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Cognitive Evaluation of Questions on Cannabis Product Use

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INTRODUCTION

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This report documents the findings from a cognitive interviewing study by the Collaborating Center for Questionnaire Design and Evaluation Research (CCQDER), National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention (CDC), of a set of questions on experiences with cannabis products, including marijuana and hemp products, for the CDC's National Center for Injury Prevention and Control (NCIPC), Division of Overdose Prevention (DOP). The questions are intended to be used on national- and state-level surveys of adults and cover topics including hemp and cannabidiol (CBD) use, marijuana use, modes of use and of product acquisition, the use of cannabis alongside and as a replacement for other substances, cannabis-impaired driving, physician-patient interactions related to cannabis, cannabis advertising, the effect of the COVID-19 pandemic on cannabis use, and the effect of changing laws on cannabis use. The questions were developed by NCIPC/DOP in consultation with other state and federal agencies and the Council for State and Territorial Epidemiologists' (CSTE) Cannabis Subcommittee.

The next section documents the methods, sample characteristics, questionnaire structure, interviewing procedures, and analytical approach. The third section of the report provides overall findings that emerged from the cognitive interviews. The fourth and final section of the report presents detailed question-by-question analysis, including descriptions of the main patterns of interpretation, response strategies, and potential sources or instances of response error.

METHODOLOGY

Cognitive interviewing is intended to provide in-depth qualitative insights into the patterns of interpretation, recall, judgment, and response that characterize respondent encounters with survey items. This study draws on the socio-cultural approach to question evaluation articulated by Gerber (1997) and further elaborated by Miller (2003) and Miller et al. (2014). It aims to document how respondents understood each question, to assess and categorize response processes based on those interpretations, and to establish constructs captured by each question and by the broader instrument.

This activity was reviewed by the NCHS Ethics Review Board and CDC and was conducted consistent with applicable federal law and CDC policy.[1]

Sample composition and recruitment

Recruitment began the week of November 8, 2021. The CCQDER Operations Team scheduled 90 interviews, and a seven-member interviewing team of CCQDER researchers conducted these interviews in English primarily virtually on the Zoom video conferencing platform between November 17, 2021, and February 18, 2022. Some interviews were conducted face-to-face, in person, in locations agreeable to respondents outside of the Questionnaire Design Research Laboratory. The CCQDER Operations Team made particular use of Reddit's active and diverse state-based cannabis user forums to recruit participants for interviews. Additionally, the team used the VolunteerMatch platform and CCQDER's respondent database to solicit additional study participants. More broadly, the entire CCQDER staff actively recruited participants by word-of-mouth and social media.

Sampling was purposive, with selection based on three criteria. First, CCQDER recruited respondents based on product use and experience. CCQDER recruiters selected only respondents who self-reported use of cannabis products in the past 12 months, to closely examine how respondents with experience with cannabis products understand terms and concepts associated with cannabis. Second, CCQDER recruited based on geography, because questions may perform differently in distinct legal and regulatory contexts. In the United States, cannabis products are regulated at the federal level, where use, possession, and distribution are illegal, and at the jurisdictional level, where certain jurisdictions allow for adult- or medical-use cannabis. Details on study categorization of legal jurisdictions can be found in Appendix 1.

Finally, CCQDER sought to recruit a diverse sample according to gender, race, ethnicity, age, and education. Researchers sought to recruit participants, as much as possible, in equal proportion, within the constraints of those willing to participate in the study. However, because qualitative sampling is based on theoretical relevance more than equal cell sizes, analysis at times prioritized the selection of certain groups over others. Importantly, the sample generated in this study is not representative and no inferences should be made from it about the relative prevalence of patterns of interpretation and response identified in the broader population. Instead, the sample was constructed to identify the broad range of patterns of interpretation present for the purpose of question evaluation and improvement prior to fielding.

Table 1 describes the study sample. The sample had more men than women. It was predominantly non-Hispanic White with a relatively large non-Hispanic Black minority and several respondents from other racial and ethnic groups. Respondents to this study tended to be relatively young or middle-aged, and the sample skewed slightly toward higher educational attainment.

Table 1: Sample Composition, n = 90

	Number	***Percent***
Gender		
Women	54	60.0%
Men	36	40.0%
Race/Ethnicity		
Non-Hispanic White	60	66.7%
Non-Hispanic Black	24	26.7%
Non-Hispanic Asian	3	3.3%
Non-Hispanic Multiracial	1	1.1%
Hispanic	2	2.2%

[1] See e.g., 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq.

