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## **The Legalization of Marijuana and its Potential Effect on Youth in the United States**

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Philadelphia College of Osteopathic Medicine  
Graduate Program in Biomedical Sciences  
School of Health Sciences

**The Legalization of Marijuana and its Potential Effect on Youth in the United States**

A Capstone in Public and Population Health Leadership by Hanna Biedny

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Submitted in Partial Fulfillment of the Requirements for the Degree of  
Master of Science in Biomedical Sciences, Public and Population Health Leadership  
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## **ABSTRACT**

Even though cannabis' federal status remains under Schedule I categorization the legality of recreational marijuana is rapidly changing across the United States. As of March 2021, sixteen states plus Washington, D.C. have legalized cannabis' recreational use and dispensaries (DISA Global Solutions, 2021). Considerable controversy follows this trend in drug legalization, specifically regarding its public health impact on children.

As states continue to proceed with the decriminalization and legalization of cannabis, those in the public health field are concerned with how this will impact children across the country, as historically, "adolescents and young adults are among the highest users of marijuana" (Ladegard et al., 2020). A comprehensive review on cannabis, focusing on both its history and legal landscape in the United States will be presented. Additionally, cannabis' use in pediatric and adolescent cases will be analyzed to determine the trajectory of cannabis use for these patients. Ultimately, this paper will investigate if medical cannabis utilization in pediatric and adolescent populations potentiates the need for these patients to use cannabis in the future, especially if it is recreationally legal.

After much research it is reasoned that medicinal cannabis should continue to be an alternative treatment option for those pediatric and adolescent cases in which normal treatments are ineffective. However, more research is needed to investigate the potential impact cannabis legalization can have on adolescent populations already being prescribed cannabinoids.

# INTRODUCTION

## Medicinal Legal Landscape

The United States' relationship with cannabis dates back to the 17<sup>th</sup> Century where the production of hemp, the cannabis plant, was encouraged by the government (Marijuana Timeline, 1998). Hemp was used for the production of a broad variety of products from rope to clothing and was even considered a proper form of currency in Maryland, Pennsylvania, and Virginia (McNearney, 2018). Nonetheless, domestic production of hemp faded quickly and was gone by the end of the Civil War. Although hemp was no longer popular, a different version of the plant, marijuana – with a high quantity of hallucinogenic agent THC, became mainstream. In the, “late 19th Century, marijuana became a popular ingredient in many medicinal products and was sold openly in pharmacies” (McNearney, 2018). Drug producers like Eli Lilly, added marijuana to analgesics, antispasmodics, and sedatives (Braun, 2019).

The acceptance of marijuana both medicinally and recreationally changed throughout the next century. The Mexican Revolution of 1910 influenced American's to associate cannabis with anti-immigration sentiment and fear. This fear grew throughout The Great Depression and by 1931, twenty-nine states had completely outlawed cannabis (Marijuana Timeline, 1998). Following this trend, in 1937 the federal government effectively taxed and criminalized both medical and non-medical forms of marijuana through the Marihuana Tax Act (Braun, 2019). It is important to note here that the American Medical Association (AMA) opposed this act and actively lobbied against it, “declaring marijuana did not induce violence, or insanity, or lead to addiction or other

drug use” (Marijuana Timeline, 1998). Medicine firmly disagreed with government policy, believing cannabis was safe and needed to be researched. This concept continues to create tension today.

In the following decades, even with the cultural shift of the 1960s and a “renewed interest in the medical properties of cannabis,” (Mead, 2019) the persistent negative attitude about marijuana was not derailed. In 1970, Congress enacted the Controlled Substances Act, which is still in affect today (Braun, 2019). This act consolidates all previous federal laws governing the handling of hallucinogens, narcotics, and other drugs and classifies these substances into 5 distinct categories or schedules. These schedules are dependent on the drug’s medical use and abuse or dependency potential. When enacted, and currently at this time, cannabis’ federal status is under the most harsh Schedule I categorization. It is seen as a drug with, “no current acceptable medical use and a high potential for abuse” (Drug Enforcement Administration [DEA], n.d). The Schedule I designation has created challenges in accessing federal funding for medical cannabis studies, sourcing cannabis as a study drug, and even creates significant issues with personal, financial, and criminal liability of study participants and study centers.

Following the Controlled Substances Act, the United States enacted a War on Drugs, which lasted until the mid 1990s. In this campaign mandatory sentences were re-enacted for drug related crimes and life sentences were demanded for repeat drug (cannabis) offenders (Marijuana Timeline, 1998). This crusade was harsh, but “ended” in 1996 as California passed proposition 215, “allowing for the sale and medical use of marijuana for patients with AIDS, cancer, and other serious painful diseases” (Marijuana Timeline, 1998).

