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Legal Cannabis Laws, Home Cultivation, and Use of Edible Cannabis Products: A Growing Relationship?

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Abstract

Background—Over half of U.S. states have enacted legal cannabis laws (LCL). In parallel, edible cannabis products (i.e., edibles) have presented new regulatory challenges. LCL provisions that dictate access to cannabis (e.g., home cultivation (HC) or dispensaries (DSP)) may impact edible production and use. This study examined relationships among HC and DSP provisions, cannabis cultivation, and edible use.

Methods—An online cannabis use survey was distributed using Facebook. Data were collected from 1813 cannabis-using adults. U.S. states were classified as states without LCL (Non-LCL) or LCL states that: (1) only permit DSP (LCL DSP-only), (2) only permit HC (LCL HC-only), or (3) permit HC and DSP (LCL HC+DSP). Analyses tested associations among these classifications, cannabis growing, and edible use and procurement.

Results—Individuals in LCL HC-only and LCL HC+DSP states were more likely to report currently growing cannabis at home (OR: 3.3, 95% CI: 1.7, 6.2; OR: 3.9, 95% CI: 2.4, 6.3, respectively) and past-month edible use (OR: 2.1, 95% CI: 1.4, 3.4; OR: 2.9, 95% CI: 2.2, 3.9, respectively) than individuals in LCL DSP-only states. Regardless of state, those who had grown cannabis were more likely to have made edibles than those who had never grown cannabis (OR: 2.2, 95% CI: 1.8, 2.6). Individuals in LCL HC-only states were more likely to have *made* edibles in the past month than individuals from Non-LCL (OR: 2.75, 95% CI: 1.5, 5.3) and DSP-only states (OR: 2.1, 95% CI: 1.0, 4.4). Individuals in LCL HC+DSP states were more likely to have *purchased* edibles in the past month than individuals from Non-LCL (OR: 3.7, 95% CI: 2.4, 5.6) and DSP-only states (OR: 3.2, 95% CI: 1.8, 5.5).

Conclusion—Specific LCL provisions may differentially affect individuals' propensity to grow cannabis and make, buy, and use edible cannabis products. Permitting home cultivation contributes to a greater probability of growing cannabis. Those who grow cannabis economize the plant by

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Conflict of interest

All authors have no conflicts of interest to report.

creating homemade edible cannabis products. Conversely, permitting dispensaries increases the likelihood of purchasing edibles. The psychoactive effects of edibles with unknown and variable cannabinoid content will be unpredictable. Policymakers should carefully consider how specific LCL provisions can affect patterns of cannabis edible product access and quality.

Keywords

Cannabis; Legalization; Edibles; Home cultivation; Dispensary; Facebook

Introduction

Edible cannabis use has become a central regulatory issue in the wake of U.S. cannabis legalization. These products come in various forms such as baked goods, candy, or drinks that have been infused with a multitude of cannabinoids found in the cannabis plant including the psychoactive compound, tetrahydrocannabinol (THC). Edible cannabis products help users avoid the health risks associated with toxins produced by smoking. However, edible cannabis use results in a delayed onset (1-3 hours) of psychoactive effects after consumption (Vandrey, et al., 2017), which, combined with increased product availability and suboptimal regulation of product packaging and content labeling, has led to an increased number of accidental edible-related overdoses and emergency room visits (Cao, Srisuma, Bronstein, & Hoyte, 2016; Ghosh, et al., 2015; MacCoun & Mello, 2015; Vandrey, et al., 2015; Wang, et al., 2014). In recent years, states with legal cannabis laws (LCL) have taken necessary regulatory steps to reduce this risk by requiring edible products to have universal warning symbols; provide consumers with knowledge about proper serving size; limit the amount of THC per serving and the total number of servings per unit; and be sealed in tamper-resistant packaging (Marijuana Enforcement Division, 2017; Oregon Liquor Control Commission, 2016). However, there has been little research focused on how specific provisions of LCL may impact access to cannabis edibles including patterns of edible product creation, availability, and consumption.

There are two types of LCL, medical cannabis laws (MCL) and recreational cannabis laws (RCL). Both permit the use of cannabis plant material or extracts containing substantial amounts of THC under certain conditions. Of note, some states permit medical use of only specific strains of cannabis containing high concentrations of cannabidiol (CBD) and relatively low concentrations of THC. These CBD-laws are generally not classified as MCL. MCL permit cannabis use only for those with a qualifying medical condition. RCL permit the use of cannabis for adults (age 21+) without the need for medical justification (as per alcohol or tobacco). Currently, the public health effects of LCL are largely unclear. For example, some studies have demonstrated that having or passing an LCL is related to greater prevalence of cannabis use in a state (Cerda, Wall, Keyes, Galea, & Hasin, 2012; Schuermeyer, et al., 2014; Stolzenberg, D'Alessio, & Dariano, 2016; Wen, Hockenberry, & Cummings, 2015) while other studies have demonstrated no effect (Harper, Strumpf, & Kaufman, 2012; Lynne-Landsman, Livingston, & Wagenaar, 2013). The lack of consistent findings may be due in part to the use of dichotomous variables representing the presence or absence of an LCL (Choo & Emery, 2017; Hunt & Miles, 2015; Pacula, Powell, Heaton, & Sevigny, 2015). No two LCL are exactly the same and analytical strategies that rely on

yes/no LCL comparisons may obfuscate important underlying policy heterogeneity. The provisions within each LCL that dictate how cannabis is produced and distributed may impact important public health metrics such as rates of cannabis use and use disorder, average cannabis THC content, and utilization of new methods of cannabis administration (Borodovsky, Crosier, Lee, Sargent, & Budney, 2016; Pacula, et al., 2015; Sevigny, Pacula, & Heaton, 2014). Analyzing the effects of specific LCL provisions is necessary to clarify the true impact of cannabis legalization and to guide effective regulation of legal cannabis.

Two LCL provisions – stipulations concerning home cultivation (HC) and dispensaries (DSP) – may have a significant influence on how individuals access cannabis. An HC provision permits individuals to grow a specific number of cannabis plants at home for personal use. From a public health perspective the HC model is appealing because it may help deter a commercialized cannabis industry (Caulkins, Kilmer, MacCoun, Pacula, & Reuter, 2012). For cannabis users, this model may be an appealing alternative to procuring cannabis from unregulated sources because it affords them more control over the quality of the cannabis they grow and use (Decorte, 2010). However, the HC model will make it difficult for regulatory agencies to prevent diversion, monitor plant limit compliance, and enforce quality control measures (e.g., limiting THC levels or use of pesticides)(Caulkins, et al., 2012; Decorte, 2010; Pacula, et al., 2015).