Age (in years)		
18-29	24	26.7%
30-49	36	40.0%
50-64	22	24.4%
65 and older	8	8.9%
Educational Attainment		
High school diploma or less	22	24.4%
Some college or 2-Year Degree	20	22.2%
4-Year degree	22	24.4%
Graduate degree	26	28.9%
Legal Jurisdiction (see Appendix 1)		
Early legalizer	20	22.2%
Recent legalizer	17	18.8%
Medical-only	32	35.5%
CBD-only	21	23.3%

The questions evaluated were compiled by the CDC Cannabis Strategy Unit in NCIPC/DOP and were designed by subject matter experts at the state and federal level. The questions were not designed for any specific survey A full copy of the instrument is provided at the end of this report in Appendix 2.

Data collection and analysis

Interviews were one hour long and were conducted by trained interviewers from CCQDER. Due to the social distancing requirements of the COVID-19 pandemic, most interviews were conducted via the Zoom video conferencing platform; a few interviews were conducted face-to-face at locations mutually agreeable to the interviewer and respondent. Respondents completed informed consent and confidentiality forms prior to the interview and were remunerated $40 after interview completion. The interviews began with interviewers administering the survey questionnaire as designed and outlined in Appendix 2 by reading the questions aloud and, with as little intervention as possible, gathering respondents' answers. This was followed by retrospective probing of the instrument aimed at understanding why respondents offered the answers they did through understanding their personal narratives and social contexts.

Analysis proceeded in a four-stage process based on the constant comparative method first articulated by Glaser and Strauss and adapted to cognitive interviewing by Miller et al. using Q-Notes, an online software application designed for managing data from cognitive interviewing. In the first stage of analysis, interviewers summarized interviews into notes that conveyed the interpretations respondents gave of key concepts (for example, their understandings of what "marijuana" meant) based on the narratives and experiences shared through probing. Additionally, these notes included descriptions of any response errors or other difficulties respondents faced when encountering the questions. Interviewers added their own notation of emergent findings to the notes when appropriate.

In the second stage, study analysts drew inductive comparisons across the dataset on a question-by-question basis. This process had the aim of identifying patterns of 1) consistent (or inconsistent) respondent understandings of key concepts and 2) associations respondents had with those concepts. In the third stage, analysts drew comparisons across subgroups within each question to determine if demographic subgroups understood questions substantially differently or similarly. Finally, in the fourth stage, analysts examined the entire instrument to identify cross-cutting conceptual themes relevant to how respondents, broadly speaking, answer questions about cannabis use and experiences.

An overview of the key findings from the study is presented next, followed by a detailed question-by-question analysis of all items

KEY FINDINGS

This section details findings that emerged across the range of questions examined. First, this section discusses the impact of product inclusion—that is, strategies respondents used in categorizing types of cannabis products—on question interpretation and challenges for eliciting consistent product inclusion across survey items. The study finds that respondents adopted different strategies for product categorization that led to inconsistent question interpretations between respondents. Second, this section examines a question version experiment designed to assess the impact of question wording on product inclusion across the instrument. The study found that the addition of clarifying wording did not lead to respondents consistently excluding what the instrument referred to as "CBD-only" products, because respondents conceived of "CBD-only products" in divergent ways. Third, this section considers the impact of regulatory environment on question interpretation and finds that regulatory environment did not impact question interpretation; rather, it impacted the products or experiences to which respondents had access.

Inconsistent product inclusion across questions

In this study, respondents answered sets of questions that referenced either "hemp or CBD-only products" or "marijuana." Questions referencing specific categories of products are detailed in Table 2.

Table 2: Questions Referencing Cannabis Product Categories

Product	*Introduction*	*Question*
Hemp or CBD-only	The next question asks about use of hemp or CBD-only products. Hemp and CBD-only products are typically found in stores such as grocery stores, gas stations, smoke shops, and malls. Do not count marijuana products when answering this question.	1. During the past 30 days, on how many days did you use hemp or CBD-only products?
Marijuana	Version 1: The next set of questions ask about marijuana use. Version 2: The next set of questions ask about marijuana use. Marijuana is also called pot, weed, or cannabis. Do not count hemp or CBD-only products when answering this question.	4. During the past 30 days, on how many days did you use marijuana?

In general, the instrument does not define the terms "hemp or CBD-only products" or "marijuana."

