behavior, particularly during periods of active neurodevelopment and maturation. Data obtained in preclinical models show that the disruption of the endocannabinoid system by exogenous THC during periods of vulnerability, including the prenatal, perinatal, and adolescent periods, can affect the development of neuronal networks involved in cognition and emotional regulation.³ While it is uncertain what impacts THC and other external cannabinoids have on the developing endocannabinoid system in humans, in 2019, the U.S. Surgeon General released an advisory regarding the harms and potential harms of marijuana use to the developing brain.¹ Due to the potential impacts on development, the American College of Obstetricians and Gynecologists recommends that women avoid using marijuana while trying to become pregnant and during pregnancy, while both the American College of Obstetricians and Gynecologists and the American Academy of Pediatricians recommend avoiding the use of THC products during breastfeeding.¹² A recent cross-sectional study found that pre-natal THC exposure was modestly associated with increased risk of childhood psychopathology.¹² This association remained significant after controlling for the increased co-use of tobacco and/or alcohol in those that used THC during pregnancy.¹² A follow-up analysis of individuals from the same study group found changes in the functional neural networks with magnetic resonance imaging that are linked to the psychopathology found in these children.¹³ As the brain continues to develop throughout adolescence and young adulthood, it is also important to understand the impact of THC exposure during these periods. A recent meta-analysis found young adult users have 37% greater odds of developing depression, 50% greater odds of suicidal ideation, and almost 3.5 times greater odds of attempting suicide than non-users.¹⁴ Though the overall, individual, risk remains relatively low and there may be reverse causality, the increased permissiveness and access to THC products may inherently place a greater number of individuals at risk for depression and suicidality.¹⁴ Cannabis use has also been associated with an increased risk of schizophrenia and other psychosis-related outcomes.¹⁵

Cardiovascular

Data from the U.S. National Vital Statistics System found an increase in cardiac-related deaths since the legalization of marijuana, particularly in states with more permissive dispensing laws.¹⁶ The understanding of the full impacts of these products is not well understood. This is due in part to the federal Schedule-1 controlled substance designation, and the related higher potency of modern cannabis products compared to what has been tested.^{16 17} That is the level of THC potency is limited to about 12% for research in the U.S., where it can exceed 35% in products on the market.¹⁷ Nevertheless, there is an emerging body of evidence linking marijuana use and increased cardiovascular risks, including arrhythmias, myocardial infarction, or cardiomyopathy.^{17 18 2} However, there is a paucity of rigorously performed studies. Additionally, which of the over 100 plant chemicals in the cannabis plant are responsible for the risk is less clear. For example, CBD has been found to have anti-inflammatory benefits, but other cannabis compounds can cause tachycardia that leads to elevated cardiac oxygen demand and ischemia.^{17 18} Further, the dose and method of consumption has an impact on the cardiovascular risks. For example, smoking marijuana can lead to decreased coronary blood flow and lowered oxygen supply as a result of the formation of carboxyhemoglobin.¹⁸

The effects of cannabinoids on the system are controlled by the endocannabinoid system, with receptors, CB₁ and CB₂, found throughout the body. CB₁ receptors are found in the central and peripheral nervous system, cardiac muscle, and the smooth muscle of the aorta and vascular endothelium, and platelets.¹⁶ THC primarily binds to CB₁ receptors and associated cardiovascular events have been attributed to sympathetic nervous system activation, increased catecholamine and beta-adrenergic stimulation, platelet activation, and vasoconstriction.¹⁶

CB₂ receptors are primarily found in the immune cells and tissues, which is the most likely reason why CBD (which preferentially binds to CB₂ receptors) has anti-inflammatory properties.^{16,18}

Particulate levels from marijuana smoke are higher than tobacco smoke.¹⁹ The average PM_{2.5} emission rate of pre-rolled marijuana joints is 3.5 times the average emission rate of Marlboro tobacco cigarettes.¹⁹ Exposure to fine particulate matter can cause cardiovascular disease, lung irritation, asthma attacks and makes respiratory infections more likely.²⁰

Cannabinoids are metabolized through the liver's cytochrome P450 system.^{2,16,17} This is the same system where a number cardiovascular-related medications are metabolized. The consequence of this may be an increased risk for drug interactions with co-use of cannabis and certain medications. There is a need for more formal human-drug interaction studies to supplement the stronger animal model data. Clinicians and patients need to be aware of these potential drug interactions, particularly for (though not limited to) antiarrhythmics, anticoagulants, beta-blockers, and statins.¹⁶ These drug interactions could have harmful clinical implications, which could be missed if clinicians do not screen for cannabis use or if patients withhold the truth.¹⁶ Patient and clinician education is paramount to preventing these consequences.

The Current Marketplace for Cannabis Products

The cannabis market continues to grow across the country. Legal sales topped \$12 billion in 2019 and are forecast to top \$30 billion annually within the next four years.²¹ In 2019, the legal cannabis industry employed nearly 250,000 people, a 15% increase from 2018.²² Leading industry players include Scotts Miracle Gro Co., Canopy Growth Corp., GW Pharmaceuticals PLC, Aurora Cannabis, Inc. and Aphria Inc. Increasingly major tobacco companies are investing in and buying shares of cannabis and marijuana companies and diversifying their products to meet the needs of those who use marijuana. Tobacco companies are also lobbying for cannabis/marijuana at the state and federal levels.

The Influence of Marketing on the Expected Effects of Cannabis (THC)

According to a science review, the US, Canada, and UK directed about \$1.6 billion towards cannabis research between 2000 and 2018, with research focused on the potential harms out-pacing therapeutic research two-fold.²³ Accordingly, with growing legalization and decriminalization in several states, the marijuana industry is investing in effects-driven marketing, inferring positive benefits, to position their products in the marketplace.²⁴ In the flower form, cannabis strains can be somewhat unpredictable, because of the variances related to the environmental conditions in which the plant was grown, the age of the plant when harvested, the parts of the plant used, and individual reactions by users.^{24 25} Terpenes are the naturally occurring phytochemicals that are primarily responsible for the aromatic characteristics of cannabis, and create cannabis sensory attributes that are referenced by effects-based marketing.²⁵ Producers of edibles, capsules, beverages, and vape products might add terpenes to cannabinoid distillates to create composites, to theoretically induce the same experience every time.²⁴ However individual physiological response to the same product can vary significantly, also partially determined by what food has been eaten, how long since the last meal, and medication interactions.²⁴ Further, there may be some placebo effect induced by the marketing and packaging of a product.²⁴ Consumers are more likely to use a product if they believe that effectiveness and safety are related to the source, perceived benefit, and positive anticipated effects.^{25 26} In summary, even with little hard evidence, there is some indication that effects-driven marketing may influence the anticipated and perceived effects users experience with cannabis products.

Retail density

The density of retail outlets is growing exponentially across the country for both medical dispensaries and retail outlets for recreational access. The figure below illustrates this growth compared with other recognized retail chains.

