Title

Heterogeneities in administration methods among cannabis users by use purpose and state legalization status: findings from a nationally representative survey in the United States, 2020

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Heterogeneities in Administration Methods among Cannabis Users by Use Purpose and State Legalization Status: Findings from a Nationally Representative Survey in the US, 2020

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Abstract

Background and Aims.—Different cannabis administration methods have differential impacts on health. This study aimed to describe administration methods among cannabis users in the US categorized by 1) use purpose and 2) state legalization status.

Design.—Cross-sectional, probability-based online survey in 2020.

Setting.—All 50 states and Washington DC in the US.

Participants.—A total of 21,903 adults (18+) were recruited from a probability-based online panel to provide nationally representative estimates.

Methods.—Eleven administration methods were grouped into combustion, vaporization, ingestion, and topicals. Weighted prevalence was reported among 1) medical-only, recreational-only, and dual-purpose users based on self-reported purposes and 2) users in states that legalized both recreational and medical cannabis (RCL states), legalized medical cannabis only, and did not legalize cannabis.

Descriptive Findings.—Among past-year users, the proportions of medical-only, recreational-only, and dual-purpose users were 25.55%, 43.81%, and 30.64%, respectively. The most common primary methods were combustion (42.08%) and topicals (28.65%) for medical purposes and combustion (72.07%) and ingestion (15.05%) for recreational purposes. Dual-purpose users were more likely to report combustion and vaporization but less likely to report ingestion and topicals as primary methods for medical use than medical-only users (Ps<.001) and more likely to report combustion and topicals but less likely to report ingestion as primary methods for recreational use than recreational-only users (Ps<.041). A higher proportion of dual-purpose users (82.82%) used more than one method than medical-only (40.52%) and recreational-only users (63.91%) (Ps<.001). For both medical and recreational purposes, RCL states had the lowest rate of

combustion and the highest rates of ingestion and topicals reported as primary methods (Ps<.033). The rate of using more than one administration method did not differ across states (Ps>.05).

Conclusion.—Cannabis users whose purposes are medical, recreational or both tend to differ in their selected administration methods.

Keywords

Cannabis legalization; medical cannabis; recreational cannabis; administration method; use pattern

Introduction

Cannabis use can have both detrimental and beneficial health effects. Primarily relying upon evidence on combustion, systematic reviews suggested that recreational use is associated with impaired cognitive and brain development, addiction and psychosis disorders, respiratory and cardiovascular diseases, and increased risks of motor vehicle accidents. (1–3) On the other hand, medical use may have therapeutic effects on certain conditions such as chronic pain, multiple sclerosis, and chemotherapy-induced nausea and vomiting. (4) As non-combustion methods are gaining popularity, (5–8) research on related health effects is emerging. (9) Non-combustion methods may reduce harms from toxic smoke and secondhand exposure, (10, 11) but may also have unique public health concerns. The risks of overdose and dependence are higher for vaporization because of the extremely high potency and more efficient and intense effects (10) and are higher for ingestion that often has unknown potency and delayed and variable effects. (12) Vaporization can be also associated with acute risks such as injuries and excessive risks of psychosis and impaired driving. (7, 11) Vaporization and ingestion can contain unique features that are appealing to nonusers and youth, such as greater discretion, better tastes, larger variety, and fancy devices, hence increasing the risks of accidental consumption, early initiation, overdose, and problem use. (10–13) Methods using CBD-only products have little psychoactive harms but are not risk free. (14) Despite the public health implications associated with these different administration methods, we have a remarkably limited understanding of the heterogeneities in these methods among cannabis users.

Cannabis users with different purposes may have differential patterns of administration methods. Very few studies have compared medical and recreational users and their non-representative samples had limited generalizability. (15) More importantly, little attention has been given to the overlaps between medical and recreational users, i.e., users with both medical and recreational purposes. Two US national studies estimated that dual-purpose users comprised approximately a third of the cannabis user population in 2010s. (16, 17) They had unique characteristics distinguishable from sole-purpose users. (18–20) Recent behavioral economics experiments also suggested that dual-purpose users may have distinct preferences for cannabis products. (18)

To date, only one study collected data on representative samples and assessed the heterogeneities in administration methods by cannabis use purpose. Pacula et al. (21) recruited 2,009 adults from a probability-based online panel in 2013 in two US states that just legalized recreational cannabis but had not started retail sales (Colorado and

Washington) and two US states that legalized medical cannabis only (Oregon and New Mexico). Among approximately 175 past-month users, 25% reported medical purposes only, 50% reported recreational purposes only, and 25% reported dual purposes. Vaporization and edibles were more likely to be used for medical purposes than for recreational purposes. Differences in administration methods between dual-purpose and sole-purpose users were not detected possibly due to small sample size in each group (~50). Large sample size is warranted to power the detection of heterogeneities. Particularly, nationally representative samples recruited after the wide adoption of recreational cannabis commercialization are needed to provide nationwide generalizable findings in the most current legal contexts.

Administration methods may also differ in jurisdictions with and without cannabis legalization. Following the worldwide momentum of medical cannabis legalization in the past two decades, Uruguay, Canada, and 11 states and Washington DC in the US further legalized recreational cannabis and started to supply diverse products in retail markets. Although dry flowers that were traditionally combusted still predominated legal sales, the consumption of alternative forms has rapidly escalated. For instance, concentrates that are typically used for vaporization increased from less than one billion sales to over six billions during 2014–2020 in the US. (22) Two recent studies found that adult users in jurisdictions with cannabis legalization were more likely to use non-flower forms of cannabis. (9, 23) However, states with recreational and medical cannabis legalization were not differentiated. The non-probability-based convenience sampling also made these findings less generalizable.

