

The Impact of Cancer Cases, Marijuana possession Arrests, and Opioid Deaths on Cannabis Policies in the United States: A Logistic Regression Study

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Abstract Recreational cannabis is currently legal in nineteen states and the District of Columbia. The history of each states pathway for passing laws codifying fully legal status varies greatly across the United States. A study was conducted with the aim of identifying factors that significantly impact a states fully legal status on cannabis employing a logistic regression design. Independent factors analyzed included the marijuana possession arrest rate (MPAR), new cancer cases, and opioid overdose rate. All data were from 2010 to assess if these factors impacted passage of laws approving recreational cannabis, as all such laws were passed after 2010. The dependent variable was dichotomous toward fully legal status or not fully legal status in states. Results showed statistical significance with the MPAR variable ($P < .05$). The opioid over dose rate and cancer cases did not yield statistically significant results. Consistent with the federalist system, select state legislatures have made the decision to pass laws regarding recreational cannabis propelled by public support when cannabis is still illegal under federal law. This paper delineates both recreational cannabis and medical cannabis laws, and provides salient discussion on variables analyzed and ideas for future policy studies.

Keywords: recreational cannabis, decriminalization, medical marijuana

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1. Introduction

Cannabis is a dioecious plant in the family *Cannabaceae* that is one of the most commonly used substances today and has penetrated cultures across the globe for centuries. It has been used for medicinal purposes reportedly since 4000 BC, as documented in the *pen-ts'ao*, an ancient pharmacopoeia that originated in China. The Chinese used Cannabis to ameliorate rheumatic pain, intestinal constipation, disorders of the female reproductive system, and malaria. In India, as early as 1000 BC cannabis was used as an analgesic, hypnotic, anesthetic, anti-inflammatory, antibiotic, antiparasitic, diuretic, and expectorant. People of India also described cannabis as a source of happiness, donator of joy, and bringer of freedom reflective of the recreational aspect of cannabis. It was listed in Avicenna's the Canon of Medicine as a diuretic, digestive, and anti-flatulent. In Africa, it aided in cases of snake bites, childbirth, malaria, fever, blood poisoning, and dysentery. [1] Current evidence-based practice on the medicinal uses of cannabis include multiple sclerosis (MS), chronic pain, fibromyalgia, epilepsy, insomnia, and lessening of tremors in Parkinson's disease [2]. The pharmacology of Cannabis is predicated on

substances called cannabinoids. The most psychoactive cannabinoid is delta-9-tetrahydrocannabinol (THC); the next most active compound is cannabidiol (CBD). The plant *Cannabis sativa* contains higher amounts of THC, and *Cannabis indica* contains higher amounts of CBD. THC is considered the active ingredient eliciting psychoactive effects associated with the euphoric high people experience after using marijuana. Cannabis can be smoked or ingested in the form of edibles. The latter may include candies, gummies, brownies, or tinctures. The psychoactive effect is procured through cannabinoid receptors located throughout the body [brain, liver, thyroid, bones, and peripheral nervous system]. Many states have codified laws on the legalization of cannabis based upon medicinal benefits and public approval despite its classification as a Schedule I controlled substance at the federal level under the Controlled Substances Act of 1971 [3]. Legalization of cannabis in select states has propagated enumerable businesses to market CBD products such as oils and lotions with sales reaching 5.3 billion in 2021 [4]. Laws can be delineated in a tripartite of fully legal, medicinal only, or prohibited. States that are classified as fully legal (Table 1, Figure 1) allowing use of cannabis for medicinal and recreational purposes are Alaska, Arizona, California, Colorado, Connecticut, Illinois, Maine, Massachusetts, Michigan, Montana,

Nevada, New Jersey, New Mexico, New York, Oregon, Rhode Island, Virginia, Vermont, and Washington. States characterized as not fully legal, restricting CBD use for medicinal purposes only, or prohibiting CBD use for any purpose are Alabama, Arkansas, Delaware, Florida, Georgia, Hawaii, Idaho, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Minnesota, Mississippi, Missouri,

New Hampshire, Nebraska, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, West Virginia, Wisconsin, and Wyoming (Table 2). This study serves to identify factors that have a significant effect on cannabis policies across the United States as well as delineate similarities and differences among state policies.