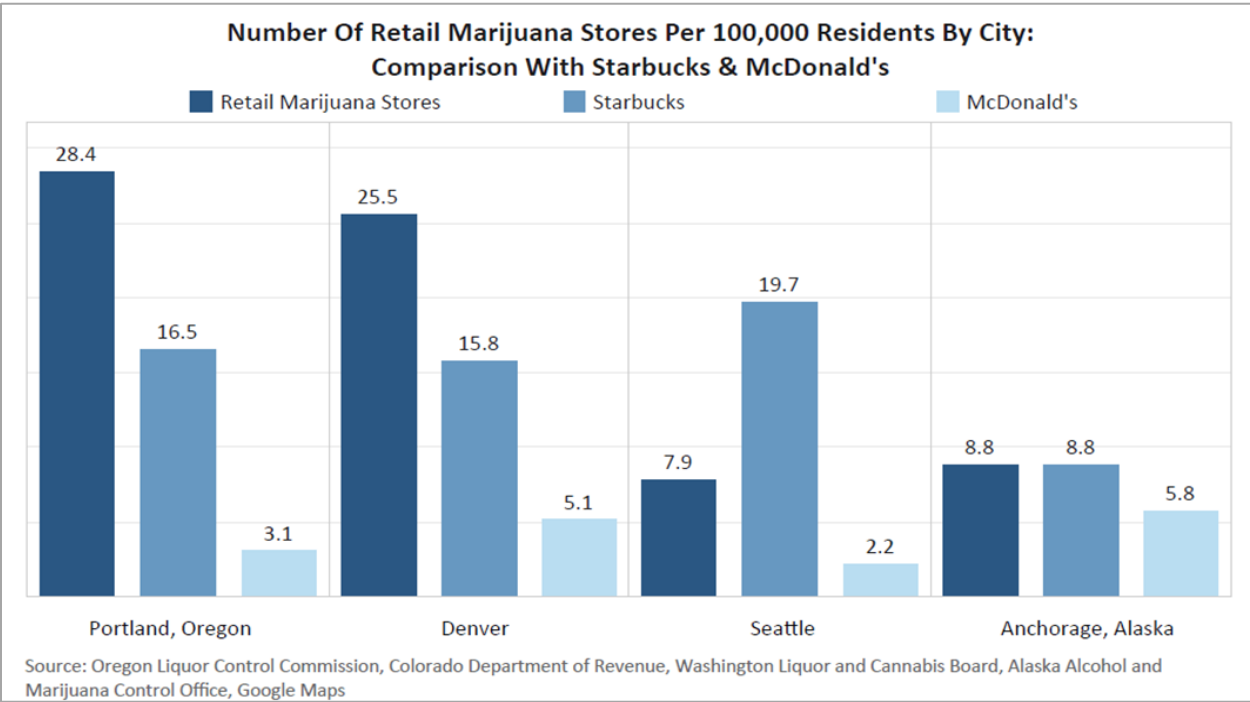


Table 4 summarizes the types of cannabis products that are currently in the marketplace.

Different ways of consuming cannabis:²⁷



The *flower* or bud is the smokable part of the cannabis plant and is cultivated, harvested, dried and cured before being sold. There is no standard dosing, potency varies and the high can be short-lived (1-3 hours). Since the flower is smoked, it is absorbed through the lungs and the high is almost immediate.



Concentrates are made after the excess plant material and other plant impurities are removed, leaving a much higher concentration of the cannabinoids and terpenes compared with the flower. Concentrates can be consumed in a number of ways, including vaping and are very potent with rapid onset of the effects.



Edibles are cannabis-infused food or drinks that can be made with either the cannabis flower or concentrates. They are sold in numerous forms including baked goods, chocolate bars, gummies, mints, beverages, cooking oils and popcorn. They are obviously eaten or drunk, they are manufactured with precise doses, and because they are absorbed through the gastrointestinal effect, there is a delayed onset of effect (usually about 20 minutes but sometimes out to 3 hours). As a result, some people ingest additional edibles when they do not experience the effect right away and this can lead to overdose. Typically, the effects of an edible last 4-6 hours.

TROUBLE SLEEPING?

Try our most popular sleep gummy for free

Three containers of Simply Crafted High Spectrum Deep Sleep Gummies, Sunset Strawberry flavor. The containers are red and black with a white cannabis leaf logo. They are labeled 'Simply Crafted HIGH SPECTRUM DEEP SLEEP GUMMIES' and 'SUNSET STRAWBERRY'.

Contains 5mg THC per piece

CLAIM YOURS NOW

Just pay shipping



Tinctures are herbal solutions created by steeping the cannabis plant in alcohol. They are typically consumed sublingually and absorbed through the blood vessels under the tongue and any amount remaining is swallowed and absorbed like edibles through the GI tract. They have a fairly rapid onset when taken sublingually (about 15 minutes) but they can have delayed effects like an edible. They can lead to an extended high. They have precise dosing like edibles.



Topicals are cannabis-infused products including lotions, sprays, transdermal patches that are applied directly to the skin. They typically provide localized effects to the specific area of the body where they are applied without a high. Since CBD is better absorbed by the skin, CBD topicals can deliver a stronger effect.

Delta 8 vs Delta 9 THC

Delta-8-THC is an isomer or a chemical analog of delta-9-THC, the molecule that produces the experience of being high for users when they ingest cannabis.²⁸ Delta-8-THC differs in the molecular structure from delta-9-THC and as a result has a lower affinity for the CB₁ receptor and therefore lower psychotropic potency than delta-9-THC.²⁸ Delta-8-THC is found naturally in cannabis, though at substantially lower concentrations than delta-9-THC.²⁸ It can also be synthesized from other cannabinoids.²⁸ Due to technical language in the 2018 U.S. federal law in The Agricultural Improvement Act of 2018 that removed industrial hemp from the definition of marijuana, hemp-derived delta-8 THC is essentially unregulated.²⁹ Now, products with Delta-8-THC are proliferating in the marketplace. There is almost no research on its physiological and long-term effects.^{29,30} In one evaluation of 10 commercial products there were significant impurity levels detected that suggested actual delta-8 purity levels around 7 to 13 percentage points lower than labeled.²⁹ In another study of vape fluid, 22 of 27 products contained olivetol, a respiratory, eye, and skin irritant that is likely the result of a CBD reaction.³⁰ These delta-8 THC products, despite their marketplace proliferation, have inconsistent regulation regarding consumer safety and labeling,³⁰ poor post-reaction purification, and inconsistent, purity certification practices.²⁹

Legalization

Legalization of marijuana for medical purposes should align with patient safety and efficacy. Legalization of marijuana for recreational use will remain a significant public health concern until there is more research on safety and long-term population health effect across the life course and we fully understand the equity and social justice impact of these laws. Cannabis should be removed from its Schedule 1 categorization in the U.S.

Controlled Substances Act to allow for more robust research and a more coordinated approach at the state and federal levels regarding marijuana regulation and legislation.

It is important to note that patients who use medical marijuana in states where it has been legalized do it without much support from the traditional medical system due to a variety of issues: Health insurance does not cover medical marijuana, only a small number of states and Washington, DC recognize a medical marijuana card issued by other states, so patients must refrain from travel, forgo relief from their symptoms, or risk arrest by bringing their marijuana across state lines, and also many medical professionals do not have the training to discuss marijuana use with their patients for their conditions, leaving patients to work through their use with trial and error.

Public health infrastructure with legalization

In 2014, Colorado became the first state to legalize recreational and medical marijuana use. The state's experience has shown that a robust public health infrastructure is essential for effective protection of population health. As states legalize both medical and recreational use of marijuana, they must reconcile the proliferation and use of products in the statutory and regulatory environments. Colorado, for example, has harmonized packaging and laboratory testing requirements for medical and recreational marijuana.³¹ Health care providers should have clear direction on how they can discuss cannabis use as a therapeutic option in accordance with state regulation. There is also significant variation among states in how they define "medicinal." Ideally, these definitions should be harmonized.

If marijuana is legalized, federal, state and local governments should develop, adopt, monitor and evaluate strict regulatory mechanisms to control marijuana production, sales and use while advancing the public health goals of preventing access by minors, protecting and informing consumers of legalized marijuana and protecting third parties from unwanted consequences of legalized marijuana use.³¹ The public health framework should monitor patterns and health effects of marijuana use, develop robust enforcement around product integrity, include better labeling of products indicating concentration and possible health-related effects, sales tracking and food safety, ensure a competent and informed public health work force and conduct mass-market health communications through public awareness and education campaigns on adult recreational marijuana laws.³¹ The public health infrastructure should be adequately funded to minimize the impact of substance use on population health, especially in under-resourced communities. It is imperative that states prevent recreational access and availability to youth and adolescents, particularly in the context of the rising dual use with e-cigarettes. There is significant interaction between marijuana and tobacco public policy including sales age restrictions, retail licensure and compliance, excise taxes, comprehensive smoke free air laws, professional education, screening within the clinical environment and cessation coverage. These efforts should be adequately funded and at least some portion of the revenue from marijuana taxation should be directed toward programs and services that improve public health. States need a supportive, robust public health infrastructure to address the entire public health response that incorporates surveillance, prevention, counter-marketing and public safety.