To address the limitations in previous research, we conducted a large nationally representative survey with comprehensive questions on cannabis use among a probability-based sample of 21,903 adults in the US in 2020. It provided timely data on all 50 states and Washington DC, distinguished dual-purpose users from sole-purpose users, and separated states with recreational cannabis legalization from states with medical cannabis legalization only. Specifically, we aimed to describe administration methods among cannabis users categorized by 1) use purpose and 2) state legalization status. The estimates have potential to inform policies that aim to target specific user groups in the US as well as other countries implementing or considering cannabis legalization.

Methods

The Marijuana Use and Environment Survey (MUES) 2020

Funded by the US National Institute on Drug Abuse, we conducted the Marijuana Use and Environment Survey (MUES) between December 2019 and February 2020 to collect detailed data on cannabis-related outcomes and environments. Respondents were recruited from a national online panel maintained by the market research company Ipsos Public Affairs (formerly Gfk Group), the same panel used in Pacula et al. (21) This so-called KnowledgePanel® is the largest probability-based online panel in the US that represents 97% of the adult population. It uses published address-based and probability-based sampling approach to recruit adults in households, including those having cell phones only and no phones. Households lacking access to internet are provided with free internet services and/or devices to enable their participation. Currently KnowledgePanel® consists of approximately

55,000 panelists, the demographics of whom are weighted to the US census. KnowledgePanel® has been widely used to provide nationally representative statistics on drug use. (17, 24–30)

A total of 21,903 adults aged 18 years or older were recruited from KnowledgePanel® with a survey completion rate of approximately 60%. The sample covered all 50 states and Washington DC in the US. The survey was administered in both English and Spanish and completed in 17 minutes on average. The survey was approved by the Human Research Protections Program at the University of California San Diego.

Measures

At the beginning of MUES 2020, we explained that "marijuana"[1] encompasses a variety of cannabis forms and listed slang terms to avoid confusion. We provided picture illustrations and text explanations on 11 administration methods. Except for other unspecified methods, these methods were grouped into four broad categories: 1) combustion, including joints, blunts, and pipes/bowls/bongs, 2) vaporization, including vaping[2] and dabbing, 3) ingestion, including edibles, drinks, tinctures, and pills/capsules, and 4) topicals (Table S1). For each method, respondents were asked if they ever used it in lifetime, the past 12 months, and the past 30 days. Lifetime users, past-year users, and past-month users were identified if an affirmative answer was given to any of the 11 methods in the associated reference period. Among lifetime users we asked the age of initiating cannabis use and among past-year users we asked if they tried to stop using cannabis in the past 12 months.

Following previous research, (16) we defined two use purposes: 1) medical purposes, "to treat or decrease symptoms of a health condition", and 2) recreational purposes, "to get pleasure or satisfaction". Among past-year users, we asked for which purposes they used cannabis in the past 12 months. Those who reported medical purposes only were categorized as medical-only users, those who reported recreational purposes only were categorized as recreational-only users, and those who reported both medical and recreational purposes were categorized as dual-purpose users. Recommendation from a doctor was not used to identify purposes, as over 50% self-identified medical users treat themselves without a recommendation. (21)

Among medical-only and dual-purpose users, we asked the primary method they used cannabis for medical purposes out of the 11 methods. Among recreational-only and dual-purpose users, we asked the same questions for recreational purposes. Because users may use multiple methods, we also counted the number of administration methods based on past-year use of each method. We inquired whether a doctor's recommendation was obtained among medical-only and dual-purpose users. We collected information on the primary source and all sources from which past-year users obtained cannabis. (21)

Respondents' demographics included gender, age, race/ethnicity, educational attainment, household income, marital status, employment status, and residence in metropolitan area.

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[1]Marijuana" instead of "cannabis" was used in the survey title and questionnaire to reflect its common use in the US.
[2]Vaping flowers and vaping concentrates were both considered "vaping" and not differentiated.

Respondents in 50 states and Washington DC were grouped into three categories based on state cannabis legalization status at the time of interview: 1) 11 states and Washington DC with both recreational and medical cannabis legalization (RCL states),[3] 2) 22 states with medical cannabis legalization only (MCL states),[4] and 3) 17 states without cannabis legalization (non-legalizing states).[5]

Statistical Analysis

We computed cannabis use prevalence in general population. Among past-year users, we described demographic characteristics, administration methods, and use patterns by cannabis use purpose as well as state legalization status. In the main analysis, bivariate logistic regressions (for binary outcomes) and bivariate linear regressions (for continuous outcomes) were used to determine the strength of evidence on differences between any two subgroups. Demographics were not adjusted in the main analysis because we aimed to apply prevalence estimates and inform policies in specific user subgroups with demographics factored in. In the secondary analysis, we report multivariate regression results with demographics adjusted. Post-stratification weights were applied to all the statistics to account for non-response, oversampling, and any known deviation from probability sampling during sample recruitment. For all the measures in the associated analytical samples, the rates of missing values ranged between 0% and 3%, with the vast majority below 1% (Table S2). Stata Version 16 was used for statistical analyses. The analysis was not pre-registered and the results should be considered exploratory.

Descriptive Results

Cannabis Use Prevalence among General Population

Figure 1 reports cannabis use prevalence by state legalization status. The prevalence of lifetime use, past-year use, and past-month use was 56.30%, 25.66%, and 16.89%, respectively. These estimates fell in the range of estimates from other probability-based national surveys in the US. The prevalence was much higher in RCL states than MCL states and non-legalizing states (Ps<.001).

Characteristics of Past-year Users

Figure 2 reports prevalence of cannabis use with different purposes. Among past-year users, 25.55%, 43.81%, and 30.64% users used for medical-only, recreational-only, and dual purposes, respectively. The rate of recreational-only use was higher than other purposes across the US (Ps<.001). RCL states had the highest rate of medical-only use (28.45%) (Ps<.004) and MCL states had the highest rate of recreational-only use (48.26%) (Ps<.043).

