

# Medical Cannabis Patients Under the Age of 21 in the United States: Description of Demographics and Conditions from a Large Patient Database, 2019-2023

Mitchell L Doucette<sup>1</sup>, Dipak Hemraj<sup>1</sup>, Douglas Bruce<sup>2,†</sup>, Emily Fisher<sup>1</sup>, D Luke Macfarlan<sup>1</sup>

<sup>1</sup>Health Economics and Outcomes Research, Leafwell, Miami, FL, USA; <sup>2</sup>Department of Health Sciences, DePaul University, Chicago, IL, USA

<sup>†</sup>Professor Douglas Bruce passed away on June 11th, 2024

Correspondence: Mitchell L Doucette, Health Economics and Outcomes Research, Leafwell Inc., Miami, FL, USA, Tel +1 203 293 9416, Email mdoucette@leafwell.com

**Introduction:** Existing research on medical cannabis patients has often overlooked those younger than 21. This study aimed to detail the frequency and rate of pediatric medical cannabis patients in the US using a large patient database.

**Methods:** Utilizing Leafwell Patient Database data from 2019 to mid-2023, we described demographics and qualifying conditions, employing descriptive statistics and  $\chi^2$  tests to discern differences between minors (0–17 years) and young adults (18–20 years). We calculated rates per 100,000 population by state.

**Results:** Analyzing 13,855 patients, 5.7% were minors and 94.3% were young adults. Anxiety emerged as the primary self-reported condition for both groups, yet differences were seen for other conditions. Differences were observed by race/ethnicity, health insurance status, residency in adult-use states, and number of reported conditions. Notably, both groups reported a similar average number of conditions.

**Conclusion:** This study underscores demographic distinctions between minor-aged medical cannabis patients and young adults. There is a need for comprehensive clinical research addressing efficacy, safety, and tailored guidelines specific for pediatric medical cannabis patients. Such insights are pivotal for healthcare providers and policymakers in navigating medical cannabis treatment protocols.

**Plain Language Summary:** This paper describes the demographics and medical conditions of medical cannabis patients under the age of 21 in the United States based on data from the Leafwell Patient Database spanning 2019 to mid-2023. We found that there is a significant number of medical cannabis users aged 20 or younger, with variations in demographics and conditions between minors (under 18) and young adults (18-20). The findings indicate that minor patients are predominantly white, non-Hispanic, residing in non-adult-use states, and report a lower number of conditions per patient compared to young adults. Anxiety, chronic pain, and PTSD are among the most commonly self-reported conditions for both age groups. There is need for additional clinical studies to understand the role of medical cannabis in addressing symptoms and improving the quality of life for conditions such as chronic pain, anxiety, and PTSD in the pediatric population. The study is limited by its reliance on self-reported data but represents the largest cohort of pediatric medical cannabis users in the world. Further investigation by academics and clinical scientists ought to inform the appropriate integration of medical cannabis in young patients.

**Keywords:** medical cannabis, pediatric, patient database, United States

## Introduction

As of 2023, 38 states, three territories, and the District of Columbia allow the medical use of cannabis products.<sup>1</sup> There are approximately 3,866,746 registered medical cannabis patients as of 2023 in the United States. This estimate is

derived from state-run medical cannabis programs and may likely be an undercount, as some states do not mandate compulsory registration for medical cannabis use.<sup>2</sup> Regardless of whether a state requires registration to a state-run medical cannabis program, each state's program stipulates a unique list of medical conditions that qualify a patient for a medical card, known as, "qualifying conditions". Potential patients must have a physician certify that they suffer from one of these conditions in order to be eligible for medical cannabis. For those under the age of 18, there are typically more stringent regulations and often a more limited list of qualifying conditions.

The 2017 National Academies of Sciences report on the health effects of cannabis and cannabinoids found some limited evidence supporting the use of medical cannabis for anxiety, PTSD, HIV/AIDS, and Tourette syndrome, and substantial or conclusive evidence in support of its use for treating traumatic brain injuries, multiple sclerosis, and chronic pain.<sup>3</sup> The report did not find evidence to confirm the efficacy of medical cannabis for various other conditions, such as cachexia, epilepsy, cancer, or muscular dystrophy. It's important to note that these findings pertain to the adult population, with the report recommending that the health effects of cannabis on certain pediatric conditions, such as epilepsy and cancers, be further studied. However, newer research suggests medical cannabis may have a superior benefit-safety profile compared to commonly used medication for chronic neuropathic pain.<sup>4</sup>

Although the data on medical cannabis patients are somewhat limited, we have a basic understanding of who these patients are and the medical conditions for which they use medical cannabis.<sup>5-9</sup> Recent research has utilized commercial data sources and publicly available data, such as state medical cannabis patient databases, to improve our understanding of medical cannabis patients. Analyses of commercial data conducted by Mahabir, Smith, and Garibaldi (2020), as well as Mahabir et al (2021), relied on data from 22 medical cannabis evaluation clinics across five states: Colorado (CO), Connecticut (CT), Maine (ME), Maryland (MD), and Massachusetts (MA). The researchers found that medical cannabis users were predominantly white, non-Hispanic, mostly male, and with an average age in the mid-40s.<sup>7,8</sup> The authors found that the mean number of comorbid conditions was 3.3 for males and 4.1 for females and that the number of comorbid conditions varied by state. Notably, they also discovered that certain demographics, particularly age, as well as the types of primary conditions, varied by state.<sup>8</sup> The fluctuation is likely due to variability in the medical conditions that qualify for treatment between states, as the authors note.