Table 1. States with Fully Legal Status

State	Recreational	Medicinal	Fines for Possession	Home Cultivation
Alaska	<i>AS 17.38</i> (2014) allows persons ≥ 21 years to possess, purchase, use, display, transport ≤ 1 ounce of marijuana; public consumption prohibited [5]	Alaska Medical Marijuana Initiative (1998) Qualified individuals must apply for a medical marijuana registry card to purchase cannabis products. Reciprocity is not honored to out of state patients [6]	\$100 to \$50,000 depending on violation and number of offenses; illegal to drive under the influence of cannabis (DUI-C)	Not more than 12 marijuana plants in a single household
Arizona	<i>The Smart and Safe Marijuana Act</i> (2020) allows persons ≥ 21 years possessing up to one ounce of marijuana or five grams of concentrated marijuana. [7]	Arizona Medical Marijuana Act (2010) Persons with a medical marijuana card may possess up to 2.5 ounces [8]. Regarding reciprocity, Arizona does not allow visitors from out-of-state to purchase medical marijuana from state dispensaries	Penalties are predicated on amount of cannabis. Fees start at one hundred dollars, DUI-C is a misdemeanor and penalties may include fines, suspension of license, and prison time	6 marijuana plants per adult, no more than 12 for more than 1 adult in dwelling
California	<i>Proposition 64</i> (2016) allows persons ≥ 21 years to possess up to 1 ounce of dry marijuana or 8 g of concentration cannabis [9].	First state to allow medicinal cannabis (1996). Persons apply for a medical marijuana ID card needed to purchase cannabis. Reciprocity is not extended to out of state patients [10]	Failing to abide by <i>Prop 64</i> quantities will result in a misdemeanor and six months in jail and/or a fine of five hundred dollars. DUI-C may result in fines, license suspension, and prison time.	Permissible to grow up to 6 marijuana plants in home
Colorado	<i>Amendment 64 to the Colorado constitution</i> (2012) persons ≥ 21 years may buy, possess, use marijuana up to one ounce [11]	Qualified persons may apply for a medical marijuana ID card; reciprocity is not extended to out of state patients	Fines range from \$700 to \$5000 depending on quantity. The legal limit for DUI-C is 5 nanograms per milliliter of blood	Adults ≥ 21 years may cultivate up to six plants in a locked space. Medical marijuana patients may grow up to 12 plants
Connecticut	<i>An Act Concerning Responsible and Equitable Regulation of Adult use Cannabis</i> was enacted in 2021 allowing persons ≥ 21 years to possess up to one and a half ounces of cannabis [12]	<i>An Act Concerning the Palliative Use of Marijuana</i> was passed in 2012 allowing qualified persons to possess up to three ounces per month; reciprocity is not honored	Maximum fine of \$2000 for quantities >1.5 ounces. DUI-C is prohibited	Medical marijuana patients can grow up to 3 mature plants and 3 immature plants
Illinois	<i>Cannabis Regulation and Tax Act</i> (2019) allows persons ≥ 21 years to possess 30 g of cannabis flower, 500 mg of THC-infused edible products, or 5 g of concentration; non-residents are allowed to purchase 15 g of cannabis, 250 mg of THC in a cannabis-infused product, or 2.5 g of concentrated cannabis product [13]	<i>Compassionate use of medical cannabis</i> (2013). State-wide registry issues ID cards for qualified residents. Reciprocity is not extended to out of state patients [14].	persons possessing between 30 and 100 g of cannabis on their first offense resulting in a year in jail and a \$2500 fine. DUI-C is prohibited.	Up to 5 cannabis plants in home
Maine	<i>LD 1701 Act of Legalize Marijuana</i> (2016) allows persons ≥ 21 years purchase up to 2.5 ounces of cannabis or 2.5 ounces of a combination of cannabis and concentrate with a government issued ID [15]	<i>Maine medical use of marijuana program</i> (1999) allows qualified persons to receive an ID card to purchase marijuana. Reciprocity is granted to persons from 25 states and DC [16].	For quantities exceeding LD1701, no more than \$1000. DUI-C is prohibited.	As many as three mature, 12 immature plants, and an unlimited number of seedlings are allowed per resident ≥ 21 years
Massachusetts	In 2016, voters in Massachusetts passed <i>The Regulation and Taxation of Marijuana Act</i> legalizing marijuana. Persons ≥ 21 years can possess up to 1 ounce of marijuana or 5 g of concentrate outside of their residence and up to 10 ounces of marijuana inside their residence [17]	Massachusetts Medical Marijuana initiative was passed in 2012 qualifying patients ≥ 18 years of age with select debilitating medical conditions to possess up to a 60-day supply of medical cannabis or 10 ounces. Patients need to register with the Medical Use of Marijuana Program to receive an ID card needed for purchases. Reciprocity is not extended to out of state medical marijuana patients [18]	Misdemeanor for possessing more than one ounce of cannabis, fine is \$500 (first offense); subsequent offense(s) fine is \$2000. DUI-C is a misdemeanor.	Adults ≥ 21 years can grow up to 6 plants in their home with a maximum of 12 plants per household.