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[3]RCL states included Alaska, California, Colorado, Illinois, Massachusetts, Maine, Michigan, Nevada, Oregon, Vermont, Washington, and Washington DC.
[4]MCL states included Arizona, Arkansas, Connecticut, Delaware, Florida, Hawaii, Louisiana, Maryland, Minnesota, Missouri, Montana, New Hampshire, New Jersey, New Mexico, New York, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, Utah, and West Virginia.
[5]Non-legalizing states included Alabama, Georgia, Idaho, Indiana, Iowa, Kansas, Kentucky, Mississippi, Nebraska, North Carolina, South Carolina, South Dakota, Tennessee, Texas, Virginia, Wisconsin, and Wyoming.

Table S3 summarizes demographic characteristics of past-year users by use purpose and state legalization status.

Cannabis Administration Methods among Past-year Users

Primary Administration Method—Main analysis results: unadjusted descriptive statistics of primary administration method are illustrated by use purpose in Figure 3a (detailed statistics in Table S4a) and by state legalization status in Figure 3b (detailed statistics in Table S4b).

Regarding broad categories, when medical-only and dual-purpose users reported for medical purposes, combustion methods were the most commonly used primary methods (42.08%), followed by topicals (28.65%), ingestion (19.66%), and vaporization (8.95%). When recreational-only and dual-purpose users reported for recreational purposes, combustion methods were also the most commonly used primary methods (72.07%), followed by ingestion (15.05%), vaporization (11.57%), and topicals (1.24%). Additional heterogeneities were detected if we separated dual-purpose users from sole-purpose users. For medical purposes, a higher proportion of dual-purpose users reported combustion (61.03% vs. 19.23%) and vaporization (11.37% vs. 6.03%) whereas a lower proportion of dual-purpose users reported ingestion (15.39% vs. 24.81%) and topicals (12.19% vs. 48.49%) as primary methods than medical-only users (Ps<.001). For recreational purposes, a higher proportion of dual-purpose users reported combustion (76.40% vs. 68.92%) and topicals (1.68% vs. 0.92%) whereas a lower proportion of dual-purpose users reported ingestion (11.15% vs. 17.88%) as primary methods than recreational-only users (Ps<.041). For both medical and recreational purposes, RCL states had the lowest rate of combustion (Ps<.001) yet the highest rates of ingestion and topicals (Ps<.033) being reported as primary methods. The rate of vaporization was lowest in non-legalizing states (Ps<.034).

Regarding 11 detailed methods, topicals (28.65%), pipes/bowls/bongs (23.44%), joints (12.31%), and edibles (10.17%) were commonly reported for medical purposes and pipes/bowls/bongs (36.34%), joints (21.88%), blunts (13.85%), and edibles (13.73%) were commonly reported for recreational purposes. Rates of nine methods differed between medical-only and dual-purpose users for medical purposes (Ps<.027), and rates of seven methods differed between recreational-only and dual-purpose users for recreational purposes (Ps<.049). By state legalization status, differences across states were observed in seven methods for medical purposes (Ps<.038) and five methods for recreational purposes (Ps<.033).

Secondary analysis results: adjusted differences in primary administration method are reported by use purpose in Table S5a and by state legalization status in Table S5b. The levels of p-values and odds ratios in adjusted results were overall comparable to those in unadjusted results with very few exceptions.

All Administration Methods—Main analysis results: unadjusted descriptive statistics of all the administration methods used in the past 12 months are illustrated by use purpose in Figure 4a (detailed statistics in Table S6a) and by state legalization status in Figure 4b (detailed statistics in Table S6b).

Regarding broad categories, combustion still predominated all the categories (63.86%). Ingestion was also very common (54.59%), followed by vaporization (36.12%) and topicals (30.07%). Dual-purpose users had the highest rates of combustion (82.87%), vaporization (50.68%), and ingestion (63.62%) (Ps<.001). Topicals were most frequently mentioned by medical-only users (61.67%) (Ps<.001). RCL states had the highest rates of ingestion (59.59%) and topicals (39.73%) (Ps<.001) yet the lowest rate of combustion (59.74%) (Ps<.0013). MCL states and non-legalizing states did not differ in combustion, ingestion, or topicals (Ps>.05). The rate of vaporization was the lowest in non-legalizing states (30.31%) (Ps<.001).

Regarding 11 detailed methods, all of them differed by use purpose (Ps<.022). All of them also differed by state legalization status (Ps<.041) except for other unspecified methods.

Figure 5 shows the total count of administration methods by use purpose and state legalization status. A considerably greater proportion of dual-purpose users (82.82%) used more than one method than medical-only (40.52%) and recreational-only users (63.91%) (Ps<.001). The average number of methods used by medical-only, recreational-only, and dual-purpose users was 1.90, 2.49, and 3.68, respectively. The proportion of users using more than one method did not differ across states (62.23–64.49%, Ps>.05). The average number of methods in RCL, MCL, and non-legalizing states was 2.85, 2.69, and 2.54, respectively.

Secondary analysis results: adjusted differences in all the administration methods are reported by use purpose in Table S7a and by state legalization status in Table S7b. The levels of p-values and odds ratios in adjusted results were overall comparable to those in unadjusted results with very few exceptions.

Cannabis Use Patterns among Past-year Users

Cannabis use patterns and sources of cannabis are presented in Table 1. The average initiation age was 30.63, 18.31, and 17.34 among medical-only, recreational-only, and dual-purpose users, respectively. Over half dual-purpose users used combustion methods nearly every day and over 20% medical-only and dual-purpose users used vaporization nearly every day. Over 80% dual-purpose users but less than two thirds of medical-only and recreational-only users reported past-month use. About 20–25% users tried to stop use. The rate of obtaining a doctor's recommendation was 37.61% among medical-only users and 28.01% among dual-purpose users. Most of these measures were comparable across states by legalization status.