Research evaluating state patient database data from 2001-to-2015 found that participation in state-level medical cannabis programs increased in the late 2000s and early 2010s.<sup>9</sup> Fairman (2016) observed that two-thirds of registered patients were male, with the differences in sex decreasing over time. Other researchers, examining similar data and years,<sup>5,6</sup> noted that the upward trend of registrants continued into the mid to late 2010s and emphasized that the most common qualifying condition was chronic pain, followed by multiple sclerosis.

Fairman (2016) provided information about the population of medical cannabis users under the age of 18, which was reported to be around 1%. Other studies have estimated the percentage of patients under 18 to be around 1% or lower.<sup>7,8,10</sup> While the information discussed above offers some insights about medical cannabis patients, there is a lack of detailed population-level data on minor-aged medical cannabis patients (those under 18) and young adult medical cannabis patients, defined as those over 18 but under 21 years of age (the legal age for non-medical, adult use in states with recreational cannabis laws).

Much of our understanding of pediatric-aged use of medical cannabis comes from clinical studies. These studies have examined the effects of cannabis on various pediatric diseases,<sup>11-14</sup> finding some evidence to support the use of medical cannabis for treatment-resistant epilepsy as well as chemotherapy-induced nausea and vomiting. There is also moderate to low evidence supporting medical cannabis as a treatment for autism.<sup>14-16</sup> Other conditions commonly self-reported as reasons for initiating medical cannabis treatment, such as chronic pain, have limited evidence supporting their efficacy.<sup>17</sup> Importantly, while the number of medical cannabis total registrants increased in the mid-to-late 2010s,<sup>5</sup> data from Monitoring the Future, a national wide survey of drug use from 1975–2023, did not suggest similar increases in medical cannabis use among 8th, 10th, and 12th graders.<sup>18</sup>

Qualifying for a medical card as a minor typically involves additional certification steps. In some states, if a patient is under the age of 18, two physicians' recommendations are required, often including one from a specialist and/or pediatrician, as well as parental consent. The qualifying criteria are also stricter for those under 18 due to concerns

about safety and tolerability.<sup>19</sup> Florida, in particular, restricts the types of cannabis products that minors can access through its medical cannabis program.

Young adults, no longer considered minors, are not subject to these restrictions, but like anyone seeking enrollment in the medical cannabis program, must be certified by a physician before they can receive their medical card. Notably, individuals aged 18 to 20 fall into a unique age group where they are not legally allowed to purchase cannabis in states with adult-use laws but can potentially access medical cannabis through a medical program.

One study has examined the motivations and behaviors surrounding medical cannabis use among young adults.<sup>20</sup> The authors utilized data from a long-running longitudinal study of substance use among several Southern California students, tracking the participants from 2008 to 2018–2019. Within the sample, they identified a small subset ( $n = 180$ ) of medical cannabis users and compared these individuals to those who reported using cannabis for recreational purposes. The study revealed that medical cannabis patients, particularly those with multiple conditions, reported more frequent and heavier cannabis use, despite not showing significant differences in symptom severity compared with recreational users.<sup>20</sup>

The focus of this manuscript is on providing a population-level description of pediatric and young adult medical cannabis patients from a large patient database in the United States. Detailed information on this segment of the population is crucial to help develop better and more comprehensive regulatory frameworks and safety guidelines, to improve patient care, and to provide researchers with a potential pool of participants for further clinical studies.<sup>21</sup> Demographic information and patient characteristics are provided overall, as well as by age group, categorized into minors (aged 17 years or younger) and young adult (aged 18 to 20 years). We explore the distribution of patients across the US and present information about the predominant types of self-reported conditions.

## Methods

To characterize medical cannabis use among pediatric-aged individuals in the US, we utilized data from 2019 to mid-2023 from Leafwell (<https://leafwell.com/>). We calculated frequencies, proportions, and conducted tests of statistical independence for various demographics both overall and within two distinct age groups: minors (those under 18 years old) and young adults (those aged between 18 and 20 years). Additionally, we reported frequency counts and rates per 100,000 population by state for each age category.

## Data and Measures

This cross-sectional study was conducted using retrospective, anonymized data supplied by Leafwell, a telehealth platform that provides access to licensed physicians for those who may qualify for the use of medical cannabis. Leafwell operates in 34 states and is advertised on internet search engines and digital media for connecting potential medical cannabis patients with physicians within their given state. After a physician qualifies a patient for medical cannabis, ie, a licensed physician verifies an existing qualifying medical condition, Leafwell helps patients receive their medical card, which enables them to purchase medical cannabis at a licensed dispensary. Leafwell patients are required to fill out a baseline questionnaire regarding basic demographic information and medical condition(s), which comprises the Leafwell Patient Database (LPD). We utilized data from this baseline questionnaire to inform our study.

Per state-level laws, parents or legal guardians (ie, caregivers) were required to fill out baseline questionnaires for minor patients. Young adult patients (18 years old or above) were not required to involve a parent or legal guardian. As minor patients did not provide their own data, their data cannot be viewed as self-reported. However, we will use that term throughout this manuscript, with the understanding that minor patients' responses were provided under the supervision of a caregiver per state law.

To maintain strict patient confidentiality, only deidentified data from the LPD was shared with internal researchers. Researchers do not have access to non-anonymized data. This project received exempt status from an external, third-party IRB, BRANY (IRB Number: IRB00000080). Patients consented to the use of their questionnaire data in aggregate form as part of the Leafwell terms of service.

Patients who completed the questionnaire self-reported their demographics, including racial/ethnic identity, age, sex, type of health insurance, state of residence, whether they had been diagnosed with schizophrenia, and details of their

medical condition. We categorized race/ethnicity into four groups: Black (non-Hispanic), White (non-Hispanic), Hispanic, and other reported races. Gender identity was simplified into two categories: male and female. Health insurance was classified as private, public, or none/other. Age was treated as a continuous variable.