Workplace safety/drug testing

Employers and employees are caught in the federal/state divide on cannabis law. Testing positive for marijuana in the workplace can jeopardize hiring, acquiring employment and job security. THC, the main psychoactive compound of marijuana, metabolizes quickly into compounds that can remain in the body for days to weeks after consumption.³² Most tests detect THC metabolites, which only can indicate prior usage but cannot assess

impairment of the user.³³ Since marijuana is still classified as a Schedule 1 drug under federal law, states and localities now face the decision of how to mitigate worksite safety laws and policies related to the legal use of marijuana among their employees. Employers that receive federal grants and federal contractors face a further dilemma as they are required to uphold federal zero-tolerance and drug-free policies in states where medicinal and recreational marijuana is permitted. Although these work environments are regulated by the Drug Free Workplace Act, the act does not require employers to conduct mandatory drug tests and has left regulation and enforcement up to states.³⁴ Additionally, more restrictions are placed on public employers than on private employers. Many private employers are not required to conduct drug testing, and many states and local governments limit or prohibit testing unless deemed necessary by the nature of the job.³³

The increasing number of states legalizing marijuana has resulted in a rising rate of failed drug tests among employees.³⁵ Some states and cities have prohibited employers from conducting pre-employment marijuana tests, while implementing certain exceptions for safety-sensitive positions and jobs that are subject to federal regulation.

There are also considerations for employees who drive a vehicle for their employment. Employers are required to do drug testing as part of pre-employment for those who will be driving a commercial motor vehicle with a Commercial Driver's License and testing is also generally required if an accident occurs.³⁶ Both cannabis and alcohol impair driving-related ability in a dose-related effect, however, cannabis response has more individual variability due to tolerance, differences in the way the product is consumed, and different absorption rates of THC.³⁷ Additionally, unlike alcohol, there is not a clear relationship between a person's THC blood or plasma concentration and impaired driving.³⁸ Detection of THC metabolites in the urine only indicates prior exposure.³⁸ The detection time is significantly past the window of intoxication and impairment.³⁸

In addition to driving during employment, there are other important implications of marijuana legalization on the workforce, including the possibility of absenteeism and presenteeism.³³ Protection for registered medical marijuana patients continues to be a divisive issue for states. Although some states have passed legislation to prohibit employers from discriminating against employees who use authorized medicinal marijuana, other states allow employers to fire employees who test positive for marijuana even if legal use is off-duty or for a medical condition.

Use of marijuana in or near the workplace, or presenting to work under the influence of marijuana, may impact productivity and safety. States must embrace evolving marijuana laws and consider appropriate accommodations and policies for employees who legally use marijuana. Additional workplace issues such as workers' compensation insurance, unemployment benefits qualifications and wrongful termination claims are further complicated by the lack of guidance on marijuana related incidences. A court ruling in Pennsylvania may serve as a precedent for workers across the country who fail a drug test for using a legal marijuana product.³⁹ The court ruled that an occupational therapist was eligible for unemployment benefits after she was fired by her employer for failing a drug test from a CBD product she was using for cancer treatment. Employers should establish and communicate clear policies regarding the use of marijuana and CBD products by employees, alignment with state and local statutes and the consequences on hiring, employment and job security.

Drug Testing and Public Assistance Programs

Over the last decade, several states have required those applying for and/or receiving cash assistance under Temporary Assistance for Needy Families (TANF) to undergo screening for illicit substance use, and then if the screening results indicate potential use, beneficiaries are required to undergo chemical drug testing.⁴⁰ The

courts have rejected broad-based testing on all applicants as unconstitutional under the Fourth Amendment, which prohibits unreasonable searches since the testing is deemed search without cause.⁴⁰ That is why states have initiated the screening first. More recently, states have tried to apply similar rules to the Supplemental Nutrition Assistance Program, Medicaid, and Unemployment Insurance. Because these are programs administered through federal-state partnerships, with specified eligibility rules, states cannot add their own eligibility conditions without federal approval.⁴⁰ The federal government has largely denied these additional conditions and in some cases, states are legally challenging the federal agency action.

Generally, this screening and drug testing is expensive for states to administer and in states where implemented these operating costs are not offset by the number of people who test positive and are denied benefits. It is only a small percentage of applicants that typically test positive.⁴⁰

Marijuana legalization and criminal and social justice

There is emerging evidence on the effects of marijuana legalization and decriminalization on equity and incarceration rates in the United States.

- Approximately 1.6 million people in the U.S. were arrested on drug-related charges in 2017, 40.4% of which were related to marijuana possession or sale.⁴¹
- Despite only comprising 31.5% of the U.S. population, 49.6% of people arrested for drug law violations are Black or Latino.⁴²
- Adults who are Black are more than three times more likely to be arrested for possession than those who are white, despite similar rates of use.⁴³
- Racial disparities in arrests persist across the country and have not improved since 2010, even in states that have legalized and decriminalized marijuana.⁴³
- In every state, those who are Black are arrested for marijuana possession at a higher rate than those who are white.⁴³
- In Washington, DC, those who are Black are 11 times more likely to be arrested for public marijuana use in comparison to whites.⁴⁴

Overall, marijuana arrests decrease after legalization.⁴³ However, racial disparities still exist in the enforcement of marijuana laws. For example, in Colorado, those who are White have experienced the greatest decrease (51%) in marijuana arrests while those who are Hispanic and Black only experienced a decrease of 33% and 25%, respectively, between 2012 and 2014.⁴⁴

Decriminalization and legalization of marijuana by states can have varying effects on vulnerable populations. High rates of criminalization have strong implications for individuals and communities, as arrests and convictions are known to have negative impacts on school completion, federal financial aid, public housing, employment, custody determinations and immigration status.⁴⁵ For generations, communities with greater numbers of Black and Hispanic residents have disproportionately suffered from criminalization rates related to marijuana use. These effects are still seen today with a high percentage of incarceration rates within these communities. Although federal surveillance systems have only more recently begun to assess marijuana use in the LGBTQ community, recent results indicate 37 percent of LGB adults aged 18-15 used marijuana in the past month and 22.9 percent had a marijuana use disorder with an increasing trend over the last few years.⁴⁶ Equity considerations must be integrated into policy development of marijuana related laws to ensure that racial and ethnic and other disparities are not further exasperated. Jurisdictions will need to consider the removal or

expungement of criminal records of existing offenders, process of expungement for certain offenses, age restrictions, juvenile offenses and other legal implications and processes that may result from legalization and/or decriminalization.

States are currently considering the potential economic benefits of the cannabis industry. Those include increased tax revenue, job growth, funding for state-sponsored programs, possible reduction in law enforcement costs and some investment opportunities.⁴⁷ Despite the possible benefits of legalization, researchers encourage states to carefully examine socioeconomic consequences associated with legalization. Early studies have found that retailer density is high among historically under-resourced communities.^{48,49} It is important to consider the socioeconomic impact of legalization on under-resourced communities and formulate equitable strategies that counteract the multifaceted negative consequences that they have experienced.