Among medical-only users, the most frequently mentioned primary source was a retail outlet (41.93%). In contrast, recreational-only users most frequently got cannabis free from a friend or family member (48.13%). Dual-purpose users almost equally frequently mentioned a friend/family for free (27.20%) and a retail outlet (27.87%). When users reported all sources, the top three sources across all user groups were getting it free from a friend or family member, paying a friend or family member, and buying from a retail outlet.

In RCL states, 41.98% users reported a retail outlet as the primary source. The most frequently mentioned primary source in MCL states and non-legalizing states was getting it free from a friend or family member (37.90% and 35.82% respectively). In terms of all sources, the top three sources across all states were getting it free from a friend or family member, paying a friend or family member, and buying from a retail outlet.

Discussion

This study provided the most current description of cannabis administration methods in a large nationally representative adult sample in the US. Instead of considering cannabis users as a homogeneous group in most previous research, (5–8, 16, 31, 32) we identified the heterogeneities by use purpose and state legalization status.

Some of our results by use purpose were consistent with previous smaller-scale studies in selected US jurisdictions. (15, 21) We also found that combustion methods were more commonly used for recreational purposes whereas ingestion methods were more commonly used for medical purposes. In contrast with previous studies, however, we estimated a greater rate of using vaporization for recreational purposes than for medical purposes. This is probably because previous studies relied upon data in 2013–2014 when only medical users had access to concentrates and devices for vaporization in legal markets. As sales of concentrates and devices increased exponentially after recreational cannabis commercialization, (22) more recreational users may have selected vaporization methods.

Our study for the first time provided estimates on the use of topicals by use purpose. Approximately half medical-only users and over 10% dual-purpose users reported topicals as the primary method for medical purposes. In RCL states, topicals for medical use were almost as common as combustion. The research on topicals is unfortunately almost nonexistent. Limited emerging evidence suggested that topicals might have efficacy on treatment of localized symptoms such as arthritis and dermatological conditions. (33) They are also commonly perceived to be safer because users can choose from a large variety of CBD-only and CBD-dominant products. Even if topicals contain THC, the psychoactive effects are considered minimal when THC is applied to skin. Meanwhile, topicals could increase the risks of accidental consumption by children. (34) Future research is urgently needed to fill the knowledge void regarding use patterns and health consequences of this special form of cannabis.

Overall, we considered the heterogeneities in administration methods by use purpose reasonable. Recreational users may be more likely to seek intense and immediate effects for pleasure, which can be achieved by combustion and vaporization with high potency and immediate delivery. In contrast, ingestion and topicals have mild, delayed, and prolonged effects that are more suitable for treating chronic symptoms. (9) Health professionals can use these findings to prevent and treat health consequences associated with commonly used methods among a specific group. The findings may also inform policies designed to target users with specific purposes. For instance, a policy increasing tax rates on dry flowers[6] may be more likely to discourage use among recreational users whereas a policy reducing tax rates on topicals may be more likely to encourage use among medical users.

Dual-purpose uses may represent a distinct group as evidenced by their unique characteristics in this study. Particularly, they had higher rates of using combustion as primary methods than sole-purpose users and hence may bear excessive risks of related harms. Also, a higher proportion of them used multiple methods than sole-purpose users. Cannabis and tobacco research suggested that using multiple methods to consume the same substance may be associated with additive harms, increased exposure to THC/nicotine, greater risks of dependence, and fewer quit attempts. (35–38) Future research is warranted to further explore the characteristics, behaviors, and risk profiles of dual-purpose users.

The selection of administration methods were at least partially restricted by the availability and accessibility of products in legal and illegal markets. About 42% users in RCL states obtained cannabis primarily from a retail outlet, whereas nearly 70% users in non-legalizing states obtained cannabis primarily from personal network or street dealers. Products for some administration methods, such as concentrates and devices for vaporization, require more sophisticated techniques to produce. They can be more cost-efficiently offered through mass production in legal markets. They are also more likely to be promoted by manufactures to pursue greater profits and meet consumer demand. It is not surprising that vaporization was more commonly used in RCL states and combustion was more commonly used in non-legalizing states.

This study has limitations. First, the analysis was cross-sectional and descriptive. The differences across states with different legalization status should not be interpreted as causal relationships because they may be preexisting. Second, survey responses may be subject to recall bias. Third, sampling weights for the overall sample may not successfully correct specific sampling bias in the cannabis user subgroup. Fourth, there is no consensus in literature regarding how use purposes should be defined (39) and current definitions may not clearly differentiate medical use from recreational use for all respondents. Fifth, vaping dry flowers was not differentiated from vaping concentrates. Sixth, the potency information on THC and CBD was not available for all the products consumed by cannabis users. As a result, we were not able to make distinctions between administration methods using THC-dominant, CBD-dominant, and CBD-only products. Seventh, we were not able to provide causal mechanisms to explain the observed discrepancies. Further, this study provided a snapshot in the current legal contexts. Cannabis users may select different methods if policy changes make products for some methods more available and accessible over time. Lastly, the findings may not generalize to minors or population out of the US setting.

Notwithstanding the limitations, this study provided the most recent nationally representative description of cannabis administration methods with particularly good representations in male, older, and minority respondents, who were often underrepresented in previous studies using online panels. (18, 21, 40) To date, MUES 2020 is the largest national survey with more detailed and comprehensive cannabis use measures than other probability-based national surveys, providing valuable opportunities for in-depth

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[6]In the US, dry flowers are typically combusted. In MUES 2020, among users reporting vaping in the past 12 months, 85% vaped concentrates and only 15% vaped dry flowers in the last time they vaped.

explorations. This study highlighted the unique patterns among dual-purpose users who were often mixed with sole-purpose users in previous research with inadequate attention.