In this study, we analyzed state frequencies in several ways. First, we provided frequency counts for each state. We then calculated rates per 100,000 using population estimates from 2020 to estimate the prevalence of medical cannabis users within the LPD. Population estimates were derived using microdata from the Current Population Survey accessed from the Integrated Public Use Microdata Series.<sup>22</sup> Rates were computed separately for the two age strata. Additionally, we categorized states into one of two cannabis legal regimes: 1) Medical Cannabis Only states, and 2) Medical Cannabis and Adult Use states. Of note, while medical cannabis is legal in 38 states, with 7 additional states legalizing CBD-oil /Low-THC medical programs, not all states allow for telehealth appointments for medical card registrations. [Supplemental Table 1](#) provides a breakdown of state regulation around telehealth usage for medical cards.

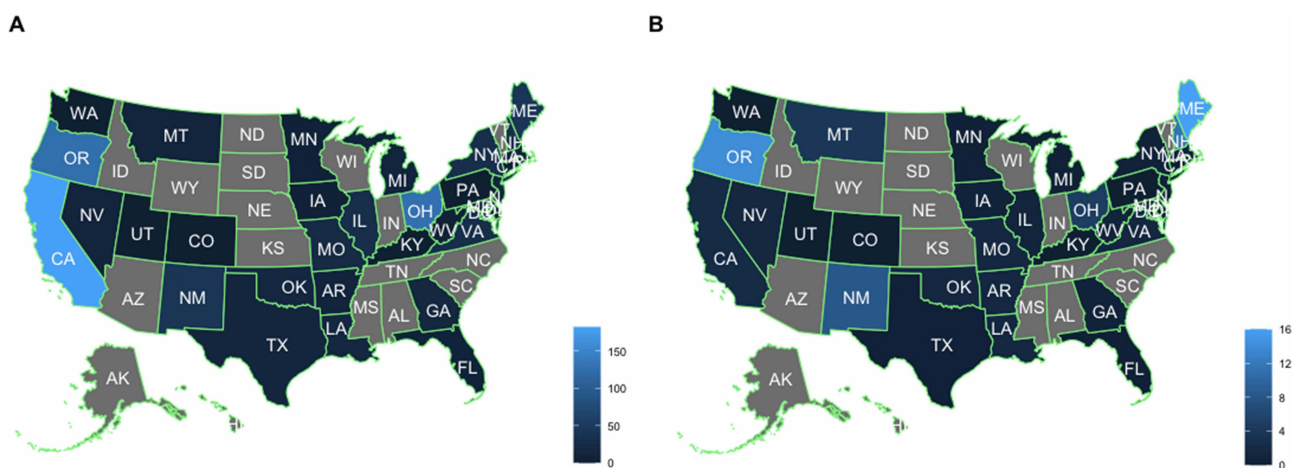
In the baseline questionnaire, patients specified a primary condition, with a provider qualifying that this reported condition merited the use of medical cannabis per state law. In the same questionnaire, we offered patients the opportunity to list other medical conditions related to their desire to be evaluated for the use of medical cannabis, or “secondary” conditions. For our analysis, we present a list of the top 15 primary conditions and provide the frequency of patients according to the number of self-reported secondary conditions by state.

## Data Analysis

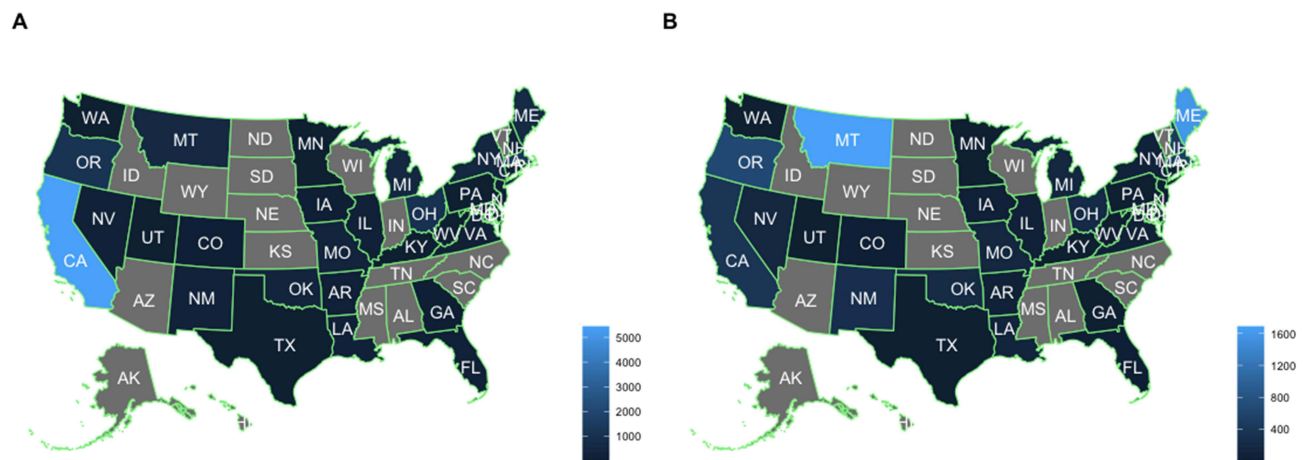
We described the frequency and proportions of patients by the demographics and conditions discussed previously. Descriptive statistics were used to identify differences in demographics and conditions between minors (0–17 years old) and young adults (18–21 years old). Rates per 100,000 population were calculated by state. Descriptive statistics and frequencies were estimated with Stata version 18.0.<sup>23</sup> We utilized R<sup>24</sup> and the “USMAP”<sup>25</sup> package to generate state maps.