In some states, revenue generated from marijuana sales and regulations has been reinvested into communities, youth and public good.⁴⁴ Colorado distributed \$230 million of marijuana revenue to the Colorado Department of Education between 2015 and 2017 to aid in school construction, early literacy, and behavioral health.⁴⁴ Oregon distributes 40% of marijuana tax revenue to the state school fund, and 20% to drug and alcohol treatment.⁴⁴ California and Massachusetts plan to invest a share of their marijuana tax revenue in communities known to be heavily impacted by unequal drug law enforcement, more specifically low-income communities of color.⁴⁴

FDA regulation of THC-containing drugs and CBD in food and nutritional supplements

Through its drug approval process, FDA continues to focus on drugs derived from cannabis, including CBD. In addition to Epidiolex, FDA has approved THC-containing drugs.⁵⁰ The agency has approved Marinol and Syndros which include the active ingredient dronabinol, a synthetic THC for therapeutic uses in the United States, including for nausea associated with cancer chemotherapy and for the treatment of anorexia associated with weight loss in AIDS patients. Another FDA-approved drug, Cesamet, contains the active ingredient nabilone, which has a chemical structure similar to THC and is synthetically derived. Cesamet, like dronabinol-containing products, is indicated for nausea associated with cancer chemotherapy. In April 2020, the Drug Enforcement Agency de-scheduled Epidiolex, removing it as a controlled substance under the federal Controlled Substances Act, making it easier to access for patients who need it for therapy.

The 2018 Farm Bill⁵¹ removed hemp-derived products from Schedule 1 status under the Controlled Substances Act, but the legislation did not legalize CBD generally. CBD generally remains a Schedule I substance under federal law. FDA issued a press release⁵² following passage of the Farm Bill stating that CBD food and nutrition supplements are illegal. In May 2020 the agency held a roundtable to get input on how it should regulate these products, and some limited enforcement followed.

Acknowledging the great public interest around CBD and the hope it can have benefits to health, the FDA set out to evaluate cannabidiol formulations with the intention of educating the public on the risks of the products and to gather science in order to understand safety concerns as well as potential benefits to inform their regulatory approach.⁵³ This evaluation found that CBD is marketed in many different types of products such as oil, capsules, food products and chocolate bars. There is concern that the public will falsely think CBD products have been evaluated and approved by the FDA.⁵³ There are still many health aspects of CBD usage that are not clear and require further research, including the effects of CBD being used daily over a sustained length of time, the effects of CBD on the developing brain, the level of usage known to trigger associated risks and the health impact of different methods of consumption such as smoking, vaping and topical use.⁵³ FDA continues to work to

Updated Policy Guidance: Cannabis

answer these questions through public hearings and gathering of data.⁵³ In January, 2023, FDA concluded that existing regulatory frameworks for food and supplements are not appropriate for Cannabidiol.⁵⁴ The agency determined they require additional authority from Congress to regulate these products.⁵⁴

AHA supports further research on the effects of CBD on public health and safety and more robust regulation and enforcement by FDA on CBD products.

Youth/Minors and School-level policy

The AHA supports laws and regulation that prevent recreational cannabis use by youth and adolescents. Research has shown that there are negative effects associated with marijuana use in adolescents on attention, memory, and learning.⁵⁵ Considerable evidence suggests that students who smoke marijuana have poorer educational outcomes and educational attainment, and a higher chance of developing dependence, using other drugs and attempting suicide, than those who do not use cannabis.⁵⁶⁻⁵⁸

This is especially concerning with the use of e-cigarettes in youth and adolescents and the fact that students are using these devices to deliver cannabis in addition to nicotine. Recreational marijuana use is illegal on school campuses under federal law. Adults who work in schools may be caught between state and federal laws and drug-free campus policies with drug testing. Under the Drug-Free Workplace Act, any employer, including a school district, that receives federal funding must operate a drug-free workplace or risk losing federal funding.⁵⁹ However, at least seven states and Washington, D.C. that have legalized medical marijuana have enacted laws or regulations allowing students to use the drug on school grounds. So far the federal government has not penalized any of those seven states.⁶⁰ New Jersey, Illinois, Colorado and Delaware allow parents to give their children non-smokable medicinal marijuana products at school, Colorado has expanded its law to allow school staff to administer the medication and Washington state and Florida allow school districts to decide whether to allow the drug on campuses. Maine expanded its state regulations to allow medical marijuana use at school.

Ultimately, states and school districts must develop consistent policies that address tobacco and marijuana use on their campuses for students and adults, and provide supportive, restorative approaches with enforcement that prioritize educational attainment and address mental health, social support, behavioral health, well-being and equity.

Expanding research at the federal and state levels

The Drug Enforcement Agency issued regulations to expand the quantity and variety of marijuana that it permits for use in officially sanctioned scientific and medical research.⁶¹ Under the Controlled Substances Act (CSA), anyone seeking to manufacture a Schedule 1 controlled substance must obtain a DEA registration. The CSA defines “manufacture” to include the planting, cultivation, growing or harvesting of a controlled substance. The review of these applications has been delayed due to DEA inaction and a Department of Justice review but is now moving forward after a legal challenge. This will represent significant progress since the DEA, for decades, has only allowed a single research facility at the University of Mississippi to grow and distribute marijuana for research.⁶² The plants grown there are generally of lower THC concentration than marijuana sold in states where it is legal. That makes it nearly impossible to conduct meaningful research on the health impact of the drug as it is consumed in the U.S. Registering more growers will allow additional strains of marijuana to be produced and made available to researchers. States are also supporting scientific discovery around cannabis by setting up their own research programs.

Updated Policy Guidance: Cannabis

Additionally, a lot of current research is observational. Patients do not always disclose their use patterns and clinicians do not always ask, which makes the quality of the observational data questionable.³ There is currently no systematic screening in place for marijuana use in electronic health records during clinical visits to gather more effective use data.

Legal barriers for research funding and clinical trials on marijuana should be removed. Additional research is needed on the epidemiology and trends in cannabis use, basic science, the health effects and equity impact of cannabis use across the lifespan, as well as research that informs clinical guidelines and describes the impact of cannabis use on health care utilization. Both state and federal governments should expand cannabis research.

Consumer and professional education

As the research evidence base grows, there is an urgent need for robust consumer education that could be provided by non-governmental organizations, public health agencies, health systems, community-based organizations, social service agencies, and professional associations around the health impact of cannabis use as well as clinical guidance and professional education for clinicians and other health professionals to support patients. Integrating standardized measures for cannabis use in electronic health records to facilitate screening and optimal treatment will also be important.

Table 1: Top Takeaways About Cannabis Use	
1	Attitudes toward recreational and medicinal use of cannabis have rapidly evolved.
2	Cannabis use has risen considerably over the past decade, particularly among individuals 18-25 years of age.
3	Cannabis formulations now include oral, sublingual, rectal, vaporized and smoked; however, regulation of these products is inconsistent, resulting in a lack of standard dosing, packaging, and labeling.
4	Tetrahydrocannabinol (THC) and cannabidiol (CBD) can have both direct and indirect effects on the cardiovascular system. THC may stimulate the sympathetic nervous system while inhibiting the parasympathetic nervous system, increase heart rate and supine blood pressure, cause platelet activation, and promote endothelial dysfunction and oxidative stress. CBD may reduce heart rate and blood pressure, improve vasodilation and reduce inflammation, and lower vascular hyperpermeability.
5	Safety signals have emerged regarding cannabis use and adverse cardiovascular outcomes, including myocardial infarction, heart failure and atrial fibrillation; however, there is a paucity of rigorously performed studies. An urgent need for carefully designed prospective short- and long-term studies regarding cannabis use and cardiovascular safety are needed.
6	Cannabis smoke contains many of the same carcinogens and mutagens as tobacco smoke. Consumers and health care providers need to be aware of the risk of smoking cannabis. Until the pathophysiology of e-cigarette or vaping product use-associated lung injury (EVALI) is better understood, vaping cannabis, especially when it is mixed with vitamin E acetate oils, should be avoided. Given the increased incidence of severe COVID-19 lung injury among tobacco smokers and e-cigarette users, the same association may exist for smoking or vaping cannabis, particularly among those with underlying cardiovascular conditions. If people choose to use cannabis for its medicinal or recreational effects, oral and topical forms may reduce some of these potential harms.
7	Cannabis use disorder, withdrawal and hyperemesis syndrome are serious adverse events that should be particularly discussed with chronic heavy users and recognized by clinicians.
8	Drug-drug interactions can exist and should be anticipated as THC has the potential to inhibit CYP 3A4/4, 2C9, 2C19, and 2D6 while CBD can inhibit CYP 3A4/5, 2C19, 2D6, and 1A2.
9	A lack of definitive evidence exists regarding the cardiovascular effects of cannabis in several vulnerable populations such as adolescents, older adults, pregnant women, transplant recipients, and those with underlying cardiovascular disease.
10	Clinicians need greater knowledge to the various cannabis products and health implications during their initial training and continuing education and must be alert to the possibility that the use of cannabis or its potent synthetic analogues might be the underlying cause of cardiovascular events and other health implications.
11	In preclinical models, THC disrupts the normal signaling of the endocannabinoid system during neurodevelopment and results in abnormal neurotransmission. Prenatal THC affects neuroanatomic areas associated with cognition and emotional regulation.
12	Acute intoxication with marijuana affects memory, behavior, and impulsivity. The long-term effect of cannabis on cognition may be domain specific