DSP provisions permit establishments (i.e., dispensaries) that operate within the framework of a state's LCL to sell a variety of cannabis products and related paraphernalia. This access model is appealing because it potentially offers state governments the ability to reduce public health risks by regulating the cultivation, production, packaging, and labeling of cannabis products (including edibles). Regulating edible products may lower users' risk of over-consumption or ingestion of harmful chemicals used in the cannabis growing process (Lynskey, Hindocha, & Freeman, 2016; Subritzky, Pettigrew, & Lenton, 2017). However, since many DSP operate as for-profit organizations, there is concern that they will prioritize profits over public health (Barry & Glantz, 2016; Pacula, Kilmer, Wagenaar, Chaloupka, & Caulkins, 2014). Presently, LCL states primarily operate under three cannabis access models. Some states permit DSP and prohibit HC, other states permit HC but prohibit DSP, and still others permit both HC and DSP.

In a previous study we found evidence that living in an LCL state that permits cannabis HC was strongly related to a higher likelihood and younger age of onset of edible cannabis use (Borodovsky, et al., 2017). However, we did not observe any such relationships between HC provisions and the likelihood of vaping cannabis. Conversely, we observed that DSP provisions were related to *both* edible cannabis use and vaping. This raised the question – why would growing cannabis at home be strongly related *only* to edible cannabis use and not vaping? One theory relates to the THC content in different parts of the cannabis plant. Some reports indicate that growers cut off the lower-THC parts of the plant (leaves and stems) (Doorenbos, Fetterman, Quimby, & Turner, 1971; Small, 2016a, 2016b; Turner, Hemphill, & Mahlberg, 1977; Weisheit, 1991) and then, using large quantities of these leftover parts, employ cannabinoid extraction procedures to concentrate high levels of THC into smaller-volume products such as edibles (Rosenthal, 2014; Small, 2016b).

The aims of the present study were to quantitatively assess (1) whether individuals who live in LCL states that permit HC are more likely to be currently growing cannabis at home, (2) whether individuals who grow cannabis at home are more likely to make cannabis edibles, (3) how individuals use the leftover parts of cannabis plants that they grow, (4) whether HC provisions and DSP provisions are related to higher likelihoods of edible use, and (5) how HC provisions and DSP provisions are related to obtaining (making vs. purchasing) edible cannabis products.

Methods

Survey

We created an online survey using the Qualtrics survey platform to assess demographics (including state residence), cannabis growing behaviors, and edible product use. Qualtrics survey data quality functions were used to prevent a single individual from responding multiple times and ensure that responses did not come from internet bots. The study was approved by The Dartmouth Committee for the Protection of Human Subjects.

Recruitment

We used Facebook advertising (Ramo, Rodriguez, Chavez, Sommer, & Prochaska, 2014) to distribute the Qualtrics survey URL link to U.S.-based Facebook users. Each advertisement contained an image of a cannabis leaf and appeared on the screen of a targeted audience of adults (ages 18+) who had endorsed cannabis-related interests on Facebook. Examples of these interests included topics such as “Tetrahydrocannabinol,” and “Medical Cannabis,” cannabis-related organizations (e.g., Marijuana Policy Project, NORML), or cannabis-related magazines (High Times and Cannabis Culture). We distributed the advertisements from September 3, 2016, to September 8, 2016, at an advertising cost of $293 (U.S.). The advertisements were shown to n=78974 individuals. Of these individuals, n=3135 (4.0%) clicked the advertisement and were redirected to the survey’s informed consent page. Of those who were directed to the consent page, n=984 (31.4%), did not provide consent or were under the age of 18. Those who consented and self-reported being age 18 or older were directed to the survey questions. Of those who started the survey, n=1813 (84.3%) completed it, passed data quality checks, and self-reported using cannabis at least once in their lifetime. Among those who started the survey, comparisons between those who did and did not complete it revealed no significant differences with regard to cannabis use characteristics (e.g., age of onset of cannabis use) or demographic variables (except for gender). A higher proportion of females completed the survey (92% of females vs. 87% of males, $p<0.05$). No compensation was provided. The survey required all items to be answered. Therefore there were no missing data points after data cleaning.

Outcome Variables

Primary dichotomous (yes/no) outcomes variables of interest were: (1) Lifetime growing cannabis, (2) Currently growing cannabis, (3) Typical use of leftover plant material (making edibles vs. directly smoking/vaping or throwing it out), (4) Lifetime making edibles, (5) Past month making edibles, (6) Lifetime edible use, (7) Past month edible use, (8) Past month purchasing edibles.

LCL Provision Classification (Primary Independent Variables)

Using peer-reviewed papers, state government (Colorado.gov, 2016) and cannabis legislation-related (ProCon.org, 2016) websites, and communications with state government officials, we classified all U.S. states (including Washington D.C.) as LCLs (or not), as well as having the following LCL provisions: (1) permits home cultivation (HC) status (yes/no), (2) permits dispensaries (DSP) (yes/no). We then created a primary independent categorical variable containing (1) states without LCL (Non-LCL), (2) LCL states that only permit dispensaries (LCL DSP-only), (3) LCL states that only permit home cultivation (LCL HC-only), and (4) LCL states that permit both home cultivation and dispensaries (LCL HC +DSP).

Analytical Approach

Analyses were designed to determine how HC and DSP provisions were associated with cannabis growing and edible making, purchasing, and use behaviors. We first characterized the distribution of demographic variables of the sample and conducted Chi-squared and Fisher's exact tests, ANOVA, and Tukey post-hoc tests to check for demographic differences across state classifications (Non-LCL vs. LCL DSP-only vs. LCL HC-only vs. LCL HC +DSP). The same statistical tests were then used to examine how distributions of the outcome variables differed across these types of states. To isolate the effects of different LCL provisions while accounting for demographic variability, two types of logistic regression models were performed using dummy coded versions of the primary independent state classification variable. The first type of model (model 1) used Non-LCL states as the reference (i.e., control) group. The second type of model (model 2) examined within-LCL differences using LCL DSP-only states as the reference group. All regression models were adjusted for age, race, gender, employment status, education, years living in current U.S. state, age of onset of cannabis use, the number of lifetime days of cannabis use, and the number of days of cannabis use in the past month. Analyses were conducted using Stata® version 14 (StataCorp, 2015).

Results

Sample Description

Table 1 displays characteristics of the entire sample and across LCL status classifications. The mean age of the entire sample was 48.0 years (SD=12.7). Approximately 76% were male, 89% were Caucasian, and 15% had a college degree or higher. Significant differences ($p<0.05$) in age, race, education, past 30-day cannabis use, and years living in current U.S. state were observed across the state classifications. Those in LCL HC+DSP states were significantly older than those in LCL DSP-only states (mean 49.6 (SD 12.8) vs. mean 46.4 (SD 12.9) respectively). LCL DSP-only states contained the highest proportion of Caucasian individuals and LCL HC+DSP states contained the lowest proportion of Caucasian individuals (94% vs. 83% respectively). LCL HC+DSP states contained the highest proportion of college-educated individuals and LCL-HC only states contained the lowest (18% vs. 11% respectively). Approximately 73% of those from LCL HC-only states were daily/near-daily users compared to 51% of those from Non-LCL states. Approximately 80% of those from LCL DSP-only states had lived in their current state for more than twenty

years compared with 62% of those from LCL HC+DSP states. A comparison with 2016 U.S. population estimates indicated that the proportion of study participants from each state corresponded closely to the proportion of the total U.S. population represented in each state (Pearson's r=0.83, p<0.0001)(U.S. Census Bureau Population Division, 2017).