To decide which products to include in answering each question set, respondents primarily developed distinctions based on product chemical composition, psychoactive effects, and plant origin and legality. However, respondents did not all comprehend the terms "hemp or CBD-only products" and "marijuana" in the same ways, and thus their categorizations varied within each question set and, sometimes, within each item. Consequently, the division between questions about "hemp or CBD-only products" and questions about "marijuana" did not function as intended.

The context of the cannabis product marketplace, which drastically changed because of Congressional approval of the 2018 Farm Bill, further complicated variation in product inclusion.[2] Practically speaking, the 2018 Farm Bill

[2] The 2018 Farm Bill removed hemp and cannabis derivatives that contained less than 0.3 percent delta-9 THC from the list of controlled substances in the Controlled Substances Act. Delta-9 THC is the primary compound frequently simply referred to as "THC" that generates a psychoactive effect for cannabis users. See Leas, E. C. (2021). The hemp loophole: A need to clarify the legality of delta-8-THC and other hemp-derived tetrahydrocannabinol compounds. *American Journal of Public Health*, *111*(11), 1927-1931. By 2021, all 50 states and the District of Columbia allowed licensed industrial hemp farming. See

legalized products containing CBD at the federal level, although some states passed their own laws concerning CBD sales. In so doing, the 2018 Farm Bill unintentionally led to the production and sale of hemp-derived psychoactive cannabinoids, such as delta-8 tetrahydrocannabinol (THC), in states with and without legal nonmedical adult-use marijuana marketplaces.[3] In the context of this instrument, the 2018 Farm Bill introduced many novel cannabis products that respondents inconsistently categorized as either "hemp or CBD-only products" or "marijuana."

Each subsection below details a thematic categorization, its conceptual operation, and its mediation by the cannabis product marketplace, which causes variations in question interpretation.

Chemical distinction: cannabis products with trace THC

Respondents who conceived of the difference between "hemp or CBD-only products" and "marijuana" products as a chemical one considered the compounds CBD and THC as distinct chemicals with very different effects. For these respondents, the key attribute of "hemp or CBD-only products" was that these products did not contain THC, in contrast to "marijuana," which did. Respondents grounded this in a firm understanding that marijuana "is THC as opposed to CBD." One respondent, for example, asked if "hemp or CBD-only products" were "the ones without THC?" Other respondents discussed examining product packaging to determine that "there is no THC in your CBD."

The content of the cannabis marketplace, however, complicated this categorization and led to it operating inconsistently for two reasons. First, CBD products frequently, and legally, contain some amount of THC. Some respondents were uncertain whether to count a product as "CBD-only" if it contained trace amounts of THC. Consequently, either respondents categorized these as "marijuana" products or, more often, these products were excluded from the survey. For example, one respondent said, "I wouldn't say CBD-only because I use full-spectrum [products containing naturally occurring trace THC]. Is that still in the scope of this question?" Another initially included a CBD-based topical cream but later asked the interviewer to exclude that product because it was not "CBD-only."

Second, the nature of hemp-derived psychoactive cannabinoid products, such as delta-8 THC, complicated this distinction. Because delta-8 THC is derived from CBD, some respondents included it as a "CBD-only" product. But because delta-8 THC is chemically THC, other respondents opposed it—chemically—to CBD. This led to inconsistent inclusion of delta-8 THC products, as well as other hemp-derived psychoactive cannabinoids, which affected question interpretation throughout the instrument depending on whether respondents categorized these products as "hemp or CBD-only" or "marijuana." At times, however, the relatively new presence of these products in the marketplace meant that respondents did not know exactly what they were. For instance, one respondent who regularly used delta-9 THC-based cannabis "flower" and vapes and who had tried CBD-only products legal under the 2018 Farm Bill conceived of delta-8 THC as "another aspect of [the plant] that's supposed to have more similar THC stuff, but it still doesn't fall under any of the legal definitions of THC." For this respondent, delta-8 THC was a nebulous third category that somehow differed in chemical composition from "regular" THC yet shared similar effects without falling under the same legal restrictions.

Plant origin and legality distinction: where products can be manufactured and purchased

Coit, M. (2022). Legal and regulatory oversight of hemp cultivation and hemp foods. In *Industrial Hemp* (pp. 59-72). Academic Press, and Falkner, A. (2022). *Hemp in the United States: An analysis of policy and consumption* (Order No. 29163479). Available from ProQuest Dissertations & Theses Global. (2656857881). Retrieved from https://www.proquest.com/dissertations-theses/hemp-united-states-analysis-policy-consumption/docview/2656857881/se-2.