Table 2: Marijuana Policy Summary

Issue Area	Responsive Messages
Legalization	• Legalization of marijuana for medical purposes should align with patient safety and efficacy. • Legalization of marijuana for recreational use will remain a significant concern until more research can be conducted on the safety and long-term population health effects across the life course, and we fully understand the equity and social justice impact of these laws. • Cannabis should be removed from its Schedule 1 categorization in the U.S. Controlled Substances Act to allow for more robust research and a more coordinated approach at the state and federal levels regarding marijuana regulation and legislation.
Public Health Infrastructure	• For states that do legalize cannabis, a robust public health infrastructure encompassing prevention, surveillance, counter-marketing and public safety is imperative. • States should harmonize their definitions for medical marijuana. • The public health response should prevent access by minors; include robust enforcement around product integrity, sales tracking and food safety verification; ensure a competent and informed public health work force; protect third parties from unwanted consequences of legalized marijuana use; and leverage mass-market public awareness and education campaigns. • Marijuana should be carefully integrated into efforts to end tobacco addiction in the US where there are intersections across policy domains.
Workplace Safety and Drug Testing	• Employers should establish and communicate clear policies regarding the use of marijuana and CBD products by employees, alignment with state and local statutes and the consequences on hiring, employment and job security.
Marijuana Legalization and Criminal Justice Reform	• Jurisdictions will need to consider the removal or expungement of criminal records of existing offenders, age restrictions, juvenile offenses and other legal implications and processes that may result from legalization and/or decriminalization of marijuana. • High rates of criminalization have strong implications for school completion, federal financial aid, public housing, employment, custody determinations and immigration status. • Revenue generated from marijuana sales and regulations should be reinvested into public health infrastructure, under-resourced communities and address youth and adolescent prevention and cessation.

Updated Policy Guidance: Cannabis

	• For generations, black and Latinx communities have disproportionately suffered from higher criminalization rates related to marijuana use. Black and LatinX people comprise 31.5% of the U.S. population, but they constitute 49.6% of people arrested for drug law violations. • Equity considerations must be integrated into policy development around marijuana laws to reduce racial and ethnic disparities.
FDA Regulation of CBD in Food and Nutritional Supplements and Prescription Drugs	• The AHA supports comprehensive FDA regulation of CBD products and standardization of manufacturing and labeling to quantify THC and CBD content according to USP reference standards. This should include over-the-counter topical CBD products. • Packaging should convey a meaningful “unit” of consumption (following alcohol ABV example), as well as clear differentiation of cannabis products from food. • In January, 2023, FDA concluded that existing regulatory frameworks for food and supplements are not appropriate for Cannabidiol; the agency determined they require additional authority from Congress to regulate these products. The agency noted various safety concerns, especially with long-term use, including harm to the liver, interactions with certain medications, possible harm to the male reproductive system, and concern with vulnerable populations such as children and those who are pregnant. The agency stated there needs to be a balance between desire for access to CBD products with the needed regulatory oversight to manage risks. • The American Heart Association supports further research on the effects of CBD on public health and safety and more robust regulation and enforcement on products advertising CBD health benefits without FDA approval.
School level policy and youth use	• The AHA supports laws and regulation that prevent recreational cannabis use by minors. • Ultimately, states and school districts must develop consistent policies that address tobacco and marijuana use on their campuses for students and adults, and provide supportive, restorative approaches with enforcement that prioritizes educational attainment and addresses mental health, social support, behavioral health, well-being and equity.
Expanding Research	• The American Heart Association supports removing the legal barriers for research funding and clinical and observational trials. Additional research is needed on the epidemiology and trends in cannabis use, basic science, the health effects and equity impact of cannabis use across the lifespan, as well as research that informs clinical guidelines and describes the impact of cannabis use on health care utilization. Both state and federal governments should expand cannabis research.

Table 3: Intersections between Tobacco and Cannabis Public Policy

Issue	Tobacco	Cannabis
Comprehensive Smoke-Free Laws	The American Heart Association advocates for comprehensive smoke-free policies in all public places such as government buildings, schools, casinos, multi-unit housing, health systems and restaurants.	• The American Heart Association supports inclusion of smoked or vaped marijuana in all comprehensive smoke-free laws, prohibiting combustible/aerosolized cannabis use in indoor public and/or commercial environments. • This support of comprehensive smoke-free environments extends to multi-unit housing where there is a need to adopt comprehensive policies that protect health, while not jeopardizing residents' housing stability. The Public Health Law Center has created a model policy here. • Particulate levels from marijuana smoke are higher than tobacco smoke.¹⁹ The average PM_{2.5} emission rate of pre-rolled marijuana joints is 3.5 times the average emission rate of Marlboro tobacco cigarettes. • Exposure to fine particulate matter can cause cardiovascular disease, lung irritation, asthma attacks and makes respiratory infections more likely. • Smoking marijuana in indoor places exposes the public and workers to dangerous secondhand smoke emissions and creates a social justice issue for those employees who may be exposed in their work environments.
Excise Taxes	The American Heart Association supports raising tobacco excise taxes as one of the most evidence-based public policy strategies to reduce tobacco use and youth initiation and uptake. Some portion of the revenue should be dedicated to tobacco use prevention and cessation and other population health initiatives.	• Cannabis tax rates vary dramatically across states and between medical and recreational use. Recreational marijuana sales are typically taxed at a higher rate than medical marijuana. • Unlike tobacco, the unique legal framework under which marijuana use and sales operate—that of differing state and federal legality leads to a situation where each state is essentially a siloed market. Marijuana products cannot cross state borders, so the entire process from production to sales must occur within state borders. This situation, along with the novelty of legalization, has resulted in a wide variety of tax designs: State Recreational Marijuana Taxes, 2021 Tax Foundation • States are using their marijuana excise tax revenue for numerous purposes including research, addressing recidivism, marijuana education and treatment,

		marijuana regulation and enforcement, criminal justice reform, public health, safety, supporting various state agencies, and putting some percentage in the general fund.
Retail Licensure	The AHA advocates at the state and local level to strengthen licensure standards for retailers of tobacco products to ensure minimum legal sales age is being enforced, flavor restrictions are being followed, and where applicable, taxes are being collected. MRTTP products are not exempted from this policy change. An annual fee must be paid by all retailers which must be high enough to support enforcement and operations of licensure requirements.	• There should be robust licensure standards for cannabis retailers to ensure minimal legal sales age enforcement, and where applicable, taxes are being collected. • Frequent users may choose to purchase more often from unlicensed retailers because of discounted prices and lack of regulation on purchase quantities. ⁶³
Retail Density	The AHA supports exploration of retail strategies to reduce all tobacco product use in the US. There are three primary policy approaches to addressing tobacco retail strategies: 1) restrict the location of tobacco retail outlets away from each other and away from youth-serving institutions, other related organizations and colleges and universities; 2) reduce the quantity of tobacco retail outlets with a purposeful equity goal of addressing density across different jurisdictions; and 3) restrict the eligibility to sell, including completely ending sales	• The density of retail outlets is growing exponentially across the country for both medical dispensaries and recreational access. • Licensed and unlicensed retail cannabis outlets are associated with young adults' heavy cannabis use and cannabis use disorder. ⁶³ • Researchers are beginning to assess the impact of marijuana outlets near schools and other youth-serving institutions, but most of these studies are looking at medical marijuana dispensaries. More research is needed on recreational outlets. Resources: Density of Marijuana Outlets Associated with More and Higher Use Among Young Adults RAND