Unadjusted relationships between LCL status and cannabis use behaviors

Table 2 displays the proportional distributions of cannabis growing and edible-related behaviors in relation to state LCL status classification. Only those who have ever engaged in a behavior (e.g., ever grew cannabis) were included in calculating the distributions associated with current or past-month behaviors. Thus, the sample sizes associated with current and past-month behaviors are smaller than the total sample size. Over half of the sample (56%) reported lifetime cannabis growing. All analyses comparing outcomes across the state classification types were statistically significant. Of those living in LCL DSP-only states, only 19% were currently growing cannabis, compared to 49% of those from LCL HC-only and LCL HC+DSP states. Among those currently growing cannabis, 42% of individuals from LCL HC-only states compared to 7% of individuals from LCL DSP-only states were growing six or more plants. Across the entire sample, making edibles was the most common use of leftover plant material (21%) followed by making concentrates (20%) and smoking (20%). Among individuals from LCL DSP-only states, 78% had lifetime edible use compared to 92% of individuals from LCL HC-only and LCL HC+DSP states. Finally, among individuals who had made edibles in their lifetime, 18% of individuals in LCL DSP-only states compared to 32% of individuals in LCL HC-only states had made edibles in the past 30 days.

Adjusted Logistic Regression Models

Growing cannabis and making edibles across home cultivation (HC) status and dispensary (DSP) status—Adjusted logistic regression models tested associations between LCL provision status and (1) currently growing cannabis at home (yes/no); (2) lifetime made cannabis edibles (yes/no) and; (3) typical use of plant leftovers (used to make edibles vs. smoke/vape/throw-out/compost/selling) (Table 3).

Currently growing cannabis: Among individuals who had grown cannabis at least once in their lifetime, individuals from LCL HC-only states and from LCL HC+DSP states were more likely than individuals from Non-LCL states to be currently growing cannabis (OR: 3.77, 95% CI: 2.12 – 6.72; OR: 4.66, 95% CI: 3.18 – 6.84, respectively), but those from LCL DSP-only states were not. Individuals from LCL HC-only states and LCL HC+DSP states were more likely than individuals from LCL DSP-only states to be currently growing cannabis (OR: 3.26, 95% CI: 1.71 – 6.21; OR: 3.87, 95% CI: 2.38 – 6.30, respectively) (Table 3).

Making edibles and use of plant leftovers: Individuals from LCL HC-only states and LCL HC+DSP states were more likely than individuals from Non-LCL states to have made cannabis edibles in their lifetime (OR: 1.67, 95% CI: 1.08 – 2.58; OR: 1.49, 95% CI: 1.16 – 1.92, respectively), but those from LCL DSP-only states were not. However, comparisons among the three LCL types did not show differences in lifetime making of edibles.

Additionally, regardless of LCL status, those who had grown cannabis at least once were more likely to have made edibles than those who had never grown cannabis (OR: 2.20, 95% CI: 1.83 – 2.63) (not shown in table). Among individuals who had grown cannabis, LCL HC status and DSP status were not related to the likelihood of using leftover plant material to make edibles. Thus, while those who grow cannabis commonly use leftovers to make edibles, the LCL provision status of states that growers live in did not alter the likelihood of engaging in this behavior (Table 3).

Edible use, home cultivation (HC) status, and dispensary (DSP) status—A series of logistic regression models tested the associations between HC and DSP provision variables and (1) lifetime edible use (yes/no) and (2) past-month edible use (yes/no) (Table 4).

Lifetime edible use: Individuals from LCL HC-only states and LCL HC+DSP states were more likely than individuals from Non-LCL states to be lifetime edible users (OR: 3.59, 95% CI: 1.68 – 7.68; OR: 3.20, 95% CI: 2.12 – 4.85, respectively), but those from LCL DSP-only states were not. Individuals from LCL HC-only states and LCL HC+DSP states were more likely than individuals from LCL DSP-only states to be lifetime edible users (OR: 3.06, 95% CI: 1.39 – 6.75; OR: 2.71, 95% CI: 1.67 – 4.40, respectively) (Table 4).

Past month edible use: Among those with lifetime edible use, individuals from LCL HC-only states and LCL HC+DSP states were more likely than individuals from Non-LCL states to be past month edible users (OR: 2.14, 95% CI: 1.35 – 3.38; OR: 2.92, 95% CI: 2.20 – 3.88 respectively), but those from LCL DSP-only states were not. Individuals from LCL HC-only states and LCL HC+DSP states were more likely than individuals from LCL DSP-only states to be past month edible users (OR: 1.85, 95% CI: 1.12 – 3.05; OR: 2.55, 95% CI: 1.78 – 3.65, respectively) (Table 4).

Home cultivation (HC) status, dispensary (DSP) status, and making or purchasing edibles—A series of logistic regression models were performed to separate the effects of LCL provision access models (HC vs. DSP) on edible acquisition behaviors (past-month making vs. past-month purchasing) (Table 5).

Made edibles (past month): Among those who had made edibles in their lifetime, individuals from LCL HC-only states were over two and a half times more likely to have made edibles in the past month than individuals from Non-LCL states (OR: 2.75, 95% CI: 1.45 – 5.25). Individuals from LCL HC+DSP were also more likely to have made edibles in the past month than individuals from Non-LCL but to a lesser extent (OR: 1.82, 95% CI: 1.16 – 2.83). Individuals from LCL DSP-only states were no more likely to have made edibles in the past month than individuals from Non-LCL states. Individuals from LCL HC-only states were over twice as likely to have made edibles in the past month than individuals from DSP-only states (OR: 2.12, 95% CI: 1.03 – 4.36). Individuals from LCL HC+DSP states were no more likely to have made edibles in the past month than individuals from LCL DSP-only states (Table 5).

Purchased edibles (past month): Among individuals who had used edibles in their lifetime, individuals from LCL HC+DSP states were over three and a half times more likely to have purchased edibles in the past month than individuals from Non-LCL states (OR: 3.67, 95% CI: 2.40 – 5.62). Individuals from LCL HC-only states and LCL DSP-only states were no more likely to have purchased edibles in the past month than individuals from Non-LCL states. Individuals from LCL HC+DSP states were over three times as likely to have purchased edibles in the past month than individuals from DSP-only states (OR: 3.19, 95% CI: 1.84 – 5.53). Individuals from LCL HC-only states were no more likely to have purchased edibles in the past month than individuals from LCL DSP-only states (Table 5).