State	Recreational	Medicinal	Fines for Possession	Home Cultivation
Michigan	In 2018, voters passed the <i>Michigan Taxation and Regulation of Marijuana Act</i> allowing persons ≥ 21 years old to possess up to 2.5 ounces of cannabis outside of their home and up to 10 ounces in their home [19]	The <i>Michigan Medical Marijuana Act</i> was passed in 2008 allowing qualified persons to possess up to 2.5 ounces of marijuana or equivalents. Written certification from an MD or DO is required. Reciprocity is extended to out of state medical marijuana patients [20]	Fines vary from not more than \$100 to not more than \$500 depending on the offense; DUI-C is prohibited resulting in fines and possible prison time.	Adults ≥ 21 years old may possess and cultivate up to 12 cannabis plants in their home and possess no more than 15 g of concentrate.
Montana	<i>Initiative 190</i> legalizing marijuana was passed by voters in 2020 allow persons ≥ 21 years of age to possess and use up to 1 ounce of marijuana or 8 g of concentrate [21]	The <i>Medical Marijuana initiative</i> (2004) allows residents to apply for a state-issued medical marijuana card and purchase up to 5 ounces per month from a licensed dispensary. Patients may also grow up to 6 flowering plants and nonflowering plants in their home. Reciprocity is honored for use and possession [21]	Fines range from \$200 to \$50,000 depending on offense. DUI-C is prohibited.	Adults can cultivate up to 4 marijuana plants, limited to 2 plants mature at any one time. Plants and marijuana harvested from plants in excess of 1 ounce must not be visible from a public place.
Nevada	The <i>Nevada Marijuana Initiative</i> was passed by voters in 2016 allowing persons ≥ 21 years of age to purchase up to 1 ounce of cannabis or one-eighth ounce of concentrate [22]	The <i>Medical Use of Cannabis</i> law was enacted in 2000. Persons with a medical marijuana ID card can purchase up to two and a half ounces of usable marijuana within a two-week period; reciprocity is honored [22]	Maximum fine is \$1000. DUI-C is prohibited.	Persons cannot cultivate cannabis within a 25-mile radius of a dispensary; those outside of 25 miles can only grow up to 12 plants total.
New Jersey	<i>The NJ Cannabis Regulatory Enforcement Assistance and Marketplace Modernization Act</i> was enacted in 2021. Residents > 21 years of age can possess up to 1 ounce of cannabis or its equivalent (eg, 5 g of concentrate). [23]	<i>The NJ Compassionate Use Medicinal Marijuana Act (2010)</i> empowers physicians to determine the dosage allowed for patients, capping the dose at 3 ounces for a thirty-day period [23]. Qualified persons will be issued an ID card for purchasing cannabis from state-licensed dispensaries. Reciprocity is honored	Fines can range from \$25,000 to \$150,000 depending on violation. DUI-C is prohibited.	Home cultivation of cannabis is prohibited
New Mexico	<i>HB2 Cannabis Regulation Act</i> legalized recreational cannabis in 2021 permitting persons ≥ 21 years to possess up to 2 ounces of cannabis, 16 g of cannabis extract, and 800 mg of edible cannabis at one time [24]	<i>HB155 The Lynn and Erin Compassionate Use Act</i> legalized medical marijuana in 2007. Qualified patients with a registration card may possess up to 8 ounces of medical cannabis over a 90-day period, and can purchase cannabis from a licensed distributor. Reciprocity is honored [24]	Maximum fine of \$1000. DUI-C is prohibited for all persons.	Adults ≥ 21 years may cultivate up to 6 mature cannabis plants and 6 immature plants per person with a limit of 12 mature plants per household. Medical Marijuana patients may grow their own cannabis with a Personal Production License.
New York	Persons ≥ 21 years may possess up to 3 ounces of cannabis for recreational use. The <i>Marijuana Regulation and Taxation Act</i> was passed in 2021 [25]	Medical marijuana is legal from the passage of the <i>Compassionate Care Act</i> in 2014. Registered cardholders can possess and purchase up to 3 ounces of cannabis or up to 24 g of concentrate. Reciprocity is not honored [25].	Fines range from \$1000 to \$15,000 depending on offense. DUI-C is illegal for all persons.	Legislation on cultivation by persons ≥ 21 years is pending.
Oregon	<i>Control, Regulation, and Taxation of Marijuana and Industrial Hemp Act</i> was enacted in 2014 where persons ≥ 21 years can possess up to 8 ounces of cannabis in their private residence; moreover, with a valid ID persons can purchase 2 ounces of dried flower cannabis, 5 g of cannabis concentrates, 16 ounces of cannabis edibles (solid form), 72 ounces of cannabis in liquid form, ten cannabis seeds, four immature cannabis plants [26]	The <i>Oregon Medical Marijuana Act</i> was enacted in 1998 and affords approved individuals/cardholders to purchase 24 ounces of dried flower marijuana, 16 ounces of medical cannabinoid (solid form), 72 ounces of liquid cannabinoid, 16 ounces of cannabinoid concentrate, 5 g of cannabinoid extract, four immature cannabis plants. Reciprocity is not honored [26]	Fines range from \$2500 to \$6250 depending on offense	Persons who are ≥ 21 years may grow up to 4 plants per household predicated on the plants being out of public view.
Rhode Island	The RI Cannabis Bill passed in 2022 allowing persons ≥ 21 years to possess and purchase up to 1 ounce of cannabis [27]	The Edward O. Hawkins and Thomas C. Slater Medical Marijuana Act passed in 2006 allowing qualified patients to possess and purchase up to 2.5 ounces of cannabis. Reciprocity is honored [28]	Fines range from \$200 to \$500,000 depending on offense.	Medical marijuana patients can grow 12 mature cannabis plants and 12 seedlings at one time. Anyone ≥ 21 years may grow 6 plants of which 3 are mature.