Conclusion

This study revealed considerable heterogeneities in cannabis administration methods among medical-only, recreational-only, and dual-purpose users. These heterogeneities should be taken into consideration in future epidemiological and policy research as well as prevention, treatment, and policy design.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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What This Research Adds

Different cannabis administration methods have differential impacts on health. Data from a large nationally representative adult survey in the US suggested that cannabis users with different purposes had considerable differences in administration methods. These heterogeneities should be considered in prevention, treatment, and policy design.
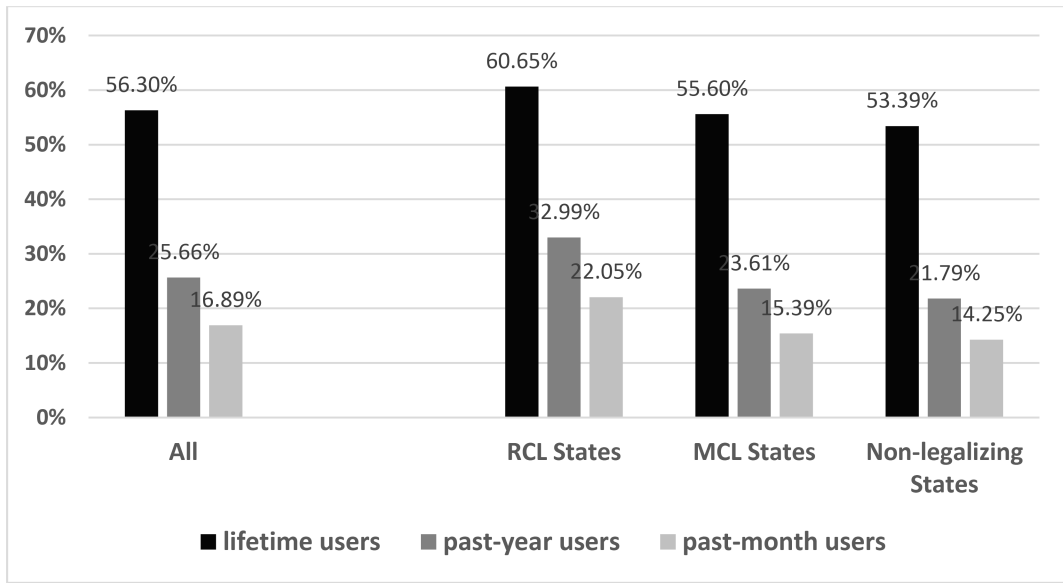
Figure 1.
Cannabis Use Prevalence among General Population, by State Legalization Status
Notes. RCL states: states legalizing both recreational and medical cannabis; MCL states: states legalizing medical cannabis only; non-legalizing states: states not legalizing cannabis.
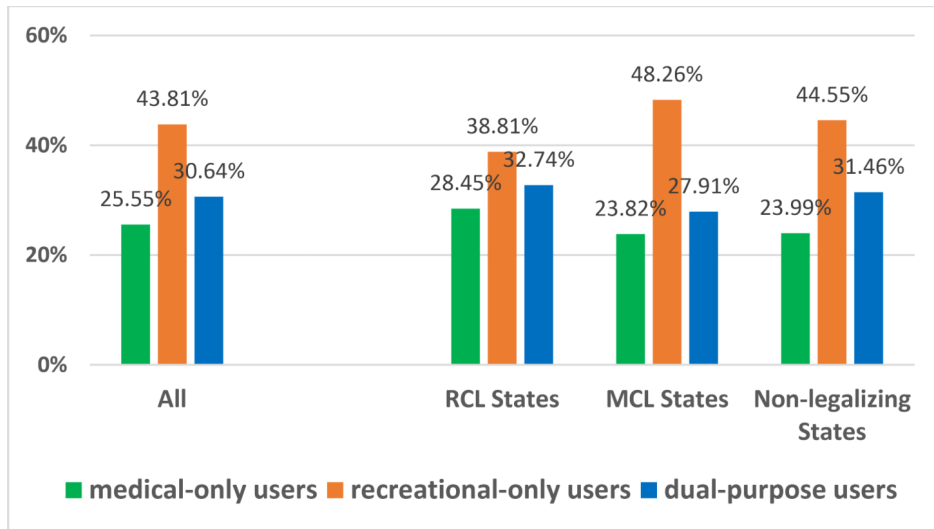
Figure 2.
Use Purpose among Past-year Users, by State Legalization Status