Discussion

This study documents multiple unique relationships across LCL provisions, cannabis growing, and edible use and procurement behaviors among a sample of U.S.-based Facebook users. First, as one would expect, our data suggest that individuals who live in LCL states that permit HC are more likely to be currently growing cannabis at home than individuals from Non-LCL states and LCL states that only permit DSP. Additionally, among individuals who are currently growing cannabis at home, those who live in LCL HC states tend to be growing a greater number of cannabis plants compared to those who live in Non-LCL or LCL states that only permit DSP. Importantly, regardless of state, individuals who had grown cannabis at home were more likely to have made edibles in their lifetime (compared to those who have never grown cannabis at home) and commonly reported using the leftover cannabis plant parts to make edibles and concentrates.

Living in either an LCL HC-only state or LCL HC+DSP state was strongly associated with past-month edible use. However, our data suggest that individuals in HC-only states make their edibles (most likely as a consequence of their higher likelihood to be currently growing cannabis) while individuals in HC+DSP states primarily purchase their edibles. From a policy perspective these findings suggest that permitting only home cultivation (but not dispensaries) may incentivize individuals to make their own edible products since these products cannot be purchased elsewhere. This dynamic is supported by literature that suggests that home cultivation captures a significant share of the licit (Caulkins, et al., 2012) and illicit (Decorte & Potter, 2015) cannabis markets. If states permit dispensaries to sell edible products, cannabis users may be less motivated to make their own even if home cultivation is also permitted.

Interestingly and seemingly inexplicable, was the observation that individuals from LCL DSP-only states were no more likely to have used or purchased edibles than individuals from Non-LCL states, but individuals LCL HC+DSP states were. We believe this is related to the LCL etiology of the states that fall into these two categories. Many of the LCL HC +DSP states were created via voter ballot initiatives in the 1990s and early 2000s. These states have had LCL in place for 15 to 20 years, maintain a loose regulatory infrastructure (Williams, Olfson, Kim, Martins, & Kleber, 2016), and often do not place limits on dispensary proliferation across the state. Thus these states have a high number of dispensaries per capita which may explain why individuals from these states were much more likely to have purchased edibles than individuals from Non-LCL states. Conversely,

many of the LCL DSP-only states are newer LCL states created in the last five years via their state legislatures rather than voter ballot initiatives. Many of these states only permit a few tightly regulated dispensaries throughout the entire state (Bestrashniy & Winters, 2015; Chapman, Spetz, Lin, Chan, & Schmidt, 2016; Pacula, Hunt, & Boustead, 2014; Williams, et al., 2016) and have only just begun operations and sales. This might explain why even though these LCL states have dispensaries, individuals from these states were no more likely to have purchased edibles in the past month than individuals from Non-LCL states. These results suggest that permitting dispensaries may change patterns of cannabis use (Pacula, et al., 2015), but also suggest that the degree of regulation of those dispensaries could alter the magnitude of that change.

Another observation worthy of comment is that individuals who grow cannabis commonly use the leftover plant material to make cannabis “concentrates” (Table 2). These relatively new formulations of cannabis extracts (e.g., “dabs”) have alarmingly high concentrations of THC and have become a cause for public health concern (Carlini, Garrett, & Harwick, 2017; Daniulaityte, et al., 2015; Loflin & Earleywine, 2014). It is possible that the motive to economize the cannabis plant by condensing large quantities of low-THC leftovers to create small-volume products that contain high concentrations of THC, applies as much or more to concentrates as it does to edibles. Further investigation of this finding is warranted in light of the emergence of butane-facilitated accidents during attempts to make cannabis concentrates at home (Bell, et al., 2015; Romanowski, et al., 2017) as well as the increased risk for psychosis (acute and chronic) and the development of cannabis use disorder associated with use of high-THC cannabis products (Di Forti, et al., 2014; Freeman & Winstock, 2015; Pierre, Gandal, & Son, 2016).

A number of sampling, analytical and survey design limitations of this study warrant comment. First, these data come from a self-selected convenience sample of social media users. Cannabis users and growers who do not use Facebook and individuals who use Facebook but were not reached by our specific advertising strategy (i.e., liking topics such as “Medical Marijuana”) were not included in the sample. Moreover, individuals who were exposed to the advertisement and chose to take the survey may reflect a group most willing to openly identify with cannabis-related topics on the internet and may be less concerned about the legal repercussions of their cannabis-related behaviors. It is unclear how these sampling factors may impact the observations from this study. Furthermore, although participants were assured of anonymity and data security several times during the survey, it is possible that respondents from Non-LCL states were more likely to lie about their current cannabis-related behaviors (e.g., growing cannabis at home) due to cannabis’ illegal status in their state. Additionally, the study sample consisted primarily of frequent (daily/almost daily) cannabis users with an extensive history of lifetime use and thus these data are not necessarily reflective of less frequent or less experienced cannabis users. Of note, the sample’s mean age was 48 years (SD=12.7). However, most Facebook users are under the age of 44 (comScore & Statista, 2016) and current cannabis users in the U.S. are disproportionately represented among young adults (age 18 to 25) (Center for Behavioral Health Statistics and Quality, 2015). Why our sampling methodology captured an older age group is unclear. Nonetheless, younger cannabis users are underrepresented in this sample. Furthermore, the majority of respondents in our sample were Caucasian.

Underrepresentation of racial minorities in our sample may affect the conclusions. Last, the survey item assessing use of leftover cannabis plant material forced a single response rather than multiple responses (which were likely) and thus the data from this item must be interpreted judiciously. Despite these limitations, online purposive data collection methods are a valid and reliable means of studying cannabis users (Ramo, Liu, & Prochaska, 2012) and have been demonstrated to be particularly useful for collecting data from hidden populations engaging in potentially illicit behaviors such as growing cannabis at home (Barratt, et al., 2012; Barratt, et al., 2015; Decorte & Potter, 2015; Potter, et al., 2015).

This study highlights the need to examine multiple aspects of LCL within the same set of analyses to obtain a broader understanding of the dynamic relationships among these laws and patterns of cannabis use. That said, LCL HC status and DSP status are only a few of many variations in LCL details that will need to be evaluated moving forward. Specific analyses of state-level regulations concerning edible cannabis production, packaging, marketing, or sales are warranted. Cannabis access models other than dispensaries and home cultivation, such as cannabis social clubs (Decorte, 2015), should also be explored. Moreover, cross-sectional data make it difficult to determine the directionality of the effects between cannabis policies and cannabis behaviors, as these cannot readily account for cultural differences that impact policy development. Future research initiatives should include individual-level longitudinal survey designs.