## **BACKGROUND**

More recently, there has been a major shift in the United States' perception. Medical cannabis is comprehensively used throughout most of the country. As of March 2021, twenty-seven states have fully decriminalized and legalized medicinal cannabis, with fourteen more allowing limited medical use (DISA Global Solutions, 2021). In comparison there are only three states in which medical cannabis is fully illegal and criminalized.

In states where medical marijuana is legal, individuals over the age of twenty-one with a qualifying condition can obtain this substance. Such people must seek consent from a physician as well as join their state's medicinal marijuana registry. In addition, minors, those under eighteen years of age, are also able to access medical marijuana with consent from a legal guardian and certification from a physician (National Conference of State Legislatures [NCSL], 2021). Many states however, "require a second physician for the certification of a minor's use... including four states that require specific certification from a pediatrician, or pediatric subspecialist, or pediatrician and psychiatrist" (Wong & Wilens, 2017).

In addition to the acceptance of medical cannabis, the United States has been becoming more progressive towards recreational usage; sixteen states as of March 2021 have fully legalized recreational cannabis. Under these states' legislation, adults over the age of twenty-one may possess and use any form of cannabis. Those under twenty-one, if qualified, can obtain only medical cannabis legally. The American Academy of

Pediatrics, opposes dispensing medical cannabis to children and adolescents outside the regulatory process of the US FDA. Although, the Academy does recognize that cannabis may currently be an option for ‘certain unique situations’ for children with life-limiting or severely debilitating conditions and for whom current therapies are inadequate. (Wong & Wilens, 2017)

### **Cannabis Role in Pediatric and Adolescent Populations**

Interests in the medical applications of cannabis have increased dramatically during the past twenty years. The Food and Drug Administration (FDA) currently approves of two cannabinoids in the United States, Dronabinol (Marinol) and Nabilone (Cesamet), both of which are only available by physician prescription (Wong & Wilens, 2017). These drugs in both pediatric and adolescent cases are used to treat chemotherapy-induced nausea and vomiting, epilepsy, spasticity, and neuropathic pain.

When preventing or treating acute chemotherapy-induced nausea and vomiting in pediatric or adolescent patients, physicians commonly have adopted, “the ‘triple therapy’ regimen of antiemetic prophylaxis” (Sherani et al., 2019). This therapy includes usage of a 5-HT<sub>3</sub> antagonist, dexamethasone, and a neurokinin-1 antagonist, all of which have little to no adverse side effects when given in the correct dosage (Sherani et al., 2019). The alternative treatment of medical cannabis is used for patients who have failed to respond adequately to conventional antiemetic therapy (Campbell et al., 2017). In previous studies Dronabinol and Nabilone have decreased nausea severity, frequency, and frequency of vomiting with little side effects (Wong & Wilens, 2017). The only

cause for concern is when given in too high of a dosage Dronabinol and Nabilone can have the reverse effect, causing hyperemesis.

The most common use of Dronabinol and Nabilone is in treating drug-resistant epilepsy, seizures not controlled by anticonvulsant medications. Devinsky et al. (2017) found that cannabinoid treatment for children with Dravet Syndrome, early onset epilepsy, significantly reduced convulsive seizure frequency as compared to placebo. In addition, further research has proven that medical cannabis is useful to treat other syndromes. Gofshteyn et al. (2016) and Kaplan et al. (2017) report reduction of seizures in patients with febrile infection related epilepsy syndrome (FIRES) and Sturge-Weber syndrome, respectively.

Spasticity and neuropathic pain in pediatric and adolescent cases are also alternatively treated with the cannabinoids. Even though studies are scarce and those that are available, like Kuhlen et al. (2016), have a risk of bias because of a lack of controls and blinding, results are in alignment with adult literature findings. Evidence suggests that patient reported pain and spasticity symptoms are improved with oral cannabinoids. (Wong & Wilens, 2017).

Although there is substantial evidence that medical cannabis provides potential health benefits for pediatric and adolescent populations, as discussed above, pediatricians and parents must weigh the benefits of cannabis use with its potential risks before consenting to allow their patients or children to use this substance.

The negative side effects of medical cannabis have been well documented. In the studies mentioned above the main short-term side effects of the cannabinoids were

drowsiness and dizziness, diarrhea, and decreased appetite (Wong & Wilens, 2017).

Although not pleasant, when compared to the potential side effects of anticonvulsant or pain drugs for children they are minimal. All of these side effects occurred at high dosages, and when dosages were reduced minimal to no side effects were reported. It is important to note, serious short-term side effects due to the accidental overdose of medicinal cannabis are hyperemesis and seizures.