Notes. RCL states: states legalizing both recreational and medical cannabis; MCL states: states legalizing medical cannabis only; non-legalizing states: states not legalizing cannabis.
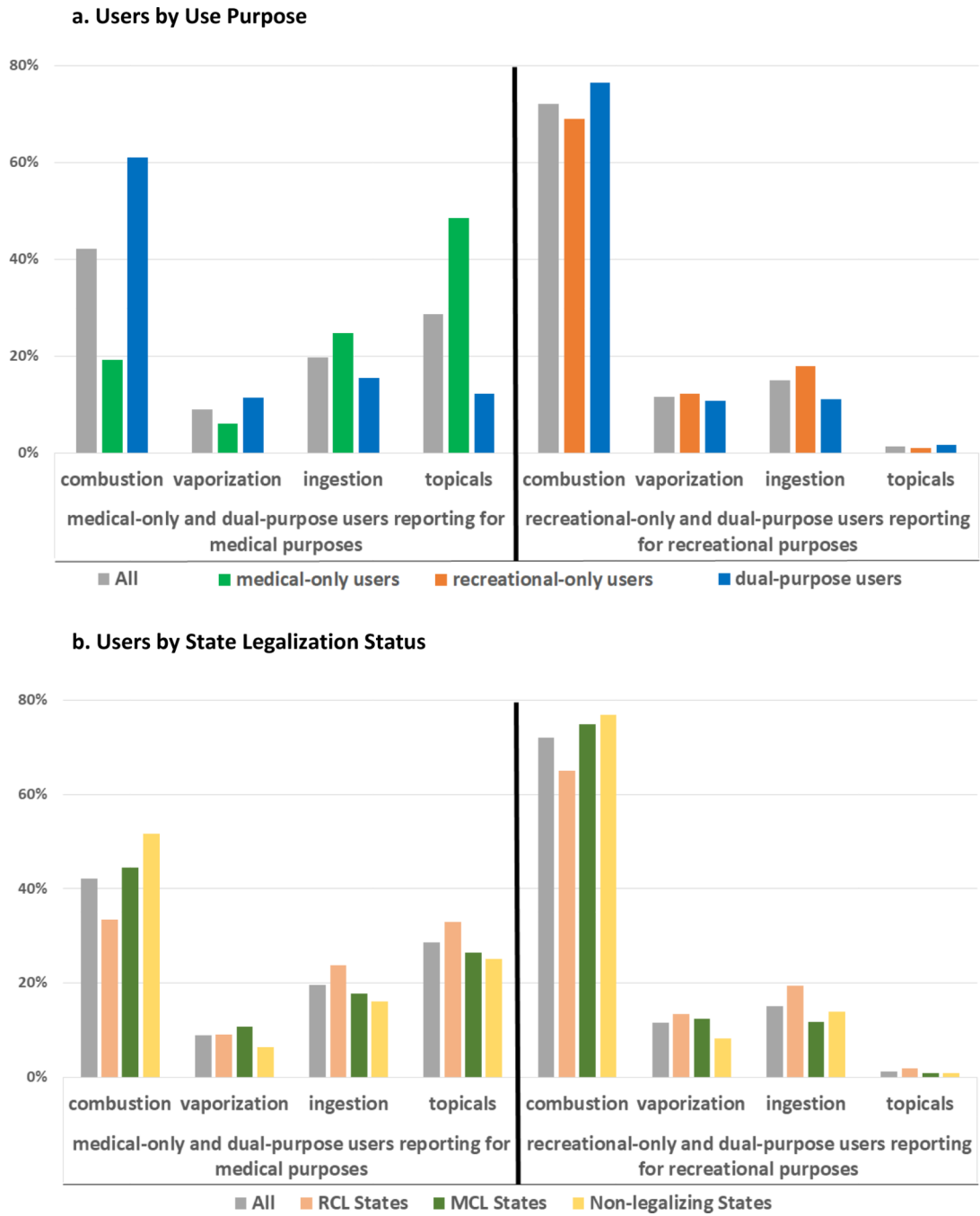
a. Users by Use Purpose

b. Users by State Legalization Status
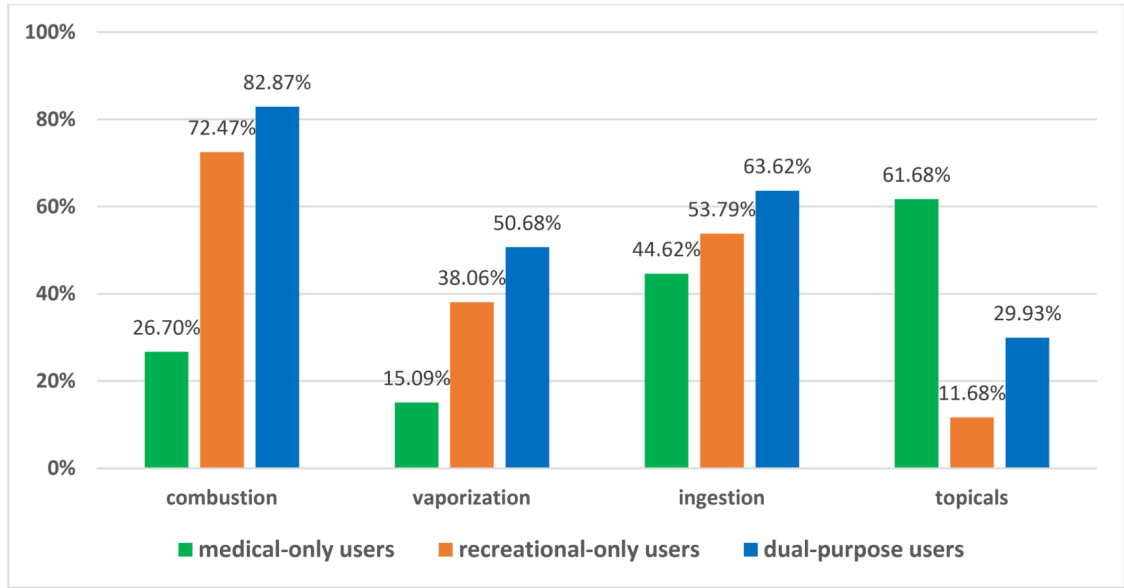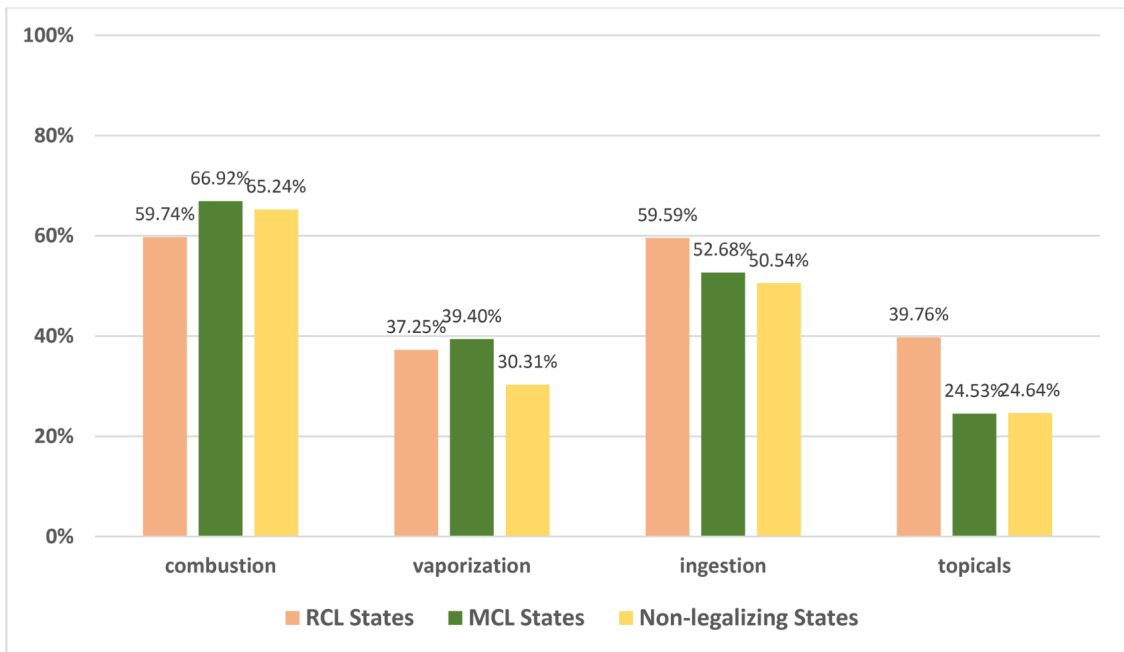