Overall, observations from this study illustrate the importance of considering how individuals obtain cannabis products. Different LCL provisions for providing access to cannabis may purposefully or inadvertently provide individuals with increased access to the same cannabis products. Moving forward, home cultivation provisions will make effective regulation harder to achieve (Caulkins, et al., 2012) because of the challenges of monitoring the potency and content of homemade cannabis edibles. However, the data generated concerning the public health impacts of home cultivation must be considered in the context of the impact of cannabis dispensary provisions. There is concern that cannabis commercialization associated with unchecked large-scale cannabis growing and dispensary proliferation will adversely affect public health via multiple sociocultural and economic factors (Barry & Glantz, 2016; Decorte & Potter, 2015; Pacula, et al., 2015; Richter & Levy, 2014). Edible product quality, labeling, packaging, and marketing regulations could help mitigate some of these risks (Barrus, et al., 2016; Lynskey, et al., 2016; Pacula, Kilmer, et al., 2014). Ultimately, a data-driven cannabis policy and regulatory infrastructure will be necessary to achieve optimal public health outcomes. Future cannabis regulatory science research should involve nuanced analyses that evaluate relationships between specific legal provisions and cannabis use behaviors that may be uniquely affected by these provisions.

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References

Barratt MJ, Bouchard M, Decorte T, Asmussen Frank V, Hakkarainen P, Lenton S, Malm A, Nguyen H, Potter GR. Understanding global patterns of domestic cannabis cultivation. Drugs and Alcohol Today. 2012; 12:213–221.

Barratt MJ, Potter GR, Wouters M, Wilkins C, Werse B, Perala J, Pedersen MM, Nguyen H, Malm A, Lenton S, Korf D, Klein A, Heyde J, Hakkarainen P, Frank VA, Decorte T, Bouchard M, Blok T. Lessons from conducting trans-national Internet-mediated participatory research with hidden populations of cannabis cultivators. Int J Drug Policy. 2015; 26:238–249. [PubMed: 25576247]

Barrus DG, Capogrossi KL, Cates SC, Gourdet CK, Peiper NC, Novak SP, Lefever TW, Wiley JL. Tasty THC: Promises and Challenges of Cannabis Edibles. Methods Rep RTI Press. 2016; 2016doi: 10.3768/rtipress.2016.op.0035.1611

Barry RA, Glantz S. A Public Health Framework for Legalized Retail Marijuana Based on the US Experience: Avoiding a New Tobacco Industry. PLoS Med. 2016; 13:e1002131. [PubMed: 27676176]

Bell C, Slim J, Flaten HK, Lindberg G, Arek W, Monte AA. Butane Hash Oil Burns Associated with Marijuana Liberalization in Colorado. J Med Toxicol. 2015; 11:422–425. [PubMed: 26289652]

Bestrashniy J, Winters KC. Variability in medical marijuana laws in the United States. Psychol Addict Behav. 2015; 29:639–642. [PubMed: 26415061]

Borodovsky JT, Crosier BS, Lee DC, Sargent JD, Budney AJ. Smoking, vaping, eating: Is legalization impacting the way people use cannabis? Int J Drug Policy. 2016; 36:141–147. [PubMed: 26992484]

Borodovsky JT, Lee DC, Crosier BS, Gabrielli JL, Sargent JD, Budney AJ. U.S. cannabis legalization and use of vaping and edible products among youth. Drug Alcohol Depend. 2017; 177:299–306. [PubMed: 28662974]

Cao D, Srisuma S, Bronstein AC, Hoyte CO. Characterization of edible marijuana product exposures reported to United States poison centers. Clin Toxicol (Phila). 2016; 54:840–846. [PubMed: 27418198]

Carlini BH, Garrett SB, Harwick RM. Beyond joints and brownies: Marijuana concentrates in the legal landscape of WA State. Int J Drug Policy. 2017; 42:26–29. [PubMed: 28171805]

Caulkins JP, Kilmer B, MacCoun RJ, Pacula RL, Reuter P. Design considerations for legalizing cannabis: lessons inspired by analysis of California's Proposition 19. Addiction. 2012; 107:865–871. [PubMed: 21985069]

Center for Behavioral Health Statistics and Quality. Behavioral Health Trends in the United States: Results from the 2014 National Survey on Drug Use and Health. 2015 In.

Cerda M, Wall M, Keyes KM, Galea S, Hasin D. Medical marijuana laws in 50 states: investigating the relationship between state legalization of medical marijuana and marijuana use, abuse and dependence. Drug Alcohol Depend. 2012; 120:22–27. [PubMed: 22099393]

Chapman SA, Spetz J, Lin J, Chan K, Schmidt LA. Capturing Heterogeneity in Medical Marijuana Policies: A Taxonomy of Regulatory Regimes Across the United States. Subst Use Misuse. 2016; 51:1174–1184. [PubMed: 27191472]

Choo EK, Emery SL. Clearing the haze: the complexities and challenges of research on state marijuana laws. Ann N Y Acad Sci. 2017; 1394:55–73. [PubMed: 27723946]

Colorado.gov. MED Licensed Facilities. Retrieved 9.14.16 from https://www.colorado.gov/pacific/enforcement/med-licensed-facilities

comScore, & Statista. Distribution of Facebook users in the United States as of December 2016 by age group. 2017. from https://www.statista.com/statistics/187549/facebook-distribution-of-users-age-group-usa/

Daniulaityte R, Nahhas RW, Wijeratne S, Carlson RG, Lamy FR, Martins SS, Boyer EW, Smith GA, Sheth A. "Time for dabs": Analyzing Twitter data on marijuana concentrates across the U.S. Drug Alcohol Depend. 2015; 155:307–311. [PubMed: 26338481]

Decorte T. The case for small-scale domestic cannabis cultivation. Int J Drug Policy. 2010; 21:271–275. [PubMed: 20176465]

Decorte T. Cannabis social clubs in Belgium: organizational strengths and weaknesses, and threats to the model. Int J Drug Policy. 2015; 26:122–130. [PubMed: 25179934]

Decorte T, Potter GR. The globalisation of cannabis cultivation: a growing challenge. Int J Drug Policy. 2015; 26:221–225. [PubMed: 25638581]

Di Forti M, Sallis H, Allegri F, Trotta A, Ferraro L, Stilo SA, Marconi A, La Cascia C, Marques TR, Pariante C. Daily use, especially of high-potency cannabis, drives the earlier onset of psychosis in cannabis users. Schizophrenia bulletin. 2014; 40:1509–1517. [PubMed: 24345517]

Doorenbos NJ, Fetterman PS, Quimby MW, Turner CE. Annals of the New York Academy of Sciences. CULTIVATION, EXTRACTION, AND ANALYSIS OF CANNABIS SATIVA L. Annals of the New York Academy of Sciences. 1971; 191:3–14.