## Results

Overall, 15,156 medical cannabis patients 20 years or younger were asked to provide baseline information, with 13,855 (91.4%) completing at least some portion of the questionnaire. Of this sample, only 5.7% were minors (n = 790), with the remaining 94.3% being 18-to-20-year-olds. [Figures 1](#) and [2](#) illustrate heat maps that show density by count (Plot A) and by rate per 100,000 population (Plot B) for minor patients and young adults, respectively. We have included the data for these visualizations in [Supplemental Table 2](#). According to [Figure 1](#), the highest counts of minor patients are in California (n = 182), Ohio (n = 127), and Oregon (n = 124), with several states reporting 0 or 1 minor patient (refer



**Figure 1** Frequency and rate per 100,000 population for minor patients (Less than 18 years of age) among US states using data from the Leafwell Patient Database, 2019-Mid-2023. Gray states indicate no data available. **Plot A** represents count frequencies; **Plot B** represents patients' rate per 100,000 population.



**Figure 2** Frequency and rate per 100,000 population for young adult patients (between the ages of 18 and 20) among US states using data from the Leafwell Patient Database, 2019-Mid-2023. Gray states indicate no data available. **Plot A** represents count frequencies; **Plot B** represents patients' rate per 100,000 population.

to [Supplemental Table 1](#) for detailed data). When considering rates per 100,000 population, Maine (rate = 15.81), Oregon (rate = 13.80), and New Hampshire (rate = 11.51) show the highest prevalence of minor patients. [Figure 2](#) indicates that California also has the largest number of young adult patients ( $n = 5439$ ), followed by Massachusetts ( $n = 1249$ ), Oregon ( $n = 1139$ ), and Ohio ( $n = 995$ ) (detailed data available in [Supplemental Table 2](#)). Regarding the rate of young adult patients per 100,000, Montana (rate = 1274.76), Maine (rate = 827.44), and Oregon (rate = 579.20) have the highest rates among the included states.

[Table 1](#) details counts and within-group percentages of patients by various demographics and characteristics, categorized by age group (minor versus young adult). The table also includes chi-square ( $\chi^2$ ) tests to assess statistical independence between groups. Reviewing the Total column, we observe that the majority of patients were white, non-Hispanic (63.2%), male (57.2%), had private health insurance (44.6%), resided in states allowing both medical cannabis and adult use (75.5%), and had an average age of 18.9 (with a standard deviation of 0.02). Less than 1% of the sampled patients self-reported a diagnosis of schizophrenia. Regarding the number of reported conditions, patients most commonly had one (32.1%), followed by two (34.4%), and three (21%) conditions, with the percentages for each category being relatively similar.

When comparing minor patients to young adult patients, we observe p-values of less than 0.001 across all characteristics except for sex, indicating significant differences between the two groups. Analysis of the within-group percentages suggests that minor patients are predominantly white, non-Hispanic and less likely to be Hispanic than the young adult group. In terms of health insurance, a greater proportion of minor patients reported having public health insurance, while young adult patients more frequently reported having no insurance or other types of insurance. Fewer minor patients resided in states where cannabis is legal for both medical and adult use. The percentage of those who reported a schizophrenia diagnosis was higher for minor patients (1.7%) compared to young adults (0.7%). Additionally, a larger percentage of minor patients reported having one or two medical conditions relative to young adults.

[Table 1](#) additionally indicates the total number of conditions reported by age group (minor versus young adult) and calculates this figure as an average number of conditions per patient. In our sample, 790 minor-aged patients self-reported a total of 1592 conditions, averaging about 2.02 conditions per individual. Meanwhile, the 13,065 young adult patients reported a total of 28,857 conditions, averaging about 2.21 conditions per individual. Overall, the average number of self-reported conditions per patient was 2.20.

[Table 2](#) lists counts of the top 15 reported medical conditions, categorized by primary medical condition as well as by any reported condition. Any reported condition is not mutually exclusive, for instance, a single individual may report multiple conditions such as anxiety, depression, and PTSD concurrently. Anxiety emerged as the most commonly reported primary condition ( $n = 5442$ ), followed by chronic pain ( $n = 1992$ ) and nausea/vomiting ( $n = 1313$ ). When

**Table 1** Descriptive Frequencies and Statistics for Pediatric Medical Cannabis Patients Using Data from the Leafwell Patient Database, Jan, 2019-Through-June-2023