Studies concerning the long-term risks of medical cannabis to pediatric and adolescent populations are absent. However, as potential long-term risks can directly influence pediatricians and parents in the decision to prescribe or seek the use of medical cannabis, it is important to try and extrapolate adverse effects using data collected about recreational marijuana.

During adolescence (11 to 21 years old) a child's brain is constantly growing and developing, therefore it is vulnerable to alterations from substances such as recreational marijuana or medical cannabis. Recent research suggests that, "individuals who begin using cannabis regularly in adolescence tend to have different cortical and subcortical volumes... that can correlate to cognitive impairments such as attention deficits, verbal memory deficits, and behavioral changes" (Wong & Wilens, 2017). Furthermore, recreational cannabis use in adolescence has been linked to earlier onset and higher rates of psychosis in susceptible patients (Ammerman et al. 2015). Bechtold et al. (2016) supports this theory by concluding that adolescent cannabis use leads to high levels of psychotic symptoms like paranoia despite one year of abstinence. Although there are differences between medical cannabis and recreational marijuana, "including frequency,

dosing, and potency” (Wong & Wilens, 2017), it is important to use all data at hand to theorize the potential long-term effects for pediatric and adolescent medical cannabis users.

### **Impact of Cannabis Policies on Pediatric and Adolescent Populations**

As states continue to proceed with the decriminalization and legalization of both medicinal and recreational cannabis, it is of increasing concern how this can impact pediatric and adolescent children. In 2015, a technical report by Ammerman et al. was released through The American Academy of Pediatrics and analyzed data from recent studies as well as national databases, Monitoring the Future (MTF) and the National Survey of Drug Use and Health, to report on the impact changing cannabis legality has had. Ammerman et al (2015) state that, when all high school data are combined for each state in which medical marijuana is legalized and for which data for current use before and after medical marijuana legalization are available (14 states to date), no state with legalized medical marijuana has shown a statistically significant increase in adolescent recreational marijuana use except Delaware; 2 states (Alaska and Montana) have shown statistically significant decreases.

Is this enough proof that legalizing and allowing the use of medical cannabis will not affect children? Or is it too early to tell?

In addition to these findings, Ammerman et al (2015) established that, “states with legalized medical marijuana reported lower rates of perception of riskiness of marijuana than states without.” Does this perception change potentially mean the United States is on

the verge of another crisis like we have experienced with prescription pain relievers?

More research and surveillance is needed to answer this question.

## **RESEARCH STRATEGIES**

A review of the literature on medical cannabis use in pediatric and adolescent populations was performed using Google Scholar, PubMed, P.C.O.M's OneSearch+, and the Journal of the American Academy of Pediatrics. The following search terms were used: ("cannabis" or "cannabinoid" or "marijuana" or "medical marijuana") AND ("pediatric" or "adolescent" or "youth.") Articles published from 2015 to 2020 were prioritized and included if they pertained to one of the following: conditions for treatment with medical cannabis, efficacy of medical cannabis for certain conditions, short- or long-term effects of medical cannabis, and any other characteristics describing cannabis' reactions in pediatric or adolescent populations. Only studies or systemic reviews on pediatrics and adolescents (aged 2 to 21) were included.

## **DISCUSSION**

### **Trajectory of Cannabis Use for Pediatric and Adolescent Populations**

Medical cannabis remains a controversial topic, especially in regards to pediatric and adolescent cases. As it is used as an alternative therapy to treat chemotherapy-induced nausea and vomiting, epilepsy, spasticity, and neuropathic pain one can conclude that it is medically relevant. However, it is neither devoid of potentially harmful effects nor universally effective. So the question remains should cannabis continue to be used as a treatment for young patients?

To answer this question one must consider the impact medical cannabis' side effects can have on the quality of a child or adolescents' life. The short-term adverse reactions of drowsiness and fatigue, diarrhea, and decreased appetite are not severe. They are unpleasant and may hinder users from doing certain tasks, such as driving or playing intensive sports, but they do not further handicap. Cannabis' mild short-term effects instead permit children and adolescents to acquire or maintain a normal life. Normalcy, especially among children and adolescents can have a major impact on their health equal to that of any drug treatment. When youth, especially those with long term illnesses, are able to participate in every-day age appropriate activities and are not hindered by adverse reactions to drug treatments amazing things occur. They are able to learn skills and develop relationships that promote social well-being and healthy development. For children who are sick or are unresponsive to normal treatment methods cannabis provides

a way to be normal and gain back control. The short-term adverse effects can be overlooked due to such a positive impact.