Updated Policy Guidance: Cannabis

	in local jurisdictions, limiting sales to adult-only, tobacco-only shops, or maintaining tobacco-free pharmacies and other health-related retailers. Each of these strategies has shown potentially significant public health and equity impact and there is amplification of effect when the strategies are combined.	
Sales Law	Federal law now limits all tobacco sales only to those 21 and older. Many states also have passed T21 laws.	• Currently, all states that have legalized recreational marijuana have kept the sales age consistent with tobacco – under the age of 21, not allowed to purchase, possess, or use. • The age for medical marijuana use, however, does vary by state. Some states do not allow smoking medical marijuana under the age of 18, others 19 or 21 and there are different restrictions around purchase, use and possession. See here for more details on the specifics of states’ laws/regulations on age restrictions.
Purchase, Use, Possession (PUP) Laws	PUP laws criminalize and punish youth for buying, possessing, and using tobacco products which can include penalties, fines, and detainment. Tobacco use and possession should not be criminalized. The AHA believes PUP laws should be reformed so that the penalty is on retailers who sell to underage buyers.	• Purchase, possession and use laws for marijuana differ significantly across states and between recreational and medical marijuana use. See here for more details on the specifics of states’ laws/regulations on PUP. • Many states have also decriminalized marijuana use and possession.
Access to Comprehensive Cessation Therapy with no co-pay	The AHA supports access to comprehensive cessation therapy with no co-pay in public and private insurance plans.	• Marijuana use among tobacco users is common and may impede cessation efforts. One study showed that 25% of callers to tobacco quit lines also used marijuana. • Marijuana cessation therapy, based on evidence based clinical guidelines, should be available with no co-pay in all private and public health insurance plans.

		• Future research should explore the opportunity for combined treatment options, and bidirectional referrals between quit-lines and marijuana treatment providers. • A review of the current evidence base shows that psychotherapeutic techniques remain the foundation of treatment for cannabis dependence, however rates of abstinence achieved are only moderate. No drug has been approved at this time for treatment of cannabis dependence due to lack of evidence for efficacy. No drug has yet been approved for the treatment of cannabis dependence because of the lack of scientific evidence. Pharmacological Treatment of Cannabis Dependence - PMC (nih.gov) • Further clinical studies are needed for the evaluation of combinations of various treatments that can meet the needs of individual patients.
Eliminating Characterizing Flavorings	The AHA’s position at this time is that the FDA should eliminate the use of all characterizing flavors other than tobacco in all tobacco products. The removal of all characterizing flavors from all tobacco products is essential for reducing their appeal to youth. The FDA should create a list of all flavoring additives and disallow those additives in the ingredient listing with occasional spot check by mass spectrometry analysis for verification. Text, signs, symbols, terms, or imagery that imply flavor, including concept flavors, should be prohibited. Mint, menthol, and coolants increase the palatability of tobacco products and contribute to inequities in tobacco use and related harms and should be included in all characterizing flavor	• Unlike tobacco, genetic variations of different marijuana plants can offer many unique flavor characteristics through natural flavonoids and terpenes. (ex. jasmine, mint, pistachio, lavender, woody, fruity. • Flavorings and additives can also be added chemically to marijuana products. • One study showed almost half of adult cannabis users reported using at least one flavored cannabis product (46.5%).

Updated Policy Guidance: Cannabis

	bans. Emerging evidence also suggests that sweeteners in tobacco products may play a role in increasing the appeal of the product; FDA should also consider the inclusion of high-intensity sweeteners in its definition of characterizing flavors.	
Marketing and Advertising to Youth	The AHA supports robust FDA and FTC regulation restricting all tobacco marketing and advertising to youth and vulnerable populations, including the use of television, radio, and print ads and commercials; celebrity endorsement; social media influencers, movie placements; price promotions; free sampling; branded events; and nontobacco merchandise. Policy restrictions on tobacco marketing should be applied to digital media where youth and young adults obtain much of their information and are exposed to tobacco product advertising. Existing requirements of warning label statements covering at least 20% of print ad space should be extended to social media posts. The use of appropriate hashtags and statements of sponsorship as outlined by the FTC should be required in all digital media	• Regulation of marijuana marketing and advertising varies significantly across states, where some states have modeled after regulations governing alcohol and tobacco advertising, and some states have not set specific regulations for advertising and marketing with legalization. There is significant interest in not exposing kids to advertising; accordingly, states are sometimes modeling guidelines for alcohol which disallow advertising on television programs, radio stations, websites, or print publications where the audience includes more than 30 percent of people under the age of 21. • Since marijuana is illegal at the federal level, there is not national advertising and marketing and it is generally illegal for advertising/marketing to be distributed across state lines. The FTC has not issued any explicit regulations for cannabis. • There is significant concern that certain marijuana advertising is following the same pattern as previous tobacco advertising, appealing to kids by using certain flavors or developing edible products that look like popular cookies or gummies.

	advertising by brands and social influencers.	
FDA Regulation (CBD Products in Food and Nutritional Supplements and Prescription Drugs)	The American Heart Association advocates for robust FDA regulation of all tobacco products including the manufacture, import, pre-market approval, packaging, labeling, advertising, promotion, distribution, chemical make-up, and nicotine concentrations.	• The AHA supports comprehensive FDA regulation of CBD products and standardization of manufacturing and labeling to quantify THC and CBD content according to USP reference standards. This should include over-the-counter topical CBD products. • Packaging should convey a meaningful “unit” of consumption (following alcohol ABV example), as well as clear differentiation of cannabis products from food. • In January, 2023, FDA concluded that existing regulatory frameworks for food and supplements are not appropriate for Cannabidiol; the agency determined they require additional authority from Congress to regulate these products. The agency noted various safety concerns, especially with long-term use, including harm to the liver, interactions with certain medications, possible harm to the male reproductive system, and concern with vulnerable populations such as children and those who are pregnant. The agency stated there needs to be a balance between desire for access to CBD products with the needed regulatory oversight to manage risks. • The American Heart Association supports further research on the effects of CBD on public health and safety and more robust regulation and enforcement on products advertising CBD health benefits without FDA approval.