| N  | Minors (Age <18)<br>(n, %) | Young Adults<br>(Age 18–20) (n, %) | Total           | P-value |
|--|----------------------------|------------------------------------|-----------------|---------|
|  | 790 (5.7%)                 | 13,065 (94.3%)                     | 13,855          |         |
| <b>Race/Ethnicity</b>                              |                            |                                    |                 |         |
| White, non-Hispanic                                | 413 (70.36%)               | 7226 (62.81%)                      | 7639 (63.17%)   | <0.001  |
| Black, non-Hispanic                                | 51 (8.69%)                 | 768 (6.68%)                        | 819 (6.78%)     |         |
| Hispanic or Latino                                 | 57 (9.71%)                 | 2285 (19.87%)                      | 2342 (19.37%)   |         |
| Other Race   | 66 (11.24%)                | 1226 (10.65%)                      | 1292 (10.68%)   |         |
| <b>Sex</b>   |                            |                                    |                 |         |
| Female   | 316 (40.46%)               | 5516 (42.96%)                      | 5,832 (42.81%)  | 0.107   |
| Male   | 465 (59.54%)               | 7323 (57.04%)                      | 7788 (57.19%)   |         |
| <b>Age, Mean (SD)</b>                              | 13.17 (0.16)               | 19.23 (0.06)                       | 18.89 (0.02)    | <0.001  |
| <b>Type of Health Insurance</b>                    |                            |                                    |                 |         |
| Private Insurance                                  | 128 (41.29%)               | 2853 (44.74%)                      | 2981 (44.58%)   | <0.001  |
| Public Insurance                                   | 130 (41.94%)               | 1440 (22.57%)                      | 1570 (23.47%)   |         |
| None or other                                      | 52 (16.77%)                | 2084 (32.69%)                      | 2136 (31.95%)   |         |
| <b>Medical Cannabis State Law</b>                  |                            |                                    |                 |         |
| Medical Cannabis Only                              | 372 (47.09%)               | 3021 (23.13%)                      | 3393 (24.5%)    | <0.001  |
| Medical Cannabis + Adult Use                       | 418 (52.91%)               | 10,044 (76.87%)                    | 10,462 (75.5%)  |         |
| <b>Total Number of Conditions</b>                  |                            |                                    |                 |         |
| 1 Condition  | 318 (40.25%)               | 4130 (31.61%)                      | 4448 (32.11%)   | <0.001  |
| 2 Conditions                                       | 256 (32.41%)               | 4508 (34.5%)                       | 4764 (34.38%)   |         |
| 3 Conditions                                       | 131 (16.58%)               | 2775 (21.24%)                      | 2906 (20.98%)   |         |
| 4 Conditions                                       | 63 (7.98%)                 | 1112 (8.51%)                       | 1175 (8.48%)    |         |
| 5 Conditions                                       | 22 (2.79%)                 | 540 (4.14%)                        | 562 (4.06%)     |         |
| <b>Conditions by Patient</b>                       |                            |                                    |                 |         |
| Total Reported Conditions*                         | 1592                       | 28,857                             | 30,449          |         |
| Conditions per Patient                             | 2.02                       | 2.21                               | 2.20            |         |
| <b>Have you been diagnosed with Schizophrenia?</b> |                            |                                    |                 |         |
| Yes  | 13 (1.65%)                 | 96 (0.74%)                         | 109 (0.79%)     | 0.016   |
| No   | 777 (98.35%)               | 12,966 (99.27%)                    | 13,743 (99.21%) |         |

**Notes:** There were 235 missing data for sex, There were 1763 missing data for Race/Ethnicity. There were 7168 missing data for this type of health insurance. There were 5 missing data points for whether someone was diagnosed with schizophrenia. \*Conditions are not mutually exclusive; patients can self-report up to 20 conditions.

assessing the distribution of primary conditions by age, a comparable percentage of minors and young adults reported experiencing anxiety. However, higher percentages of young adults reported conditions such as chronic pain, depression, and insomnia compared to minors. Conversely, conditions such as cancer, epilepsy, PTSD, and other miscellaneous conditions were reported at higher percentages among minors than young adults.

The list of non-mutually exclusive medical conditions revealed different patterns compared to the primary medical condition list. While anxiety remained the most frequently reported condition (n = 8568), insomnia rose to the second most common (n = 4394), followed by chronic pain (n = 3602). Across age stratifications, the patterns were similar; both minors and young adults reported anxiety in comparable percentages. However, young adults reported a higher prevalence of chronic pain and depression, whereas minors more frequently reported cancer, PTSD, and other conditions. Another significant observation from the non-mutually exclusive condition list was that nearly an equal percentage of patients across both age groups reported experiencing insomnia.

[Supplemental Table 3](#) provides frequencies of medical conditions by states. Notably, anxiety was the most frequently self-reported medical condition across several states, including California, Massachusetts, New Jersey, Oklahoma, and

**Table 2** Frequency of Top 15 Reported Primary Medical Conditions and Any Reported Conditions Among Pediatric Medical Cannabis Users by Age Group (Minor Vs Young Adult) Using Data from the Leafwell Patient Database, 2019–2023