State	Recreational	Medicinal	Fines for Possession	Home Cultivation
Virginia	The <i>Cannabis Control Act</i> was enacted in 2021 allowing persons ≥ 21 years to possess not more than 1 ounce of cannabis. Adult sharing of cannabis is permitted without remuneration [29]	<i>HB 1251 CBD oil and THC-A oil</i> (2017) Persons with intractable epilepsy could have access to CBD or THC-A. In 2018, the bill was amended allowing anyone with a medical condition to apply to use cannabis in the state. Qualified individuals will receive a medical cannabis card through the Virginia Board of Pharmacy. Reciprocity is not honored [29]	\$25 to \$250,000. Persons may be charged with DUI-C if they are determined to have used marijuana with a civil penalty of up to \$25.	Adults may grow up to 4 plants per household
Vermont	In 2018, [H.511] <i>An Act relating to eliminating penalties for possession of limited amounts of marijuana by adults 21 years of age or older</i> was enacted allowing such persons to possess up to 1 ounce of marijuana [30]	<i>An Act Relating to Marijuana Use by Persons with Severe Illness</i> was passed in 2004. Qualified patients register with the state medical marijuana system to receive their ID card. Reciprocity is not honored [31]	Fines range from <100 to \$500	Adults may possess two mature marijuana plants and four immature plants per house or residential unit
Washington	Under <i>Initiative 502</i> cannabis for recreational use was approved in 2012 allowing persons ≥ 21 years to possess and/or purchase up to 1 ounce of cannabis, 7 grams of concentrate, 16 edibles, or 72 ounces of liquid at a time [32]	Under <i>Initiative 692</i> , which was passed in 1998, persons with a qualifying medical condition may be granted an ID card to purchase cannabis for medicinal purposes. Cardholders may possess up to 3 ounces of marijuana, 48 ounces of marijuana infused solid form, 216 ounces of liquid form, or 21 g of concentrate. Reciprocity is not honored [33]	Fines range from \$100 to \$10,000. DUI-C equates to a minimum of 5 nanograms per milliliter of THC in the blood stream	Only persons with a medical marijuana card may cultivate their own cannabis. These persons may grow up to 6 plants [this limit can increase to 15 with physician approval]