Table 4: Type of Cannabis Products in the Marketplace

Product Type	Definition	Market share (2020)*	Change since 2017*	Product Labeling Requirements**	Notes
Commercial Products					
Flower	Smokable part of the plant	46%	-19.0%		No standard dosing structure - dose/potency depends on strain
Concentrates	Cannabis terpenes and cannabinoids that have been separated from the excess plant material and other impurities	29%	+70.6%		Can be sprinkled, 'kief' on to flower to increase flower's potency. Can be vaporized using a dab rig or vaporizer. High potency makes it easy to overconsume.
Edibles	Cannabis-infused food or drinks made from flower or concentrate.	12%	+33.3%	FDA requires statutory authority from Congress to regulate as food and supplements.	Edibles from dispensaries have dose labeling of how much THC or CBD. Delayed onset of effects can lead to overconsumption.
Tinctures	Herbal solutions made by steeping the plant in alcohol.	10%	-33.3%	FDA requires statutory authority to regulate these products.	Consumption is usually done sublingually, which are rapidly absorbed into the blood stream as well as absorbed through the digestive track (if any tincture is swallowed). When purchased from a dispensary the tincture has a dose label.
Topicals	Cannabis-infused products like lotions, balms, sprays, patches, or salves.	3%	+50.0%	FDA will likely require statutory authority to regulate topicals as cosmetics products	THC topical products provide a localized effect with the psychoactive effect. CBD is better absorbed through the skin than THC and may have a more systemic effect.

Updated Policy Guidance: Cannabis

Synthetic Cannabinoids	Synthesized chemicals that act on the same endocannabinoid receptors as THC.			Most synthetic cannabinoids are illegal both at federal and state levels but remain widely available in convenience stores and online.	May affect the brain differently and unpredictably compared to THC. The hundreds of known synthetic chemicals are different chemicals than THC.
FDA Approved Medications					
<i>Epidiolex</i>	Plant-derived CBD				
<i>Cesamet</i>	nabilone - synthetic cannabinoid similar to THC				
<i>Marinol</i>	dronabinol - synthetic THC				
Other Prescription Medications					
<i>Sativex</i>	1:1 ration of plant-based THC and CBD			Not FDA-approved. Available in Canada and Europe.	
* https://www.statista.com/statistics/795153/us-market-share-of-cannabis-products-by-category/					
** https://www.sttark.com/blog/complete-guide-to-cannabis-labels					

References

1. US Surgeon General's Advisory: Marijuana Use and the Developing Brain. Washington, DC: US Department of Health and Human Services Office of the Surgeon General; 2019.
2. Page RL, 2nd, Allen LA, Kloner RA, Carriker CR, Martel C, Morris AA, Piano MR, Rana JS, Saucedo JF, American Heart Association Clinical Pharmacology C, et al. Medical Marijuana, Recreational Cannabis, and Cardiovascular Health: A Scientific Statement From the American Heart Association. *Circulation*. 2020;142:e131-e152. doi: 10.1161/CIR.0000000000000883
3. Testai FD, Gorelick PB, Aparicio HJ, Filbey FM, Gonzalez R, Gottesman RF, Melis M, Piano MR, Rubino T, Song SY, et al. Use of Marijuana: Effect on Brain Health: A Scientific Statement From the American Heart Association. *Stroke*. 2022;53:e176-e187. doi: 10.1161/STR.0000000000000396
4. Key substance use and mental health indicators in the United States: Results from the 2019 National Survey on Drug Use and Health. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2020.
5. Jones J. Nearly half of US adults have tried marijuana. In: Gallup, ed.; 2021.
6. Results from the 2021 national survey on drug use and health: Detailed tables. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2022.
7. Miech R, Johnston, LD., Patrick, ME., O'Malley, PM., Bachman, JG., Schulenberg, JE. Monitoring the Future National Survey Results on Drug Use, 1975-2002: Secondary School Students. In; 2023.
8. Keyes KM, Kreski NT, Ankrum H, Cerda M, Chen Q, Hasin DS, Martins SS, Olfson M, Miech R. Frequency of adolescent cannabis smoking and vaping in the United States: Trends, disparities and concurrent substance use, 2017-19. *Addiction*. 2022;117:2316-2324. doi: 10.1111/add.15912
9. Chaffee BW, Couch ET, Wilkinson ML, Donaldson CD, Cheng NF, Ameli N, Zhang X, Gansky SA. Flavors increase adolescents' willingness to try nicotine and cannabis vape products. *Drug Alcohol Depend*. 2023;246:109834. doi: 10.1016/j.drugalcdep.2023.109834
10. Maynard CP, Schwartz J. Cannabis vaping among high school seniors in adult-use, medical, and prohibited legal contexts. *Drug Alcohol Depend Rep*. 2023;6:100136. doi: 10.1016/j.dadr.2023.100136
11. Meyer HC, Lee FS, Gee DG. The Role of the Endocannabinoid System and Genetic Variation in Adolescent Brain Development. *Neuropsychopharmacology*. 2018;43:21-33. doi: 10.1038/npp.2017.143
12. Thompson R, DeJong K, Lo J. Marijuana Use in Pregnancy: A Review. *Obstet Gynecol Surv*. 2019;74:415-428. doi: 10.1097/OGX.0000000000000685
13. Faraj MM, Evanski J, Zundel CG, Peters C, Brummelte S, Lundahl L, Marusak HA. Impact of prenatal cannabis exposure on functional connectivity of the salience network in children. *J Neurosci Res*. 2023;101:162-171. doi: 10.1002/jnr.25136
14. Gobbi G, Atkin T, Zytynski T, Wang S, Askari S, Boruff J, Ware M, Marmorstein N, Cipriani A, Dendukuri N, et al. Association of Cannabis Use in Adolescence and Risk of Depression, Anxiety, and Suicidality in Young Adulthood: A Systematic Review and Meta-analysis. *JAMA Psychiatry*. 2019;76:426-434. doi: 10.1001/jamapsychiatry.2018.4500
15. Marconi A, Di Forti M, Lewis CM, Murray RM, Vassos E. Meta-analysis of the Association Between the Level of Cannabis Use and Risk of Psychosis. *Schizophr Bull*. 2016;42:1262-1269. doi: 10.1093/schbul/sbw003
16. Zorn S. Cardiovascular risk of marijuana. *Latest in Cardiology*. 2021.
17. Latif Z, Garg N. The Impact of Marijuana on the Cardiovascular System: A Review of the Most Common Cardiovascular Events Associated with Marijuana Use. *J Clin Med*. 2020;9. doi: 10.3390/jcm9061925