The long-term effects of medical cannabis have yet to be studied. It is unknown how Dronabinol and Nabilone can effect brain development and long-term growth in children and young adults. As previously mentioned, data on the long-term effects of recreational marijuana is readily available and has been used to extrapolate medical cannabis' long-term effects. The potential long-term adverse reactions of cognitive impairment, behavioral challenges, and early onset psychosis negatively impact a child's life. It would be extremely difficult to achieve normalcy or even develop appropriate skills needed in adulthood with any of these potential long-term reactions. However, as medicinal and recreation cannabis are different the conclusions extrapolated from recreational cannabis studies are not representative of medical cannabis' potential effects. Before one can support normalizing the use of medicinal cannabis in adolescent and pediatric populations, questions regarding cannabis' long lasting impact must be answered.

Thus, the simple answer to if cannabis should continue to be used as a treatment for young patients is yes. Medicinal cannabis should continue to be an alternative treatment option for those pediatric and adolescent cases in which normal treatments are ineffective. However, more research is needed to investigate any potential long-term effects medicinal cannabis can have before accepting it as a normal treatment option. Without proper knowledge of all of medical cannabis' potential side-effects physicians as

well as parents can not make informed decisions on whether or not to allow this treatment path.

### **Trajectory of Cannabis Impact on Pediatric and Adolescent Populations**

As states continue to proceed with the decriminalization and legalization of both medicinal and recreational cannabis it is important to discuss the impact this changing legal landscape can have on pediatric and adolescent children. Described earlier, data from nation wide sources revealed that adolescent recreational marijuana usage did not significantly increase when a state legalized medical cannabis (Ammerman et al., 2015). This illustrates an interesting point. The legalization of medical cannabis does not have an impact on adolescent recreational usage. This conclusion was drawn by monitoring states over a short time period following each states' medicinal cannabis legalization, so longer-term results may indicate a different trend. Nevertheless, this supports the idea that medical cannabis has more of a positive impact then it does negative on pediatric and adolescent populations. In light of this relationship one must consider if the legality of recreational cannabis could influence the use of medical cannabis. Does recreational legalization have a positive or negative impact, on adolescent medical cannabis use? Technically, legalizing recreational cannabis allows adolescents greater ease of access to all types of cannabis and cannabinoids, which could potentially influence negative substance use. So would a child, who is currently being prescribed a cannabinoid as a treatment for a disease, prefer to use recreational cannabis and "self-prescribe" if legal? This is an interesting point to consider as little to no research has been done.

With the legalization process predicted to continue, the question of nationwide marijuana legalization is more a matter of when, not if. So how can the United States properly introduce cannabis to limit its impact on youth? First, states that are considering allowing recreational cannabis or those that already allow it should conservatively regulate its sale through strict laws. It may be beneficial to introduce laws that mimic those of tobacco and alcohol that limit where cannabis can be sold, who can sell it, and increase the age needed to purchase this substance. These laws influence those in adolescent populations and dissuade many from trying to obtain cannabis. Next, public health campaigns that effectively describe the harm and negative side effects associated with adolescent cannabis use are needed. They would discourage the population from trying or continuing use of cannabis even despite cannabis being legal. Simply, such campaigns would influence adolescents' to perceive cannabis as harmful and encourage them to cease trying it. A good model to use to produce cannabis' public health campaigns would be tobacco's "The Real Cost" campaign (Food and Drug Administration, 2021) as tobacco is marketed and sold much like recreational cannabis. Lastly, those in the medical and public health fields must discourage the use of marijuana by adults in the presence of children and adolescents. Role modeling healthy behaviors is key to influencing children and adolescents. By following these three suggestions the states can limit cannabis' impact on youth when it is introduced.

## **FUTURE STUDIES**

After presenting a comprehensive review on cannabis, focusing on its history, legal landscape, and use in pediatric and adolescent populations there are many directions in which further research is needed. The first being that studies should investigate the long-term effects of medicinal cannabis in pediatric and adolescent patient populations. This data is needed so physicians and parents can make better-informed decisions about using cannabis as an alternative treatment option. Extrapolating medicinal cannabis' effects from studies on recreational cannabis is not sufficient enough. Other research should be directed toward analyzing how the changing legal landscape of cannabis is impacting youth across the nation. Researchers should look to firmly answer the question, if legalizing either medicinal or recreational cannabis influences youth cannabis use rates? Additionally, it is important to examine what, if any, impact does legalization have on children already using medical cannabis? With the question of nationwide marijuana legalization more a matter of when, not if it, is important that more research is done on these topics as they have the potential to influence a full generation.

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