| Condition  | Primary Medical Condition     |                                       |               | Any Reported Medical Condition |                                       |               |
|--|-------------------------------|---------------------------------------|---------------|--------------------------------|---------------------------------------|---------------|
|  | Minors<br>(Age <18)<br>(n, %) | Young Adults<br>(Age 18–20)<br>(n, %) | Total (n, %)  | Minors<br>(Age <18)<br>(n, %)  | Young Adults<br>(Age 18–20)<br>(n, %) | Total (n, %)  |
| ADD/ADHD   | 12 (1.81%)                    | 113 (0.89%)                           | 125 (0.94%)   | 19 (1.36%)                     | 172 (0.63%)                           | 191 (0.66%)   |
| Anorexia   | 7 (1.06%)                     | 177 (1.39%)                           | 184 (1.38%)   | 14 (1%)                        | 566 (2.06%)                           | 580 (2.01%)   |
| Anxiety  | 269 (40.46%)                  | 5173 (40.59%)                         | 5442 (40.58%) | 423 (30.11%)                   | 8145 (29.54%)                         | 8568 (29.57%) |
| Arthritis  | 0 (0%)                        | 36 (0.29%)                            | 36 (0.27%)    | 1 (0.08%)                      | 66 (0.24%)                            | 67 (0.24%)    |
| Cancer   | 23 (3.46%)                    | 16 (0.13%)                            | 39 (0.3%)     | 25 (1.78%)                     | 34 (0.13%)                            | 59 (0.21%)    |
| Chronic Pain   | 40 (6.02%)                    | 1952 (15.33%)                         | 1992 (14.87%) | 108 (7.69%)                    | 3494 (12.68%)                         | 3602 (12.44%) |
| Crohn's Disease  | 3 (0.46%)                     | 36 (0.29%)                            | 39 (0.3%)     | 4 (0.29%)                      | 50 (0.19%)                            | 54 (0.19%)    |
| Depression   | 21 (3.16%)                    | 878 (6.89%)                           | 899 (6.71%)   | 129 (9.19%)                    | 3636 (13.19%)                         | 3765 (13%)    |
| Epilepsy   | 23 (3.46%)                    | 55 (0.44%)                            | 78 (0.59%)    | 27 (1.93%)                     | 94 (0.35%)                            | 121 (0.42%)   |
| Headache   | 17 (2.56%)                    | 539 (4.23%)                           | 556 (4.15%)   | 56 (3.99%)                     | 2003 (7.27%)                          | 2059 (7.11%)  |
| Insomnia   | 15 (2.26%)                    | 1298 (10.19%)                         | 1313 (9.8%)   | 184 (13.1%)                    | 4210 (15.27%)                         | 4394 (15.17%) |
| Muscle Spasms  | 5 (0.76%)                     | 102 (0.81%)                           | 107 (0.8%)    | 21 (1.5%)                      | 563 (2.05%)                           | 584 (2.02%)   |
| Nausea/Vomiting  | 3 (0.46%)                     | 200 (1.57%)                           | 203 (1.52%)   | 24 (1.71%)                     | 579 (2.1%)                            | 603 (2.09%)   |
| Other  | 127 (19.1%)                   | 1071 (8.42%)                          | 1198 (8.95%)  | 133 (9.47%)                    | 1085 (3.94%)                          | 1218 (4.21%)  |
| PTSD   | 100 (15.04%)                  | 1098 (8.62%)                          | 1198 (8.94%)  | 237 (16.87%)                   | 2875 (10.43%)                         | 3112 (10.74%) |
| <b>Total number of Top 15 Conditions</b>                               | 665                           | 12,744                                | 13,409        | 1405                           | 27,570                                | 28,975        |
| <b>Number of Top 15 conditions as a percentage of total conditions</b> | 84.2%                         | 97.5%                                 | 96.8%         | 88.3%                          | 95.5%                                 | 95.2%         |

**Note:** Primary medical condition is the condition patients self-reported as the first reason they are seeking medical cannabis. Any reported medical conditions are mutually exclusive of the primary medical condition and all other self-reported conditions provided by the patient.

Pennsylvania. Chronic pain emerged as the primary self-reported condition for Michigan, Montana, Ohio, and Illinois.  $\chi^2$  tests for statistical independence indicated a variation in the leading primary condition by state.

The bottom row of Table 2 illustrates the top 15 conditions as a percentage of the total conditions, utilizing data from Table 1 (both for primary reported conditions and non-mutually exclusive conditions). These top 15 reported conditions account for over 95% of all conditions documented in the LPD. However, minors were slightly underrepresented, constituting 11.7% of primary conditions that were not among the top 15 reported conditions, compared to just 4.5% for young adults.

## Discussion

In this investigation, we provided frequencies and percentages of minor and young-adult-aged medical cannabis users across various demographics and qualifying conditions over a 4.5-year span, utilizing data from a commercial dataset, the LPD. While our investigation does not encompass the entire population of medical cannabis users in the United States, resulting in a significant underestimation of the true prevalence of youth-aged medical cannabis patients, it represents an initial step toward understanding the demographics and medical conditions of pediatric medical cannabis patients and the reasons for their medical use.

Our data indicates the presence of a considerable number of minor-aged medical cannabis users in the United States, albeit constituting a smaller percentage compared to young adults (those aged 18–20). We observe variations in demographics and medical conditions across age stratification, with minors predominantly self-reporting as white, non-Hispanic, residing in non-adult-use states, and exhibiting a lower number of conditions per patient compared to young adults. Conversely, a higher percentage of young adults reside in states with adult-use cannabis laws, report having no health insurance, and identify as Hispanic compared to minors.

In line with previous study efforts, we find that the most commonly self-reported reasons for pursuing medical cannabis varied by state.<sup>6</sup> As somewhat anticipated, a higher percentage of minor-aged patients reported using medical cannabis for cancer compared to young adults. Upon examining our population-level dataset of medical cannabis users aged 20 years or younger, we observed similar patterns to those found in the existing body of literature regarding patient demographics and self-reported conditions. Consistent with prior research, chronic pain emerged as a leading primary self-reported qualifying condition.<sup>6–8</sup> What is unclear in our research, and the research of others, is what proportion of the variability in primary qualifying conditions is explained by state-level policy. For example, anxiety was the most common primary qualifying condition and secondary condition. We do not know the extent to which patients who have anxiety, but live in a state that does not consider it a qualifying condition, list another medical condition to qualify for a medical card. Our finding that anxiety is the most common secondary condition for using medical cannabis does somewhat speak to this phenomena.

Our sample notably comprises fewer individuals identifying as white, non-Hispanic, compared to research conducted across 22 medical cannabis evaluation sites in 5 states.<sup>7,8</sup> This suggests a potentially more diverse representation of medical cannabis users within our dataset. It is also possible that this difference in demographics might be attributed to the population under 20 years old tending to be less white, non-Hispanic. Another explanation of this slight increase in population diversity is the use of data from a telehealth platform. Prior research suggests, specifically in New York, that access to a certifying provider may be disproportionately distributed by census tract,<sup>26</sup> favoring census tracts with higher density of bachelor's degrees. The fact that the data was collected from a telehealth-based data repository may reduce geographic access issues.