[3] These hemp-derived psychoactive cannabinoids are made from the synthetic conversion of CBD derived from hemp into other cannabinoids not naturally found in large amounts in the hemp plant. Until the federal government clarifies its position, the regulation of delta-8 THC and other hemp-derived psychoactive cannabinoids falls under the purview of the states, with many states banning or restricting sale of these products. For a review of the pharmacology and effects of delta-8 THC, see Tagen, M., & Klumpers, L. E. (2022). Review of delta-8-tetrahydrocannabinol (Δ8-THC): Comparative pharmacology with Δ9-THC. *British journal of pharmacology*, *179*(15), 3915-3933.

Respondents who understood the difference between "hemp or CBD-only products" and "marijuana" products to relate to plant origin and legality relied on the legalization of industrial hemp farming made possible by the 2018 Farm Bill. These respondents understood "hemp or CBD-only products" to be products derived from industrial hemp (and thus legal) and "marijuana" products to not be derived from industrial hemp (and thus inconsistently legal depending on jurisdictional law). This produced a neat categorization of products, though one that differed from the chemical distinction outlined previously. Table 3 outlines how this distinction operates in relation to the previous one.

Table 3: Chemical versus Origin and Legality Distinctions, with Sample Cannabis Products

		Chemical distinction	
		No THC	*THC*
Origin and legality distinction	*Industrial hemp*	CBD distillates	"Full-spectrum" CBD, delta-8 THC
	Non-hemp	n/a	"Marijuana," delta-9 THC

In jurisdictions where the cannabis product marketplace was governed by different legal statuses—for example, where "marijuana" was illegal while CBD products were legal—the distinction based on plant origin and legality operated cleanly. One respondent from a state with no legalized delta-9 THC consumption, possession, or distribution said, "there's a very distinct split in my state where you can purchase those items and how they're legally treated." Particularly knowledgeable respondents discussed the legal changes in depth:

> *When they made hemp federally legal, how they defined hemp was the percentage of delta-9 THC in it to the CBD. So what people did to get around that is they got the delta-8 THC so it got around the law, and right now there's debate on whether they're going to change the law…delta-9 is just what's more available in marijuana naturally. And delta-8 is what they've been able to pull out of hemp, and you can get it from marijuana, but basically they're doing it to get around the law…from the legal hemp.*

In jurisdictions where both "marijuana" and CBD products derived from hemp were legal, however, respondents generally did not use the product origin and legality distinction to differentiate between "hemp or CBD-only products" and "marijuana" products and relied on other methods of categorization.

Psychoactive effects distinction: the kind of cannabis that gets you high

Respondents who conceived of the difference between "hemp or CBD-only products" and "marijuana" in terms of psychoactive effects understood "hemp or CBD-only products" to be non-psychoactive and "marijuana" products to be psychoactive. For these respondents, the low percentage of THC in some CBD products derived from industrial hemp did not create a psychoactive effect. Thus, these products could be classified as "hemp or CBD-only products." Psychoactive products derived from hemp, such as delta-8 THC, could be classified alongside psychoactive "marijuana" products not derived from hemp. Table 4 outlines how this distinction operates in relation to the previous two.

Table 4: Chemical, Origin and Legality, and Psychoactive Distinctions, with Sample Cannabis Products

		Chemical distinction	
		No THC	*THC*
Origin and legality distinction	*Industrial hemp*	CBD distillates	"Full-spectrum" CBD
	Non-hemp	n/a	

Psychoactive effects ■ Yes ☐ No

Respondents who used this distinction effectively grouped CBD products containing no THC with CBD products containing low amounts of THC. For example, one respondent described her use of a CBD salve "in a topical

format…used as a pain blocker or a mild muscle relaxer, and it does not contain the same kind of 'mind altering compounds.' It does not contain THC. It is much less fun overall." Other respondents had similar conceptions. "You don't actually get high from CBD," one explained, while another said that CBD is "hemp, it's part of the marijuana plant…but there's no psychotrop—psychidel—whatever it's called, the high effect…especially if the product has 0 percent THC."

The distinction based on psychoactive effects also cleanly categorized delta-8 THC and other hemp-derived psychoactive cannabinoids made available under the 2018 Farm Bill. One respondent explained that "since [delta-8 THC's] psychoactive, I would put it into the marijuana category more than the hemp category." However, the terminology of the instrument—"hemp or CBD-only products" and "marijuana"—did not immediately imply a distinction based on psychoactive effects. As one hemp-farming respondent explained, "if the intent of the question is to differentiate between psychoactive and non-psychoactive, there are people who will say that delta-8 is hemp-derived and call it hemp, but it is definitely psychoactive." There were more than a few respondents who seemed to conclude that plant origin outweighed psychoactive effects and included delta-8 alongside the less "fun" CBD-only products.