Freeman TP, Winstock AR. Examining the profile of high-potency cannabis and its association with severity of cannabis dependence. Psychol Med. 2015; 45:3181–3189. [PubMed: 26213314]

Ghosh TS, Van Dyke M, Maffey A, Whitley E, Erpelding D, Wolk L. Medical marijuana's public health lessons–implications for retail marijuana in Colorado. N Engl J Med. 2015; 372:991–993. [PubMed: 25760352]

Harper S, Strumpf EC, Kaufman JS. Do medical marijuana laws increase marijuana use? Replication study and extension. Ann Epidemiol. 2012; 22:207–212. [PubMed: 22285867]

Hunt, PE., Miles, J. Curr Top Behav Neurosci. Berlin, Heidelberg: Springer Berlin Heidelberg; 2015. The Impact of Legalizing and Regulating Weed: Issues with Study Design and Emerging Findings in the USA; p. 1-26.2016/01/01 ed

Loflin M, Earleywine M. A new method of cannabis ingestion: the dangers of dabs? Addict Behav. 2014; 39:1430–1433. [PubMed: 24930049]

Lynne-Landsman SD, Livingston MD, Wagenaar AC. Effects of state medical marijuana laws on adolescent marijuana use. Am J Public Health. 2013; 103:1500–1506. [PubMed: 23763418]

Lynskey MT, Hindocha C, Freeman TP. Legal regulated markets have the potential to reduce population levels of harm associated with cannabis use. Addiction. 2016; 111:2091–2092. [PubMed: 27145424]

MacCoun RJ, Mello MM. Half-baked–the retail promotion of marijuana edibles. N Engl J Med. 2015; 372:989–991. [PubMed: 25760351]

Marijuana Enforcement Division. 1 CCR 212-2. Colorado Department of Revenue: Secretary of State; 2017. Retail Marijuana Rules.

Oregon Liquor Control Commission. Medical and Recreational Marijuana Packaging and Labeling Guide 2.0. 2016 In.

Pacula RL, Hunt P, Boustead A. Words Can Be Deceiving: A Review of Variation Among Legally Effective Medical Marijuana Laws in the United States. J Drug Policy Anal. 2014; 7:1–19. [PubMed: 25657828]

Pacula RL, Kilmer B, Wagenaar AC, Chaloupka FJ, Caulkins JP. Developing public health regulations for marijuana: lessons from alcohol and tobacco. Am J Public Health. 2014; 104:1021–1028. [PubMed: 24825201]

Pacula RL, Powell D, Heaton P, Sevigny EL. Assessing the effects of medical marijuana laws on marijuana use: the devil is in the details. J Policy Anal Manage. 2015; 34:7–31. [PubMed: 25558490]

Pierre JM, Gandal M, Son M. Cannabis-induced psychosis associated with high potency "wax dabs". Schizophr Res. 2016; 172:211–212. [PubMed: 26876313]

Potter GR, Barratt MJ, Malm A, Bouchard M, Blok T, Christensen AS, Decorte T, Frank VA, Hakkarainen P, Klein A, Lenton S, Perala J, Werse B, Wouters M. Global patterns of domestic cannabis cultivation: sample characteristics and patterns of growing across eleven countries. Int J Drug Policy. 2015; 26:226–237. [PubMed: 25582281]

ProCon.org. 28 Legal Medical Marijuana States and DC. Retrieved 1.24.2017 from http://medicalmarijuana.procon.org/view.resource.php?resourceID=000881

Ramo DE, Liu H, Prochaska JJ. Reliability and validity of young adults' anonymous online reports of marijuana use and thoughts about use. Psychol Addict Behav. 2012; 26:801–811. [PubMed: 22082344]

Ramo DE, Rodriguez TM, Chavez K, Sommer MJ, Prochaska JJ. Facebook Recruitment of Young Adult Smokers for a Cessation Trial: Methods, Metrics, and Lessons Learned. Internet Interv. 2014; 1:58–64. [PubMed: 25045624]

Richter KP, Levy S. Big marijuana–lessons from big tobacco. N Engl J Med. 2014; 371:399–401. [PubMed: 24918955]

Romanowski KS, Barsun A, Kwan P, Teo EH, Palmieri TL, Sen S, Maguina P, Greenhalgh DG. Butane Hash Oil Burns: A 7-Year Perspective on a Growing Problem. J Burn Care Res. 2017; 38:e165–e171. [PubMed: 27058582]

Rosenthal E. Beyond Buds: Marijuana Extracts - Hash, Vaping, Dabbing, Edibles and Medicines. Quick Trading Company. 2014

Schuermeyer J, Salomonsen-Sautel S, Price RK, Balan S, Thurstone C, Min SJ, Sakai JT. Temporal trends in marijuana attitudes, availability and use in Colorado compared to non-medical marijuana states: 2003-11. Drug Alcohol Depend. 2014; 140:145–155. [PubMed: 24837585]

Sevigny EL, Pacula RL, Heaton P. The effects of medical marijuana laws on potency. Int J Drug Policy. 2014; 25:308–319. [PubMed: 24502887]

Small, E. Cannabis: A Complete Guide. CRC Press; 2016a. Cannabis Chemistry: Cannabinoids in Cannabis, Humans, and Other Species; p. 199-221.

Small, E. Cannabis: A Complete Guide. CRC Press; 2016b. Medical Marijuana: Production; p. 351-369.

StataCorp. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP; 2015.

Stolzenberg L, D'Alessio SJ, Dariano D. The effect of medical cannabis laws on juvenile cannabis use. Int J Drug Policy. 2016; 27:82–88. [PubMed: 26123892]

Subritzky T, Pettigrew S, Lenton S. Into the void: Regulating pesticide use in Colorado's commercial cannabis markets. Int J Drug Policy. 2017; 42:86–96. [PubMed: 28173984]

Turner JC, Hemphill JK, Mahlberg PG. Gland Distribution and Cannabinoid Content in Clones of Cannabis-Sativa L. American Journal of Botany. 1977; 64:687–693.

U.S. Census Bureau Population Division. Annual Estimates of the Resident Population: Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2016. Retrieved 2.24.17 from https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

Vandrey R, Herrmann ES, Mitchell JM, Bigelow GE, Flegel R, LoDico C, Cone EJ. Pharmacokinetic Profile of Oral Cannabis in Humans: Blood and Oral Fluid Disposition and Relation to Pharmacodynamic Outcomes. J Anal Toxicol. 2017; 41:83–99. [PubMed: 28158482]

Vandrey R, Raber JC, Raber ME, Douglass B, Miller C, Bonn-Miller MO. Cannabinoid Dose and Label Accuracy in Edible Medical Cannabis Products. JAMA. 2015; 313:2491–2493. [PubMed: 26103034]

Wang GS, Roosevelt G, Le Lait MC, Martinez EM, Bucher-Bartelson B, Bronstein AC, Heard K. Association of unintentional pediatric exposures with decriminalization of marijuana in the United States. Ann Emerg Med. 2014; 63:684–689. [PubMed: 24507243]

Weisheit RA. The Intangible Rewards from Crime - the Case of Domestic Marijuana Cultivation. Crime & Delinquency. 1991; 37:506–527.