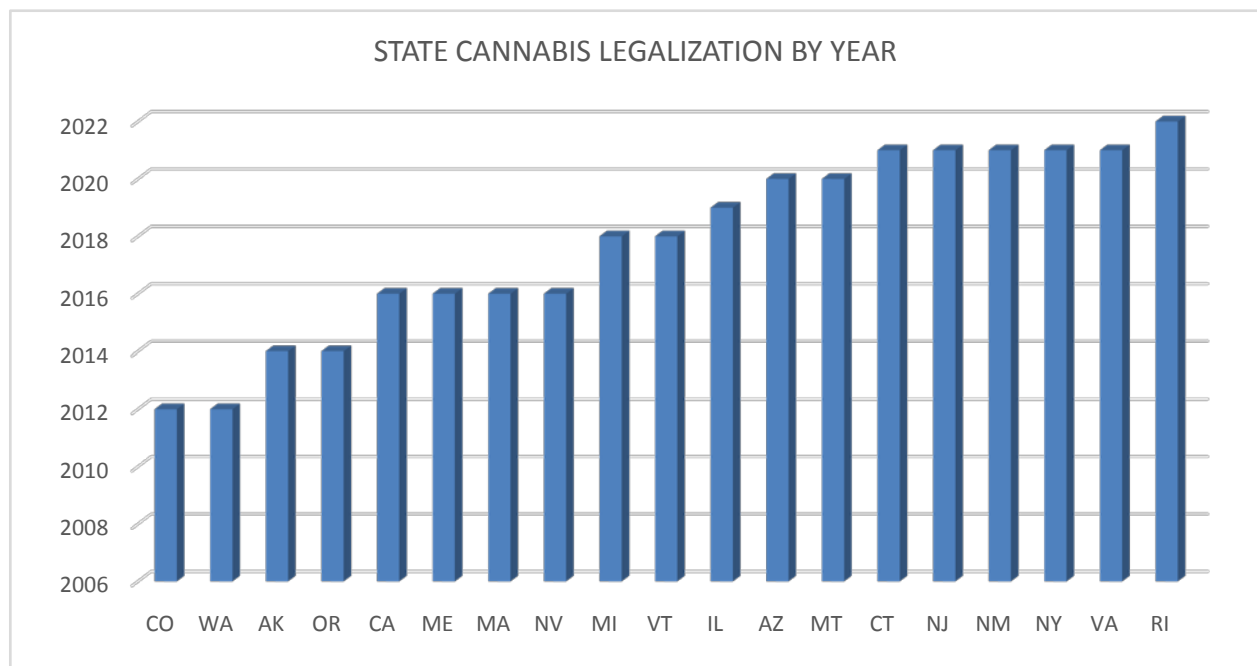


Figure 1. Year cannabis legalization bills were passed in nineteen states

Table 2. States that are not fully legal

State	Medicinal	Fines for Possession	Home Cultivation
Alabama	<i>The Darren Wesley 'Ato' Hall Compassion Act</i> was enacted in 2021 allowing persons with qualifying conditions to apply for a medical marijuana ID card; minors can also apply but are limited to products with <3% THC. Persons may possess up to 70 doses daily, and may purchase up to 60 doses daily. Reciprocity is not honored [34]	Fines range from \$6000 to \$7500 depending on offense.	No person may cultivate cannabis in their home
Arkansas	Amendment 98 was passed in 2016 allowing persons with qualifying medical conditions to purchase up to 2.5 ounces from a dispensary every 14 days. Patients from out of state may apply for a temporary card to purchase cannabis [35]	\$200 to \$15,000 depending on offense.	Cannabis may not be grown by any person
Delaware	<i>The Delaware Medical Marijuana Act</i> was passed in 2011 allowing qualified patients to purchase [with a compassionate use card] three ounces of medical cannabis every 2 weeks. Reciprocity is not honored from out of state patients [36]	Fines range from \$100 to \$575 depending on offense	Patients and other residents are prohibited from growing their own cannabis

State	Medicinal	Fines for Possession	Home Cultivation
Florida	<i>The Use of Marijuana for Debilitating Medical Conditions</i> [Amendment 2] was passed in 2016 allowing patients with a qualifying medical condition to possess, use, and purchase cannabis with an ID card. Patients may purchase up to a 70-day supply of marijuana products from a state-licensed facility. Reciprocity is not honored [37]	Fines range from \$1000 to \$25000 depending on offense	Qualified patients, nor any resident, are allowed to grow marijuana
Georgia	Georgia's <i>Hope Act HB 324</i> passed in 2019. Qualified patients may legally possess up to 20 fluid ounces of "low THC oil" derived from the marijuana plant. Patients are issued a registry card. Reciprocity is honored [38]	Fines range from \$1000 to \$5000.	Growing cannabis is under the purview of the Medical Cannabis Commission per <i>HB 324</i> who will issue a limited number of licenses for growing, manufacturing, and dispensing of low THC oil
Hawaii	<i>Act 228 [Medical Use of Marijuana]</i> passed in 2000 legalizing cannabis for medicinal use for qualified patients. Patients with a valid medical marijuana card may possess up to 4 ounces of usable marijuana. Patients may purchase 4 ounces in a 15-day period. Reciprocity is honored [39]	Fines range from \$130 to \$10,000 depending on offense	Qualified patients may grow an adequate supply of cannabis, but cannot exceed 10 plants
Idaho	Medical marijuana is illegal with the exception of Epidiolex. Idaho permits the use of CBD, made from mature cannabis stalks or sterilized seeds devoid of THC [40]	Fines range from \$1000 to \$10,000 depending on offense.	Cultivation of marijuana is prohibited
Indiana	Medicinal use of cannabis is illegal in Indiana, however CBD oil containing < 0.3 percent THC is allowed [41]	\$5000 to \$10,000 depending on offense	Cultivation of cannabis is illegal
Iowa	<i>The Medical Cannabidiol Act</i> was passed in 2017 allowing qualified patients to purchase, possess, and use cannabis with a registration card. Allowing cannabis products are vaporizable, orals forms, topical forms, and nebulizable forms. Reciprocity is honored [42]	Fines range from \$1000 to \$100,000 depending on offense.	Cultivation of marijuana is illegal.
Kansas	Medical marijuana has not yet been codified in Kansas. <i>HB2540</i> (2022) allows patients to take FDA-approved medications with cannabis composition such as Epidiolex [43]	Fines range from \$1000 to \$100,000 depending on offense.	Cultivation of cannabis is prohibited
Kentucky	Medical marijuana is illegal. <i>HB 333</i> passed in 2017 allows persons to use CBD products with ≤0.3 percent THC [44]	Fines range from \$250 to \$10,000 depending on offense.	Cultivation of cannabis is prohibited
Louisiana	Medical Marijuana is legal in Louisiana [2020]. With a physician's recommendation patients can obtain an ID card and purchase cannabis from state licensed dispensaries (up to 2.5 ounces of cannabis every 14 days). Reciprocity is not honored [45]	Fines range from \$100 to \$1,000,000.	Cultivation of cannabis is limited to Agricultural Centers at Louisiana State University and Southern University.
Maryland	Medical marijuana was operationalized in 2014 [<i>HB 881</i>] establishing the Maryland Medical Cannabis Commission. Patients may possess a maximum of 120 g of cannabis at any one time with a medical marijuana card. Reciprocity is not honored [46]	Fines range from \$100 to \$100,000 depending on offense.	Cultivation of cannabis is limited to state-approved entities.
Minnesota	Passage of <i>SB 2470</i> codified the Medical Marijuana Program in 2014. Qualified persons may obtain a registration card and purchase up to a 30-day supply of non-smokeable cannabis products. Reciprocity is not honored [47]	Fines range from \$200 to \$10,000 depending on offense	Cultivation of cannabis is limited to state-approved entities.
Mississippi	<i>SB2095</i> was passed in 2022 creating the Medical Marijuana Program for patients that qualify. MMCEU (Medical Marijuana Cannabis Equivalency Units) are used to possession limits where 1 MMCEU is equal to 3.5 g of medical cannabis flower, 1 g of concentrate, or 100 milligrams of THC in an infused product. Registration cardholders may purchase up to 6 MMCEU's in a week from an approved dispensary. Reciprocity is honored with a nonresident ID card [48]	Fines range from \$250 to \$500,000.	Cultivation of cannabis is limited to state approved entities.
Missouri	Amendment 2 passed in 2018 allowing qualified patients to obtain a registration ID card and purchase 4 ounces of dried marijuana or equivalent and possess not less than a 60-day supply of dried marijuana. Reciprocity is not honored [49]	\$500 to \$10,000 depending on offense	Patients can grow 6 flowering plants in their homes
New Hampshire	Medical Marijuana became legalized in 2013 from <i>HB573 Relative to the use of Cannabis for Therapeutic Purposes</i> . Patients with a registration ID card may purchase up to 2 ounces of cannabis during a 10-day period, and may possess up to 2 ounces of cannabis. Reciprocity is honored [50]	\$100 to \$350 depending on offense.	Cultivation of cannabis by any person is prohibited.
Nebraska	Medical marijuana is not legal. Use is limited to hemp-derived CBD containing <0.3% THC [51]	\$300 to \$10,000 depending on offense.	Cultivation of cannabis is illegal.
North Carolina	Medical marijuana is not legal in North Carolina. Persons with intractable epilepsy can, however, possess and consume CBD oil containing <0.9 percent THC. <i>SB711 Compassionate Care Act</i> passed the NC senate in 2022 but has not yet passed the House of Representatives [52]	\$200 to \$1000 depending on offense.	Cultivation of cannabis is illegal
North Dakota	Medical marijuana is legal via Initiated Constitutional Measure No. 5 [Compassionate Care Act] passed in 2016. Qualified patients may possess up to a 30-day supply of cannabis. Purchase limits are 2.5 ounces of dried leaves and flower and up to 2000 mg of other cannabis products. Reciprocity is not honored [53]	\$1000 to \$3000 depending on offense.	Home cultivation of cannabis is illegal.