18. Dziemitko S, Harasim-Symbor E, Chabowski A. How do phytocannabinoids affect cardiovascular health? An update on the most common cardiovascular diseases. *Ther Adv Chronic Dis*. 2023;14:20406223221143239. doi: 10.1177/20406223221143239
19. Ott W, Zhao, T., Cheng, KC., Wallace, LA., Hildemann, LM. Measuring indoor fine particle concentrations, emission rates, and decay rates from cannabis use in a residence. *Atmospheric Environment: X*. 2021;10.
20. Kaufman JD, Elkind MSV, Bhatnagar A, Koehler K, Balmes JR, Sidney S, Burroughs Pena MS, Dockery DW, Hou L, Brook RD, et al. Guidance to Reduce the Cardiovascular Burden of Ambient Air Pollutants: A Policy Statement From the American Heart Association. *Circulation*. 2020;142:e432-e447. doi: 10.1161/CIR.0000000000000930
21. Arcview Market Research and BDS Analytics. The state of legal cannabis market. In; 2020.
22. Leafly. Cannabis jobs report: Legal cannabis now supports 243,700 full time American jobs. 2020. <https://www.leafly.com/news/industry/243700-marijuana-jobs-how-many-in-america>.
23. O'Grady C. Cannabis research data reveals a focus on harms of the drug. *Science*. 2020;369:1155. doi: 10.1126/science.369.6508.1155
24. Guercio D. Why effects-based cannabis marketing is mostly bullshit: Just because the packaging promises a couch-locked high doesn't mean the weed will deliver it. <https://liferhacker.com/why-effects-based-cannabis-marketing-is-mostly-bullshit-1849541947>. 2022.
25. Sommamano S, Chittasupho, C., Ruksiriwanich, W. Jantrawut, P. The cannabis terpenes. *Molecules*. 2020;25:5792.
26. Waddell JT, Corbin WR, Meier MH, Morean ME, Metrik J. The Anticipated Effects of Cannabis Scale (AECS): Initial development and validation of an affect- and valence-based expectancy measure. *Psychol Assess*. 2021;33:180-194. doi: 10.1037/pas0000881
27. A guide to cannabis product types. <https://weedmaps.com/learn/introduction/guide-cannabis-product-types#SnippetTab>. 2022.
28. Kruger JS, Kruger DJ. Delta-8-THC: Delta-9-THC's nicer younger sibling? *J Cannabis Res*. 2022;4:4. doi: 10.1186/s42238-021-00115-8
29. Ray CL, Bylo MP, Pescaglia J, Gawenis JA, Greenleaf CM. Delta-8 Tetrahydrocannabinol Product Impurities. *Molecules*. 2022;27. doi: 10.3390/molecules27206924
30. Geci M, Scialdone M, Tishler J. The Dark Side of Cannabidiol: The Unanticipated Social and Clinical Implications of Synthetic Delta(8)-THC. *Cannabis Cannabinoid Res*. 2023;8:270-282. doi: 10.1089/can.2022.0126
31. Ghosh T, Van Dyke M, Maffey A, Whitley E, Gillim-Ross L, Wolk L. The Public Health Framework of Legalized Marijuana in Colorado. *Am J Public Health*. 2016;106:21-27. doi: 10.2105/AJPH.2015.302875
32. Lucas CJ, Galettis P, Schneider J. The pharmacokinetics and the pharmacodynamics of cannabinoids. *Br J Clin Pharmacol*. 2018;84:2477-2482. doi: 10.1111/bcp.13710
33. Phillips JA, Holland MG, Baldwin DD, Gifford-Meuleveld L, Mueller KL, Perkison B, Upfal M, Dreger M. Marijuana in the Workplace: Guidance for Occupational Health Professionals and Employers: Joint Guidance Statement of the American Association of Occupational Health Nurses and the American College of Occupational and Environmental Medicine. *Workplace Health Saf*. 2015;63:139-164. doi: 10.1177/2165079915581983
34. Federal contractors and grantees. Washington, DC: Substance Abuse and Mental Health Services Administration; 2023. <https://www.samhsa.gov/workplace/employer-resources/contractor-grantee-laws>.
35. Lytle T. Marijuana and the workplace: It's complicated. SHRM. 2019. <https://www.shrm.org/hr-today/news/hr-magazine/fall2019/pages/marijuana-and-the-workplace-its-complicated.aspx>.
36. What tests are required and when does testing occur? What CDL Drivers Need to Know. Washington, DC: Federal Motor Carrier Safety Administration; 2023.

37. Sewell RA, Poling J, Sofuoglu M. The effect of cannabis compared with alcohol on driving. *Am J Addict.* 2009;18:185-193. doi: 10.1080/10550490902786934
38. Couper F, Logan, BK. Drugs and human performance fact sheets. Washington, DC: National Highway Traffic Safety Administration; 2004.
39. Leadbetter B. Washington Health System v. Unemployment Compensation Board of Review. Commonwealth Court of Pennsylvania, Title No. 886. Pennsylvania; 2019.
40. Thompson D. Drug testing and public assistance. CLASP: Policy solutions that work for low-income people; 2019.
41. Mitra S, Virani S. The Implementation of Marijuana Legalization in New York. *Psychiatr Serv.* 2019;70:625-628. doi: 10.1176/appi.ps.201900030
42. Drug Policy Alliance. Drug war statistics. <http://www.drugpolicy.org/issues/drug-war-statistics>. 2023.
43. ACLU. A tale of two countries: Racially targeted arrests in the era of marijuana reform. In; 2020.
44. Drug Policy Alliance. From prohibition to progress: A status report on marijuana legalization, what we know about marijuana legalization in eight states and Washington, DC. In; 2018.
45. Banys P. Mitigation of Marijuana-Related Legal Harms to Youth in California. *J Psychoactive Drugs.* 2016;48:11-20. doi: 10.1080/02791072.2015.1126770
46. 2020 National survey on drug use and health: Lesbian, Gay and Bisexual adults. Washington, DC: TREVOR; 2022.
47. Zvonarev V, Fatuki TA, Tregubenko P. The Public Health Concerns of Marijuana Legalization: An Overview of Current Trends. *Cureus.* 2019;11:e5806. doi: 10.7759/cureus.5806
48. Thomas C, Freisthler B. Examining the locations of medical marijuana dispensaries in Los Angeles. *Drug Alcohol Rev.* 2016;35:334-337. doi: 10.1111/dar.12325
49. Mair C, Freisthler B, Ponicki WR, Gaidus A. The impacts of marijuana dispensary density and neighborhood ecology on marijuana abuse and dependence. *Drug Alcohol Depend.* 2015;154:111-116. doi: 10.1016/j.drugalcdep.2015.06.019
50. FDA and cannabis: Research and drug approval process. Washington, DC: Food and Drug Administration; 2023.
51. Agricultural improvement act of 2018. In: Washington, DC; 2018.
52. Statement from FDA commissioner Scott Gottlieb, MD on signing of the Agriculture Improvement Act and the agency's regulation of products containing cannabis and cannabis-derived compounds. Food and Drug Administration; 2018.
53. Hahn S. FDA advances work related to cannabidiol products with focus on protecting public health, providing market clarity. Food and Drug Administration; 2020.
54. FDA concludes that existing regulatory frameworks for foods and supplements are not appropriate for cannabidiol, will work with Congress on a new way forward. Washington, DC: US Food and Drug Administration; 2023.
55. Schweinsburg AD, Brown SA, Tapert SF. The influence of marijuana use on neurocognitive functioning in adolescents. *Curr Drug Abuse Rev.* 2008;1:99-111. doi: 10.2174/1874473710801010099
56. Silins E, Horwood LJ, Patton GC, Fergusson DM, Olsson CA, Hutchinson DM, Spry E, Toumbourou JW, Degenhardt L, Swift W, et al. Young adult sequelae of adolescent cannabis use: an integrative analysis. *Lancet Psychiatry.* 2014;1:286-293. doi: 10.1016/S2215-0366(14)70307-4
57. Sultan RS, Zhang AW, Olfson M, Kwizera MH, Levin FR. Nondisordered Cannabis Use Among US Adolescents. *JAMA Netw Open.* 2023;6:e2311294. doi: 10.1001/jamanetworkopen.2023.11294
58. Boakye E, Obisesan OH, Uddin SMI, El-Shahawy O, Dzaye O, Osei AD, Benjamin EJ, Stokes AC, Robertson RM, Bhatnagar A, et al. Cannabis vaping among adults in the United States: Prevalence, trends, and association with high-risk behaviors and adverse respiratory conditions. *Prev Med.* 2021;153:106800. doi: 10.1016/j.ypmed.2021.106800
59. Camera L. Teaching to the drug test. In: *US News and World Report.* 2019.

Updated Policy Guidance: Cannabis

60. Norwood C. The pros and cons of allowing medical marijuana use in schools. *Governing: The future of states and localities*. 2018.
61. Controls to enhance the cultivation of marihuana for research in the United States. Washington, DC: Drug Enforcement Agency; 2020.
62. Zarrabi AJ, Frediani JK, Levy JM. The State of Cannabis Research Legislation in 2020. *N Engl J Med*. 2020;382:1876-1877. doi: 10.1056/NEJMp2003095
63. Pedersen ER, Firth CL, Rodriguez A, Shih RA, Seelam R, Kraus L, Dunbar MS, Tucker JS, Kilmer B, D'Amico EJ. Examining Associations Between Licensed and Unlicensed Outlet Density and Cannabis Outcomes From Preopening to Postopening of Recreational Cannabis Outlets. *Am J Addict*. 2021;30:122-130. doi: 10.1111/ajad.13132