Wen H, Hockenberry JM, Cummings JR. The effect of medical marijuana laws on adolescent and adult use of marijuana, alcohol, and other substances. J Health Econ. 2015; 42:64–80. [PubMed: 25863001]

Williams AR, Olfson M, Kim JH, Martins SS, Kleber HD. Older, Less Regulated Medical Marijuana Programs Have Much Greater Enrollment Rates Than Newer 'Medicalized' Programs. Health Aff (Millwood). 2016; 35:480–488. [PubMed: 26953303]

Int J Drug Policy. Author manuscript; available in PMC 2018 December 01.

Table 1

Participant characteristics by legal cannabis law (LCL), dispensary (DSP) and home cultivation (HC) state status

		LCL State Status			
	Overall Sample (n=1813)	**Non-LCL (n=916)**	**LCL DSP-only (n=387)**	**LCL HC-only (n=103)**	**LCL HC+DSP (n=407)**
Age, m (SD) *	48.0 (12.7)	48.1 (12.5)	46.4 (12.9)	47.7 (13.5)	49.6 (12.8)
Gender					
Male, n (%)	1386 (76.4)	694 (75.8)	301 (77.8)	80 (77.7)	311 (76.4)
Female, n (%)	416 (22.9)	215 (23.5)	85 (22.0)	23 (22.3)	93 (22.9)
Other, n (%)	11 (0.6)	7 (0.8)	1 (0.3)	0 (0)	3 (0.7)
Race and Ethnicity *					
Caucasian, n (%)	1608 (88.7)	807 (88.1)	365 (94.3)	97 (94.2)	339 (83.3)
African American, n (%)	19 (1.1)	9 (1.0)	7 (1.8)	0 (0)	3 (0.7)
Hispanic, n (%)	67 (3.7)	39 (4.3)	5 (1.3)	0 (0)	23 (5.7)
Other, n (%)	119 (6.6)	61 (6.7)	10 (2.6)	6 (5.8)	42 (10.3)
Level of Education *					
High school or less, n (%)	678 (37.4)	337 (36.8)	165 (42.6)	41 (39.8)	135 (33.2)
Some college, n (%)	620 (34.2)	309 (33.7)	128 (33.1)	32 (31.1)	151 (37.1)
Associate degree, n (%)	237 (13.1)	131 (14.3)	41 (10.6)	19 (18.4)	46 (11.3)
College or higher, n (%)	278 (15.3)	139 (15.2)	53 (13.7)	11 (10.7)	75 (18.4)
Lifetime days cannabis use					
1–99, n (%)	77 (4.2)	43 (4.7)	16 (4.1)	2 (1.9)	16 (3.9)
100–999, n (%)	246 (13.6)	120 (13.1)	58 (15.0)	14 (13.6)	54 (13.3)
>999, n (%)	1490 (82.2)	753 (82.2)	313 (80.9)	87 (84.5)	337 (82.8)
Past 30-day cannabis use *					
0 days, n (%)	273 (15.1)	174 (19.0)	52 (13.4)	12 (11.7)	35 (8.6)
1–9 days, n (%)	191 (10.5)	102 (11.1)	51 (13.2)	5 (4.9)	33 (8.1)
10–19 days, n (%)	135 (7.5)	74 (8.1)	32 (8.3)	3 (2.9)	26 (6.4)
20–25 days, n (%)	177 (9.8)	99 (10.8)	38 (9.8)	8 (7.8)	32 (7.9)

			LCL State Status		
	Overall Sample (n=1813)	**Non-LCL (n=916)**	**LCL DSP-only (n=387)**	**LCL HC-only (n=103)**	**LCL HC+DSP (n=407)**
26–30 days, n (%)	1037 (57.2)	467 (51.0)	214 (55.3)	75 (72.8)	281 (69.0)
Age first use cannabis, m (SD)	16.0 (4.8)	16.1 (4.7)	15.9 (4.4)	15.7 (5.6)	16.1 (5.4)
Years living in current state*					
0–10 years, n (%)	296 (16.3)	145 (15.8)	37 (9.6)	13 (12.6)	101 (24.8)
11–20 years, n (%)	243 (13.4)	133 (14.5)	40 (10.3)	15 (14.6)	55 (13.5)
>20 years, n (%)	1274 (70.3)	638 (69.7)	310 (80.1)	75 (72.8)	251 (61.7)
Employment					
Full-time (≥35 hrs/wk), n (%)	898 (49.5)	460 (50.2)	202 (52.2)	44 (42.7)	192 (47.2)
Part-time, n (%)	137 (7.6)	63 (6.9)	31 (8.0)	9 (8.7)	34 (8.4)
Student, n (%)	36 (2.0)	14 (1.5)	6 (1.6)	3 (2.9)	13 (3.2)
Retired, n (%)	284 (15.7)	140 (15.3)	50 (12.9)	17 (16.5)	77 (18.9)
Disabled, n (%)	376 (20.7)	195 (21.3)	78 (20.2)	27 (26.2)	76 (18.7)
Unemployed, n (%)	82 (4.5)	44 (4.8)	20 (5.2)	3 (2.9)	15 (3.7)

*Analysis comparing this variable across LCL status categories was statistically significant ($p<0.05$)

Chi-squared, Fisher's and ANOVA used to calculate p values. Tukey post-hoc tests used for pairwise comparisons

Table 2

Point estimates and bivariate tests of cannabis growing and edible outcomes across states with and without legal cannabis laws (LCL) and dispensary (DSP) or home cultivation (HC) provisions

	Overall sample	Non-LCL	LCL DSP-only	LCL HC-only	LCL HC+DSP
Ever grow cannabis n (%) *					
No	761 (44)	412 (48)	172 (48)	35 (35)	142 (36)
Yes	954 (56)	447 (52)	189 (52)	65 (65)	253 (64)
Currently growing cannabis at home n (%)†					
No	690 (72)	376 (84)	153 (81)	33 (51)	128 (51)
Yes	264 (28)	71 (16)	36 (19)	32 (49)	125 (49)
# plants currently growing at home n (%)†					
0 plants	690 (72)	376 (84)	153 (81)	33 (51)	128 (51)
1–5 plants	138 (14)	49 (11)	24 (13)	5 (8)	60 (24)
6–25 plants	106 (11)	16 (4)	11 (6)	24 (37)	55 (22)
>25 plants	20 (2)	6 (1)	1 (0.5)	3 (5)	10 (4)
Typical use of plant leftovers n (%)†					
Smoke	187 (20)	109 (24)	43 (23)	9 (14)	26 (10)
Vape	6 (0.5)	5 (1)	0 (0)	0 (0)	1 (0.4)
Make edibles	196 (21)	82 (18)	42 (22)	15 (23)	57 (23)
Make concentrates	186 (19)	63 (14)	36 (19)	24 (37)	63 (25)
Sell	14 (1)	5 (1)	3 (2)	0 (0)	6 (2)
Throw out	140 (15)	80 (18)	23 (12)	3 (5)	34 (13)
Compost	153 (16)	73 (16)	29 (15)	7 (11)	44 (17)
Other	72 (8)	30 (7)	13 (7)	7 (11)	22 (9)
Ever use edible n (%)					
No	352 (19)	224 (24)	86 (22)	8 (8)	34 (8)
Yes	1461 (81)	692 (76)	301 (78)	95 (92)	373 (92)
# times used edibles in past 30 days n (%)‡					