State	Medicinal	Fines for Possession	Home Cultivation
Ohio	<i>HB523 Marijuana for Medical Purposes</i> legalized medical marijuana in 2016. Patients may register for the medical marijuana program and purchase up to a 90-day supply of cannabis from a state licensed dispensary [54]. Reciprocity is not honored.	\$150 to \$20,000 depending on offense	Cultivating cannabis at home is prohibited
Oklahoma	<i>Title 63 Section 420</i> of the Oklahoma Statutes (2018) allows persons with qualifying medical disease to carry up to 3 ounces of cannabis, keep up to 8 ounces in their residence, and possess up to six mature marijuana plants and seedlings. A medical marijuana card will be issued to qualified patients. Reciprocity is honored [55]	\$1000 for any offense	It is illegal for non-medical marijuana patients to grow cannabis
Pennsylvania	Medical Marijuana is legal through the passage of <i>Senate Bill 3</i> [Medical Marijuana Program] in 2016. Registered patients may possess and purchase a 30-day supply of cannabis. Reciprocity is not honored [56]	\$500 to \$5000 depending on offense.	Cultivation of cannabis at home is illegal.
South Carolina	CBD products with <0.9% THC is limited to epileptic patients through the passage of the Medical Cannabis Therapeutic Treatment Research Act (2014) [57]	\$200 to \$2000 depending on offense.	Cultivation of cannabis is illegal carrying fines up to \$200,000 and up to 25 years in prison.
South Dakota	The Medical Marijuana initiative (2020) allows qualified patients to possess up to 3 ounces of cannabis. Dispensaries are not yet operational. Reciprocity is honored [58]	\$2000 to \$30,000 depending on offense.	Medical marijuana card holders may grow 3 plants, or more as prescribed by a physician.
Tennessee	<i>SB280 (2015)</i> allows persons with qualified seizures to use CBD products containing less than 0.9% THC. Reciprocity is not honored [59]	\$250 to \$500 depending on offense.	Home cultivation of cannabis is illegal.
Texas	In 2015 <i>SB399 [Texas Compassionate Use Act]</i> was passed. Persons with qualifying seizures are allowed to possess cannabis extracts containing <0.5 percent THC. Reciprocity is not honored [60]	\$2000 to \$50,000 depending on offense.	Home cultivation of cannabis is illegal.
Utah	The <i>Utah Medical Cannabis Act (2018)</i> allows persons with qualifying medical conditions to possess and purchase up to 113 g of cannabis or no more than 20 g of total composite THC in other forms. Reciprocity is not honored [61]	\$1000 to \$10,000 depending on offense.	Cultivation of cannabis is illegal.
West Virginia	The <i>Medical Cannabis Act</i> was codified in 2017 allowing persons with qualifying medical conditions to possess and purchase up to a 30-day supply of cannabis. Reciprocity is limited to terminally ill cancer patients [62]	\$1000 for any offense	Home cultivation of cannabis is illegal.
Wisconsin	Under <i>Lydia's Law (2013)</i> Patients with a seizure disorder and physician's certification may use CBD oil for their medical condition. Reciprocity is not honored [63]	\$1000 to \$10,000 depending on offense.	Home cultivation of cannabis is illegal
Wyoming	Cannabis is illegal in Wyoming for any type of use [64]	\$750 to \$10,000 depending on offense.	Home cultivation of cannabis is illegal.