Effects of multiple distinctions on instrument-wide question performance

The distinctions used by respondents, often including multiple distinctions used by the same respondent even when responding to one item, subsequently affected additional items on the instrument. The biggest impact appeared to be from delta-8 THC products, which were inconsistently categorized even by the same respondent over the course of the instrument. For example, one respondent included the delta-8 THC gummies she used when answering the items on "hemp or CBD-only products" because of its marketing to show origin from hemp. In Question 4 (see Table 3), which specifically inquired as to the number of days she used marijuana products, the respondent excluded the gummies and answered based on a trip in the last 30 days to a state with legally sold adult-use marijuana. Thus far, the respondent's answers were consistent with a product origin conception of the difference between "hemp or CBD-only products" and "marijuana." However, for the rest of the instrument, the respondent included her delta-8 THC gummies in answering each item even though the items referred to "marijuana" because delta-8 psychoactively affected her in a similar way to "marijuana." Other respondents included their delta-8 THC products under both "hemp and CBD-only products" and "marijuana" products, reducing the impact of the differentiation made.

One approach this instrument took to clarifying the difference between "hemp and CBD-only products" and "marijuana" was to establish that "marijuana" is also known as "pot, weed, or cannabis." Respondents generally agreed with this statement for the terms "marijuana," "pot," and "weed." To respondents in the sample, these three terms appeared to be identified with delta-9 THC-dominant cannabis smoked, eaten, vaped, or otherwise ingested. However, respondents disagreed about the term "cannabis," with one respondent saying "marijuana, pot, and weed are the same thing, but for some reason when I hear the word 'cannabis' I think about, like, the whole family of these products." Another echoed this respondent and further clarified that "when I hear cannabis, I thought that could be CBD too." In this way, the clarification potentially offered by the inclusion of additional terms served to muddy the waters.

Impact of "marijuana" question versions on instrument-wide product inclusion

This study additionally attempted to specify the difference between "hemp and CBD-only products" and "marijuana" products through the inclusion of a second version of Question 4. The two versions of this question were intended to evaluate whether the addition of question wording defining marijuana and instructing respondents to exclude hemp or CBD-only product use would convey what was meant by "marijuana" and decrease the incidence of hemp or CBD-only product inclusion across the rest of the instrument.

> **Version 1:** The next set of questions ask about marijuana use. During the past 30 days, on how many days did you use marijuana?

> **Version 2:** The next set of questions ask about marijuana use. Marijuana is also called pot, weed, or cannabis. Do not count hemp or CBD-only products when answering this question. During the past 30 days, on how many days did you use marijuana?

Researchers deployed these two question versions in a split-ballot experiment, where approximately half of respondents received version 1, and approximately half of respondents received version 2. Study analysts qualitatively coded subsequent question responses and discussions in question probing to determine if respondents excluded "hemp or CBD-only products" when responding to all questions following Question 4, and if respondents excluded "hemp or CBD-only products" more consistently after receiving Version 1 or Version 2.

Analysis demonstrated that the added wording did not lead to respondents consistently excluding "hemp or CBD-only products" from subsequent questions, because respondents conceived of these products in very different ways (see "Inconsistent product inclusion across questions," above). Study analysts examined the distribution of the first time that respondents included hemp or CBD-only products in their response to an item, as shown in Figure 1. At least some respondents among both experimental conditions included hemp or CBD-only products as soon as Question 4, and there is no clear pattern indicating that one version leads to more consistent exclusion of "hemp or CBD-only products." Instead, across both groups of respondents, inclusion of hemp or CBD-only products is clustered on Question 13 (on advertising) and Question 18 (on whether a product contains more CBD or THC). Question topics are detailed in Table 5.