Figure 3.

Primary Administration Method of Cannabis Use among Past-year Users, by Use Purpose and State Legalization Status

Notes. RCL states: states legalizing both recreational and medical cannabis; MCL states: states legalizing medical cannabis only; non-legalizing states: states not legalizing cannabis. Detailed statistics are reported in Table S4.

a. Users by Use Purpose
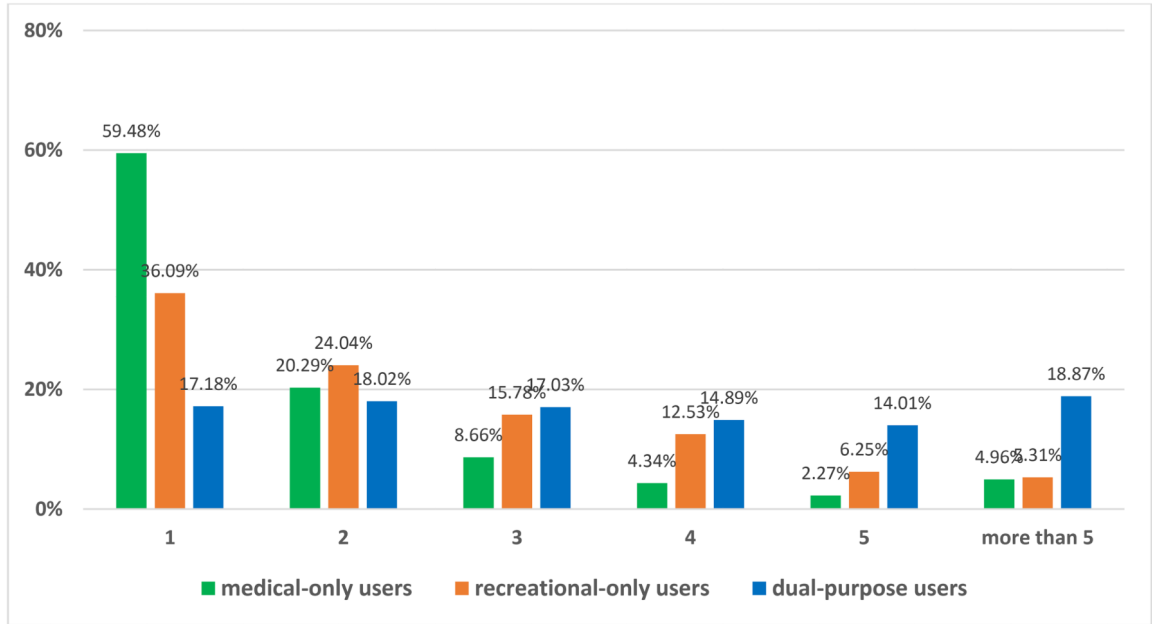

b. Users by State Legalization Status

Figure 4.
All Administration Methods of Cannabis Use among Past-year Users, by Use Purpose and State Legalization Status
Notes. RCL states: states legalizing both recreational and medical cannabis; MCL states: states legalizing medical cannabis only; non-legalizing states: states not legalizing cannabis. Detailed statistics are reported in Table S6.

a. Total Number of Methods among Users by Use Purpose

Legend: medical-only users, recreational-only users, dual-purpose users

b. Total Number of Methods among Users by State Legalization Status

Legend: RCL States, MCL States, Non-legalizing States

c. Average Number of Methods among Users by Use Purpose and State Legalization Status