2. Methods

Logistic regression was performed using SPSS (v28); P value <.05 is considered statistically significant. The unit of analysis was state where Forty-eight states were included in the study. Florida and North Dakota were excluded from the analysis because data was not available for all independent variables. States were coded as 1 if their policy is classified as fully legal, and 0 for states with a policy that was not fully legal. *Fully legal* is defined as policies that allow cannabis use for medicinal and recreation; *not fully legal* is defined as policies that prohibit the use of cannabis for any reason, or restricted cannabis to medicinal purposes. Independent variables are the opioid overdose rate, marijuana possession arrest rate (MPAR), and cancer rate. The cancer rate data was accessed from the American Cancer Society representing new cases of cancer in 2010. The MPAR was accessed from ACLU report [65] examining race disparities in marijuana arrests in 2018 and 2010. The report noted the percent change between 2018 and 2010; having the arrest

rate from 2018 and percent change from 2010, the MPAR for 2010 could be derived. Data from the state of Florida was not included in the ACLU report. The 2010 opioid overdose rate was accessed from Centers for Disease Control and Prevention; data for North Dakota was not available. The rationale for choosing 2010 for all independent variables was to capture a timepoint that may have precipitated laws to be passed respective of fully legal status as no state passed a law allowing recreational cannabis before 2010.

3. Results

The marijuana possession arrest rate was statistically significant and had an inverse effect given the negative beta coefficient (Table 3). This can be interpreted as the odds of a state having a fully legal policy on cannabis decreases by a factor of .989 with a one unit increase in the marijuana possession arrest rate. The variables opioid overdose rate and new cancer cases were not statistically significant.

Table 3. Logistic Regression Results

Variable	Beta Coefficient	SE	Wald	df	P	OR	95% CI
MPAR	-.011	.004	8.097	1	.004	.989	.981-.996
New Cancer Cases	.000	.000	1.087	1	.297	1.0	1.0-1.0
Opioid Overdose Rate	.018	.104	.030	1	.863	1.018	.831-1.248
Constant	1.658	1.168	2.017	.156	5.250		

4. Discussion

This study explored the impact of the MPAR, opioid deaths, and new cancer cases from 2010 on cannabis policies in forty-eight states. Employing logistic regression stratified by states that are fully legal or not fully legal revealed only the MPAR was statistically significant. The range for the 2010 MPAR was 16 to 849, with Massachusetts having lowest rate and South Dakota with the highest rate. Massachusetts has fully legal status while South Dakota limits use of cannabis for medicinal purposes. Other states on the lower end of MPAR with full legal status are Alaska (97), California (121), Connecticut (113), Colorado (204), Illinois (129), Maine (133), Michigan (157), Montana (206), Nevada (202), New Mexico (147), Oregon (209), Rhode Island (127), and Washington (90). States on the higher end of the MPAR and classified as not fully legal are South Carolina (745), Wyoming (685), West Virginia (407), North Dakota (407), Georgia (467), and Nebraska (594). These findings comport with the statistical significance finding for the MPAR variable, that is, a salient association between the MPAR and fully legal status; lower MPAR's found more frequently in the fully legal status cohort.

In the absence of similar regression studies linking the MPAR to fully legal status cannabis laws the concept of decriminalization has tacit relevance. Decriminalization can be described as a state reducing the penalty for possessing small amounts of cannabis from a criminal offense to a civil offense [66]. In 2008 voters in Massachusetts convincingly approved [65 to 35 percent] a ballot initiative to decriminalize possession of small amounts of marijuana where a fine of \$100 would be incurred if a person is caught with less than an ounce of marijuana. Opponents of the initiative posited that passage of the initiative would promote drug use [67]. Grucza et al conducted a study employing state Youth Risk Behavior Surveys from 2007 to 2015 to ascertain if there was an association between changes in state policies toward decriminalization of cannabis and increased arrests. The states studied included Massachusetts, Connecticut, Rhode Island, Vermont, and Maryland. Investigators found a 75 percent reduction in the rate of drug-related arrests for both youth and adults [66]. In 2019, Plunk et al studied 38 states inclusive of fully legal states, in part, and states that had enacted decriminalization policies from 2000 to 2016 with the aim determining increases or decreases in the arrest rates for cannabis possession. They found a decrease in the adult arrest rate by 131.28 per 100,000 population post decriminalization policies, and a decrease of 168.50 per 100,000 population post fully legal status [68]. In 2011, voters in Connecticut were in support of decriminalization by a two to one margin [65 to 32 percent] with every demographic lending support [69]. Alaska decriminalized cannabis in 1975 [70], nearly forty years before recreational cannabis was legal. Decriminalization of cannabis may have served as a salient forerunner to select states decision to legalize cannabis, and may be a factor in the future for states that are not fully legal in turning the tide toward legalization.

The opioid overdose rate ranged from 2.8 in Louisiana to 25.6 in West Virginia. New cases of cancer in 2010 ranged from 2540 in Wyoming to 157,320 in California.