Within this dataset, the most commonly self-reported conditions were anxiety, chronic pain, and PTSD. The 2017 National Academies of Science did conclude substantial evidence supporting the use of medical cannabis for chronic pain and limited evidence for PTSD and anxiety. However, the findings were specific to the adult population. There remains a lack of pediatric specific evidence supporting the efficacy of medical cannabis in treating anxiety, chronic pain, and PTSD. This is largely explained by the difficulty of including pediatric patients in clinical cohorts. Clinical trials testing efficacy of traditional pharmaceuticals for pediatric-specific conditions face many issues.<sup>27</sup> It is reasonable to expect those issues, including funding and more restrictive oversight, are heightened when attempting to do so with a cannabis-based medical product.

The dearth of pediatric specific evidence may necessitate a two-pronged approach toward comprehending the utilization of medical cannabis among young adults. Additional clinical, patient-level research is imperative to comprehend the role of medical cannabis in addressing symptoms and enhancing the quality of life for the presented disease areas: chronic pain, anxiety, and PTSD. These clinical studies should aim not only to establish efficacy but also to provide information on adverse events, the preferable route of administration (eg, edible cannabis vs whole plant cannabis), and dosage specifics in the pediatric population.

In conjunction, research utilizing population-level self-reported patient databases should integrate electronic health information. This integration will enable the utilization of real-world data on a larger scale to address some of the aforementioned questions. These future research trajectories, when pursued concurrently, have the potential to furnish physicians and public health advocates with essential details regarding the appropriate integration of medical cannabis alongside established medical guidelines. Furthermore, it can help delineate situations where medical cannabis may not be suitable. Comprehensive understanding of administration routes and dosage information will empower healthcare providers to offer informed counsel to their patients on this increasingly relevant topic.

## Limitations

There are limitations to this manuscript as the data is self-reported within a large-scale commercial entity. Consequently, relying on self-reported data introduces bias into the reported information. However, the descriptive nature of the presented data is less prone to suffer from information bias as it primarily pertains to patient demographics, including age, race/ethnicity, and location. It's important to note that the secondary medical conditions are based on self-reported data and therefore do not constitute clinical diagnoses. It remains unclear whether this biases our data toward more or less relevant clinical diagnoses. While the sample size of the data is substantially large, it is not possible to differentiate between real state-level participation in medical cannabis registration versus the market penetration of Leafwell's services. Therefore, it is unclear whether the counts and rates provided are generalizable to the states from which they



were collected or if the data provided here are a convenience sample of those using medical cannabis products. Despite these limitations, this information contributes to comprehending the demographics of medical cannabis patients within the United States.

## Conclusions

Medical cannabis patients aged 20 years or younger report similar medical conditions associated with their medical cannabis use to that of the general population. Younger patients may be slightly more diverse comparatively and they likely present a similar number of comorbid conditions compared to the general population. Considering the dearth of pediatric-based research supporting the most commonly self-reported medical conditions for using medical cannabis, there remains a need for further investigation by academics and clinical scientists to understand how utilizing medical cannabis as a treatment impacts individuals under the age of 20.

## Ethics Approval and Informed Consent

This research was approved for research by an external IRB, Brany; Protocol Number: 23-12-733-1597; PI: Mitch Doucette. The data accessed and analyzed with complete with relevant data protections and privacy regulations.

## Consent of Publication

The authors confirm they have seen the manuscript and consent to its submission.

## Acknowledgments

The authors would like to thank Zach Levin for this contribution to the legal aspects of this paper. The authors would like to acknowledge the passing of Dr. Douglas Bruce on June 11th, 2024. He was a brilliant mind and a thoughtful collaborator and we are thankful to have worked with him.

## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

## Funding

This study was executed without external funding.

## Disclosure

Authors MLD, DH, EF, and DLM are employees of Leafwell and hold stock or stock options in Leafwell. Leafwell is a Telehealth company that connects potential medical cannabis patients to physicians in a friendly PC model. Leafwell does not produce or sell cannabis products. No grant funding was used to sponsor this research. The authors report no other conflicts of interest in this work.

---

## References

1. State Medical Cannabis Laws. 2024. Accessed March 11, 2024. Available from: <https://www.ncsl.org/health/state-medical-cannabis-laws>.
2. Project MP Medical cannabis patient numbers. MPP, 2023. Accessed November 23, 2023. Available from: <https://www.mpp.org/issues/medical-marijuana/state-by-state-medical-marijuana-laws/medical-marijuana-patient-numbers/>.
3. National Academies of Sciences, Engineering, and Medicine; Health and Medicine Division. Committee on the health effects of marijuana: an evidence review and research agenda, board on population health and public health practice, health and medicine division, national academies of sciences, engineering, and medicine. In: *The Health Effects of Cannabis and Cannabinoids*. The Current State of Evidence and Recommendations for Research. National Academies Press; 2017: 24625. doi:10.17226/24625
4. Nutt DJ, Phillips LD, Barnes MP, et al. A multicriteria decision analysis comparing pharmacotherapy for chronic neuropathic pain, including cannabinoids and cannabis-based medical products. *Cannabis Cannab Res*. 2022;7(4):482–500. doi:10.1089/can.2020.0129