Figure 5.
Number of Administration Methods Used by Past-year Users, by Use Purpose and State
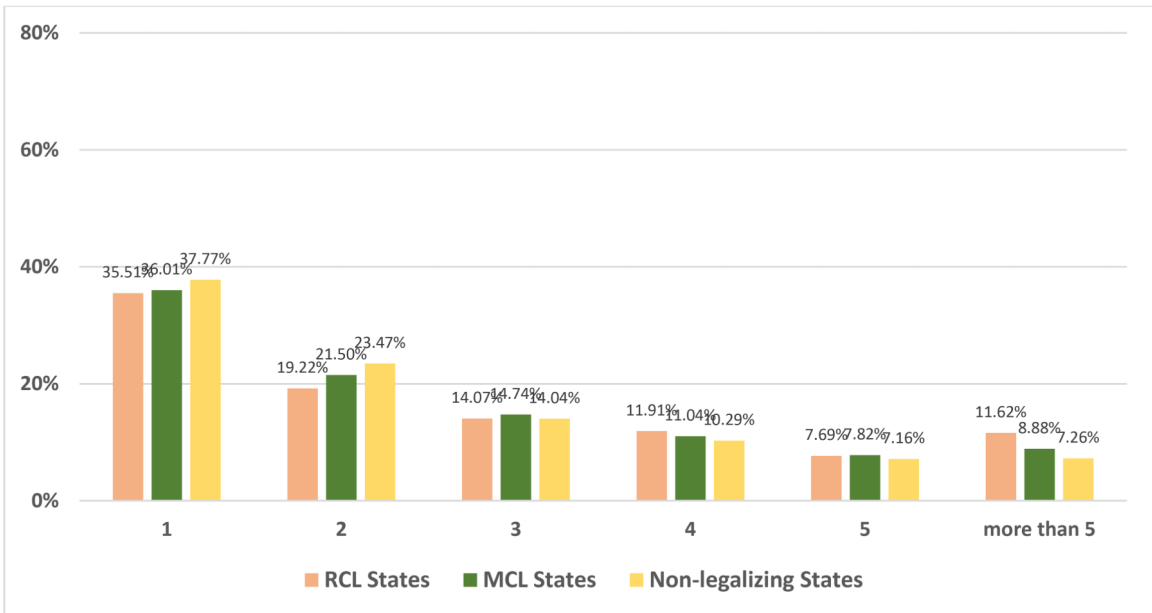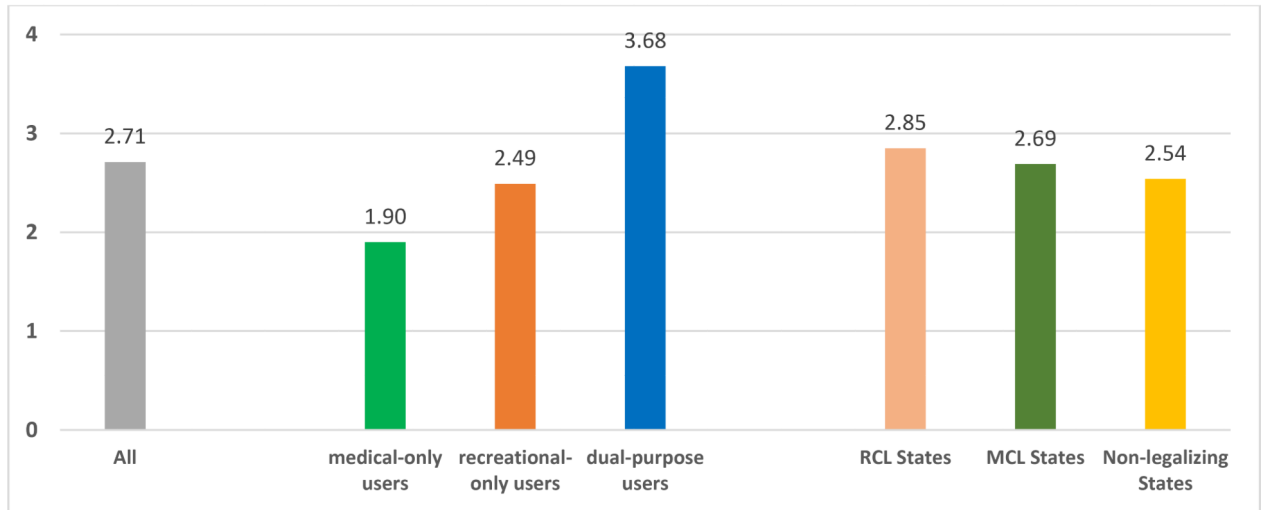Legalization Status
Notes. RCL states: states legalizing both recreational and medical cannabis; MCL states:
states legalizing medical cannabis only; non-legalizing states: states not legalizing cannabis.

Table 1.

Cannabis Use Patterns and Sources of Cannabis among Past-year Users, by Use Purpose and State Legalization Status

	All Users N=5,268	Users By Use Purpose			Users By State Legalization Status		
		Medical-only Users N=1,522	Recreational-only Users N=2,131	Dual-purpose Users N=1,603	Living in RCL States N=2,197	Living in MCL States N=1,805	Living in Non-legalizing States N=1,266
				Weighted % or Mean			
Use Patterns							
Age of 1st use, mean	21.16	30.63	18.31	17.34	22.06	20.71	20.56
>=20 days of use per month if >0 day of use, %							
Combustion	35.65	34.27	21.87	53.03	36.32	36.41	33.83
Vaporization	15.88	26.18	8.26	21.65	17.82	15.08	14.09
Ingestion	2.75	4.32	1.47	3.76	3.77	2.53	1.45
Past-month use, %	65.83	64.09	55.80	81.97	66.82	65.19	65.36
Tried to stop cannabis use in the past year, %	23.70	22.12	24.81	23.50	22.25	22.62	27.02
Doctor's Recommendation, %	NA	37.61	NA	28.01	32.99	32.00	NA
Primary Source of Cannabis, %							
Grew/made my own	2.75	3.14	0.97	4.74	5.17	1.37	1.40
Got it free from a friend or family member	36.12	25.96	48.13	27.20	34.56	37.90	35.82
Paid a friend or family member	14.59	8.90	14.55	19.29	7.74	18.85	17.92
Bought from a dealer	10.19	3.39	10.78	14.90	4.20	12.56	14.88
Bought from a cannabis retail outlet	27.64	41.93	19.46	27.87	41.98	20.89	17.84
Other sources	8.71	16.68	6.11	6.00	6.36	8.43	12.15
All Sources of Cannabis, %							
Grew/made my own	4.74	4.07	2.18	8.73	7.71	3.44	2.59
Got it free from a friend or family member	46.53	30.37	56.38	45.60	48.05	46.37	44.78
Paid a friend or family member	21.26	11.70	21.22	29.13	13.33	26.27	25.00
Bought from a dealer	13.26	5.23	13.22	19.87	6.98	15.12	18.99
Bought from a cannabis retail outlet	33.66	43.87	24.73	38.31	49.77	26.24	22.47
Other Sources	9.47	17.23	6.53	7.43	6.96	9.28	13.01

Notes. RCL states: states legalizing both recreational and medical cannabis; MCL states: states legalizing medical cannabis only; non-legalizing states: states not legalizing cannabis.