These variables did not yield statistical significance. It has been reported that cancer patients have great difficulty acquiring a medical marijuana card in states with a medical marijuana program. State law requires physician approval before patients can be registered in medical marijuana programs. In 2018, just 1 percent of Massachusetts 25,000 physicians are registered with the state to prescribe cannabis [71]. Moreover, hospitals with a federal research grant risk losing funding or paying steep penalties if clinicians give patients cannabis because marijuana is still considered an illegal drug in the eyes of the federal government. In 2017, Valencia et al [72] outlined challenges patients face in obtaining medical marijuana cards. Persons who are employed, have health insurance, and large incomes tend to participate more in a medical marijuana program than persons with less means. States may charge a standard fee for the required registration, such as Arizona, which charges a fee of \$150; these fees are not covered by health insurance plans. Satterlund et al [73] asserts there is a stigma associated with medical cannabis use. Social labels such as “junkie” may dissuade patients from engaging in a discussion of cannabis use with their physician, and physician's themselves may be ambivalent about giving their recommendation on cannabis use for their patients. In 2014, Michalec et al [74] found that 39 percent of specialists and 34 percent of primary care physicians in Delaware reported being very unlikely to authorize eligible patients for medical marijuana. These findings suggest that patients and their caregivers may have an easier path to procuring cannabis in fully legal states, even given the limited amount persons can possess or grow under the auspices of respective state laws.

The majority of states with fully legal status permit persons ≥ 21 years of age to possess up to 1 ounce of marijuana. States that allow more than 1 ounce include Connecticut, Maine, Michigan, New Mexico, New York, and Oregon. Fines across the fifty states vary considerably for possession of cannabis as outlined in Table 1 and Table 2. Decriminalization laws have been passed in Alaska, California, Colorado, Connecticut, Delaware, Hawaii, Illinois, Maine, Massachusetts, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New Hampshire, New Mexico, New York, North Carolina, North Dakota, Ohio, Oregon, Rhode Island, Vermont, Virginia, and Maryland. Maryland's decriminalization law was passed in 2014 rendering possession of less than 10 g of marijuana a civil offense punishable by a fine of up to \$100 for a first offense, \$250 for a second offense, and \$500 for a third offense; there is no prison time. Supporters of the law echo that the law reallocates time of law enforcement officials allowing them to focus on more nefarious crimes [75]. Driving under the influence of cannabis (DUI-C) is prohibited in all states regardless of fully legal status or adoption of medical marijuana programs. For example, in California, a first DUI-C offense can result in up to 6 months of prison and up to \$1000 fine [76]. Regarding home cultivation of cannabis in fully legal states, most states allow a defined number of plants with the caveat that the plants must be out of public view. New Jersey prohibits home cultivation of cannabis plants, and only persons with a medical marijuana card may cultivate cannabis in the state of Washington.

Medical marijuana programs vary with regard to patient eligibility such as qualifying diseases, reciprocity, cannabis supply maximum, registration fees, home cultivation, approved dispensaries, and physician registration. Conservative states like Alabama, Arkansas, Oklahoma, Iowa, West Virginia, Utah, and North Dakota prohibit home cultivation of cannabis, or limit access to cannabis through state approved dispensaries such as Louisiana and Mississippi. Reciprocity refers to patients having access to medical marijuana while visiting other states. States that allow reciprocity include Georgia, Hawaii, Iowa, Mississippi, New Hampshire, Oklahoma, and South Dakota; West Virginia only permits reciprocity for terminally ill cancer patients. States that have not adopted a medical marijuana program but allow FDA-approved drugs [containing low concentrations of THC] for patients with seizure disorders include Idaho, Indiana, Kansas, Kentucky, Nebraska, North Carolina, South Carolina, Tennessee, Texas, and Wisconsin. The state of Wyoming does not allow cannabis use for any medical disorder.

The limitation of this study is the exclusion of two states from the logistic regression analysis because of data not being available. These states were Florida and North Dakota.

5. Conclusion

This study analyzed data from 2010 reflective of cancer cases, opioid deaths, and MPAR and found that the MPAR was statistically significant in the logistic regression model. Decriminalization laws and medical marijuana laws have preceded passage of recreational cannabis laws in select states, and this trend may continue culminating in more states becoming fully legal. Cannabis classification of a Schedule I drug at the federal level will not likely change in the foreseeable future leaving states to chart their own course on cannabis legalization. Future studies should focus on cannabis taxation, continued monitoring of marijuana arrests among youth and adults, and standardization of CBD product content. Insight into how sales tax on cannabis products was formulated and revenue allocation would be informative. Tracking marijuana possession and trafficking arrests across demographics in fully legal states and states that are not fully legal would provide prospective clarity on whether recreational cannabis translates to increased or decreased arrests compared to states that prohibit recreational cannabis. Regulating CBD product content may accelerate approval of research studies that aim to elucidate physiological mechanisms toward treatment of disease and standardization of care. The path toward legalization of cannabis for nineteen states is not predicated on a solitary factor; public opinion, ideology, arrest statistics, health benefits may collectively play a role and serve as a blueprint for future legalization legislation.

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