	Overall sample	Non-LCL	LCL DSP-only	LCL HC-only	LCL HC+DSP
0 days	925 (63)	498 (72)	207 (69)	49 (52)	171 (46)
1–9 days	432 (30)	164 (24)	81 (27)	32 (34)	155 (42)
10–25 days	67 (5)	22 (3)	9 (3)	7 (7)	29 (8)
26–30 days	37 (3)	8 (1)	4 (1)	7 (7)	18 (5)
Ever made edibles n (%)					
No	904 (50)	496 (54)	192 (50)	40 (39)	176 (43)
Yes	909 (50)	420 (46)	195 (50)	63 (61)	231 (57)
Made edibles in past 30 days n (%)[§]					
No	734 (81)	359 (85)	159 (82)	43 (68)	173 (75)
Yes	175 (19)	61 (15)	36 (18)	20 (32)	58 (25)

Chi squared and Fishers exact tests used to calculate p-values

p<0.001 for all analyses - in outcome (e.g. % lifetime edible use) when compared across categories of an LCL provision variable (No LCL vs. LCL HC not allowed vs. LCL HC allowed)

[*] Individuals who selected “I prefer not to answer” for this survey question were excluded

[†] Among those who had ever grown cannabis

[‡] Among those who had ever used edibles

[§] Among those who had ever made edibles

Int J Drug Policy. Author manuscript; available in PMC 2018 December 01.

Table 3

Adjusted logistic regression models: relationship between home cultivation (HC) and dispensary (DSP) provisions of cannabis laws and patterns of cannabis growing, use of cannabis grow leftovers and making edibles

	Outcome Variable: Currently growing cannabis at home (yes/no)		Outcome Variable: Lifetime made cannabis edibles (yes/no)		Outcome Variable: Typically use leftovers to make edibles (yes/no)*	
LCL provision indicator variable	**Model 1 OR (95% CI)**	**Model 2 OR (95% CI)**	**Model 1 OR (95% CI)**	**Model 2 OR (95% CI)**	**Model 1 OR (95% CI)**	**Model 2 OR (95% CI)**
Non-LCL	ref		ref		ref	
LCL: DSP-only	1.16 (0.73, 1.86)		1.21 (0.94, 1.55)		1.42 (0.89, 2.26)	
LCL: HC-only	**3.77 (2.12, 6.72)**		**1.67 (1.08, 2.58)**		1.68 (0.81, 3.50)	
LCL: HC+DSP	**4.66 (3.18, 6.84)**		**1.49 (1.16, 1.92)**		1.47 (0.95, 2.27)	
LCL provision indicator variable						
LCL: DSP-only		ref		ref		ref
LCL: HC-only		**3.26 (1.71, 6.21)**		1.36 (0.86, 2.16)		1.32 (0.59, 2.96)
LCL: HC+DSP		**3.87 (2.38, 6.30)**		1.20 (0.88, 1.64)		1.01 (0.59, 1.76)

Bold odds ratios = statistically significant different likelihood ($p<0.05$) of an outcome (e.g., currently growing cannabis at home) when comparing categories of an LCL variable (e.g., LCL HC-only vs. Non-LCL (ref) [model 1])

*Compared to combined group of smoking, vaping, throwing out, using as compost, or selling

All analyses adjusted for age, race, gender, employment, education, years living in current state, age onset of cannabis use, lifetime and past month days of cannabis use.

Table 4

Adjusted logistic regression models: relationship between provisions of cannabis laws (home cultivation (HC) and dispensaries (DSP)) and use of cannabis edibles

	Outcome Variable: Lifetime edible use (yes/no)		Outcome Variable: Past month edible use (yes/no)	
LCL provision indicator variable	**Model 1 OR (95% CI)**	**Model 2 OR (95% CI)**	**Model 1 OR (95% CI)**	**Model 2 OR (95% CI)**
Non-LCL	ref		ref	
LCL: DSP-only	1.17 (0.86, 1.59)		1.18 (0.87, 1.62)	
LCL: HC-only	**3.59 (1.68, 7.68)**		**2.14 (1.35, 3.38)**	
LCL: HC+DSP	**3.20 (2.12, 4.85)**		**2.92 (2.20, 3.88)**	
LCL provision indicator variable				
LCL: DSP-only		ref		ref
LCL: HC-only		**3.06 (1.39, 6.75)**		**1.85 (1.12, 3.05)**
LCL: HC+DSP		**2.71 (1.67, 4.40)**		**2.55 (1.78, 3.65)**

Bold odds ratios = statistically significant different likelihood ($p<0.05$) of an outcome (e.g., currently growing cannabis at home) when comparing categories of an LCL variable (e.g., LCL HC-only vs. Non-LCL (ref) [model 1])

All analyses adjusted for age, race, gender, employment, education, years living in current state, age onset of cannabis use, lifetime and past month days of cannabis use.

Table 5

Adjusted logistic regression models: comparison of effects of home cultivation (HC) and dispensary (DSP) provisions on likelihood of making and purchasing edibles in the past month

	Outcome Variable: Past month *made* edibles (yes/no)		**Outcome Variable: Past month *purchased* edibles (yes/no)**	
LCL provision indicator variable	**Model 1 OR (95% CI)**	**Model 2 OR (95% CI)**	**Model 1 OR (95% CI)**	**Model 2 OR (95% CI)**
Non-LCL	ref		ref	
LCL: DSP-only	1.46 (0.90, 2.37)		1.19 (0.70, 2.02)	
LCL: HC-only	**2.75 (1.45, 5.25)**		1.53 (0.72, 3.24)	
LCL: HC+DSP	**1.82 (1.16, 2.83)**		**3.67 (2.40, 5.62)**	
LCL provision indicator variable				
LCL: DSP-only		ref		ref
LCL: HC-only		**2.12 (1.03, 4.36)**		1.36 (0.60, 3.09)
LCL: HC+DSP		1.27 (0.74, 2.19)		**3.19 (1.84, 5.53)**

Bold odds ratios = significant difference ($p<0.05$) in outcome (e.g., making edibles in past 30 days) when comparing categories of an LCL variable (e.g., LCL HC-only vs. Non- LCL (ref) [model 1])

All analyses adjusted for age, race, gender, employment, education, years living in current state, age onset of cannabis use, lifetime and past month days of cannabis use.