5. Boehnke KF, Dean O, Haffajee R, Hosanagar A. US trends in registration for medical cannabis and reasons for use from 2016–2020: an observational study. *Ann Intern Med.* 2022;175(7):945–951. doi:10.7326/M22-0217
6. Boehnke KF, Gangopadhyay S, Clauw DJ, Haffajee RL. Qualifying Conditions of Medical Cannabis License Holders in the United States. *Health Aff.* 2019;38(2):295–302. doi:10.1377/hlthaff.2018.05266
7. Mahabir VK, Merchant JJ, Smith C, Garibaldi A. Medical cannabis use in the United States: a retrospective database study. *J Cannabis Res.* 2020;2(1):32. doi:10.1186/s42238-020-00038-w
8. Mahabir VK, Smith CS, Vannabouathong C, Merchant JJ, Garibaldi AL. Comparing medical cannabis use in 5 US states: a retrospective database study. *J Cannabis Res.* 2021;3(1):15. doi:10.1186/s42238-021-00075-z
9. Fairman BJ. Trends in registered medical marijuana participation across 13 US states and District of Columbia. *Drug Alcohol Depend.* 2016;159:72–79. doi:10.1016/j.drugalcdep.2015.11.015
10. Knishkowsky B. Medical cannabis for pain in adolescence. *J Pain Manage.* 2016;9(4):415–421.
11. Hemraj D, Casarett DJ, Macfarlan L, Fisher E, Doucette ML. Use of medical cannabis for pediatric health conditions: a systematic review of the recent literature. *J Cann Res Under Rev.* 2022;1:1.
12. Wong SS, Wilens TE. Medical cannabinoids in children and adolescents: a systematic review. *Pediatrics.* 2017;140(5):e20171818. doi:10.1542/peds.2017-1818
13. Pawliuk C, Chau B, Rassekh SR, McKellar T, Siden H. Efficacy and safety of paediatric medicinal cannabis use: a scoping review. *Paediatr Child Health.* 2020;26(4):228–233. doi:10.1093/pch/pxaa031
14. Fletcher S, Pawliuk C, Ip A, Oberlander T, Siden H. Symptoms, adverse events, and outcomes in the use of medicinal cannabis in children and adolescents with autism spectrum disorder: a scoping review protocol. *JBI Evid Synth.* 2021;19(5):1251–1258. doi:10.11124/JBIES-20-00001
15. da SEA, Medeiros WMB, Jpmd S, et al. Evaluation of the efficacy and safety of cannabidiol-rich cannabis extract in children with autism spectrum disorder: randomized, double-blind and controlled placebo clinical trial. *Trends Psych Psycho.* 2022;44. doi:10.47626/2237-6089-2021-0396.
16. da SEA, Medeiros WMB, Torro N, et al. Cannabis and cannabinoid use in autism spectrum disorder: a systematic review. *Trends Psych Psycho.* 2022;44:e20200149. doi:10.47626/2237-6089-2020-0149.
17. Woo JJ, van Reekum EA, Rosic T, Samaan Z. Children and youth who use cannabis for pain relief: benefits, risks, and perceptions. *Adolescent Health Med Therapeutics.* 2020;11:53–61. doi:10.2147/AHMT.S254264
18. Miech RA, Johnson LD, Patrick ME, O'Malley PM, Bachman JG Monitoring the future national survey results on drug use, 1975–2023: overview and detailed results for secondary school students. Institute for Social Research, University of Michigan; 2024. Available from: <https://monitoringtheefuture.org/results/annual-reports/>.
19. Aran A, Harel M, Cassuto H, et al. Cannabinoid treatment for autism: a proof-of-concept randomized trial. *Mol Autism.* 2021;12(1):6. doi:10.1186/s13229-021-00420-2
20. Hummer JF, Seelam R, Pedersen ER, Tucker JS, Klein DJ, D'Amico EJ. Why young adults obtain a medical marijuana card: associations with health symptoms and heaviness of use. *Cannabis.* 2021;4(1):27–39. doi:10.26828/cannabis/2021.01.001
21. Ho Y, Hu F, Lee P. The advantages and challenges of using real-world data for patient care. *Clin Transl Sci.* 2020;13(1):4–7. doi:10.1111/cts.12683
22. Flood S, King M, Rodgers R, Ruggles S, Warren JR *Integrated Public Use Microdata Series, Current Population Survey (IPUMS)*. University of Minnesota; 2024. Accessed December 30, 2023. Available from: <https://cps.ipums.org/cps/>.
23. StataCorp. 2023. Stata Statistical Software: Release 18. College Station, TX: StataCorp LLC
24. R Core Team (2017). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. Available from: <https://www.R-project.org/>.
25. Di Lorenzo P (2023). usmap: US Maps Including Alaska and Hawaii. R package version 0.6.2. Available from: <https://CRAN.R-project.org/package=usmap>.
26. Cunningham CO, Zhang C, Hollins M, Wang M, Singh-Tan S, Joudrey PJ. Availability of medical cannabis services by racial, social, and geographic characteristics of neighborhoods in New York: a cross-sectional study. *BMC Public Health.* 2022;22(1):671. doi:10.1186/s12889-022-13076-1
27. Joseph PD, Craig JC, Caldwell PH. Clinical trials in children. *Br J Clin Pharmacol.* 2015;79(3):357–369. doi:10.1111/bcp.12305

## Adolescent Health, Medicine and Therapeutics

Dovepress

### Publish your work in this journal

Adolescent Health, Medicine and Therapeutics is an international, peer-reviewed, open access journal focusing on health, pathology, and treatment issues specific to the adolescent age group. All aspects of health maintenance, preventative measures and disease treatment interventions are addressed within the journal and practitioners from all disciplines are invited to submit their work as well as healthcare researchers and patient support groups. The manuscript management system is completely online and includes a very quick and fair peer-review system. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <http://www.dovepress.com/adolescent-health-medicine-and-therapeutics-journal>