Figure 1: Distribution of Respondents by Question Version and Time Hemp or CBD-only Products First Included

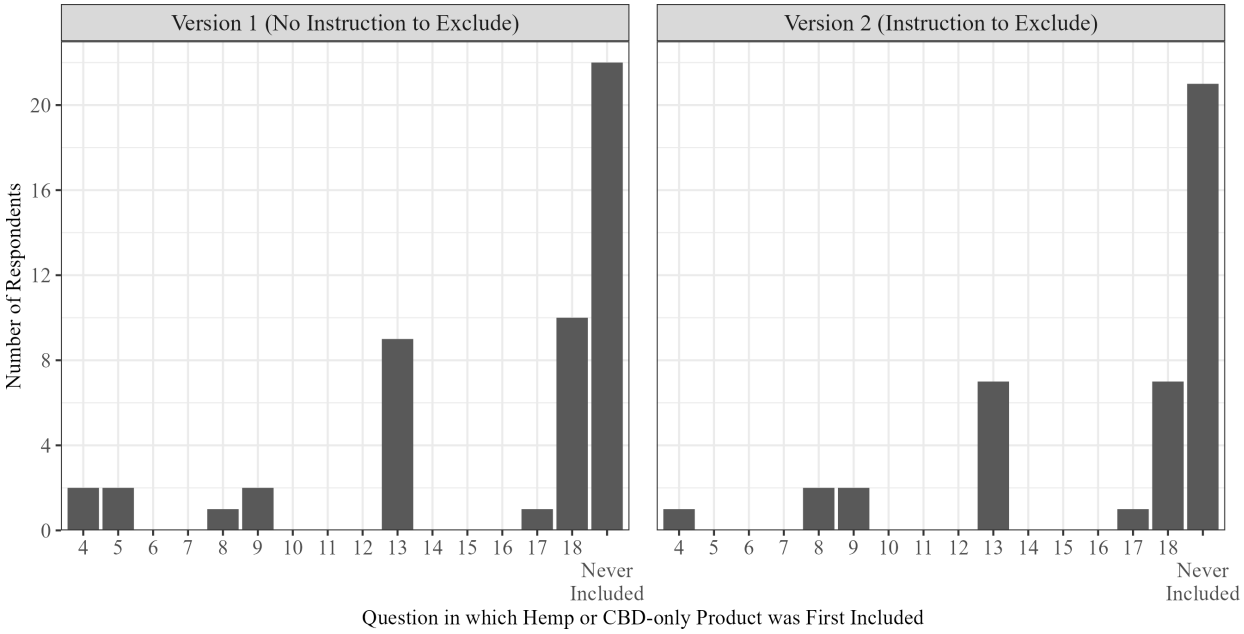


Table 5: Question Topics

Question Number	*Topic*
4	Marijuana use
5	Co-use of other substances with marijuana
6	Replacement of other substances with marijuana
7	Driving after use of marijuana
8	Medical professionals asking about marijuana use
9	Medical professionals advising about marijuana use
10	Desire to cut back or cease marijuana use
11	Ability to cut back or cease marijuana use

12	Marijuana use in the household
13	Advertising about marijuana products or stores
14	Anti-marijuana messaging
15	Relationship of marijuana use to the COVID-19 pandemic
16	Relationship of marijuana use to legalization
17	Locations of marijuana acquisition
18	Product composition

From the cognitive interviewing data, it is not possible to conclude which question wording leads to more or less inclusion of "hemp or CBD-only products" in the instrument.

Impact of jurisdictional regulatory environment on question performance

This study was designed to examine the potential impact of jurisdictional legal and regulatory policies on question response. The study sample was divided into four categories of U.S. states and the District of Columbia based on the legal status of adult nonmedical and medical cannabis use, as detailed in Appendix 1.

Broadly speaking, this study did not find any discernable impact of jurisdictional legal or regulatory policy on the understandings respondents had of questions and response options, and, consequently, on question response in general. For example, Question 5 asked the following:

> 5. When you used marijuana in the last 30 days, did you use any other substances at the same time or within a few hours? (Select all that apply.)

Respondents understood this question on two axes: the type of inclusion, that is, intentional only or intentional and incidental, and the product domain, that is, only drugs and vices, or drugs, vices, and on-label use of prescription medications. These interpretations did not meaningfully differ by the type of jurisdiction in which the respondent lived. For example, one respondent who lived in a jurisdiction where cannabis is legal for adult nonmedical use, said that he "always" has a "nicotine vape pen" with him and included that that incidental co-use in his response. Another in a jurisdiction where only CBD products were legal for adult use explained that his tobacco use was "just like a habit, you know…I don't change anything just because I smoke marijuana." For these respondents, and for others across the instrument, their relative legal access to delta-9 THC-dominant products did not affect their understanding of the survey item.

This lack of impact even extends to the phenomenon of social desirability bias, which can occur in questions about sensitive or illegal topics and lead to underreporting of socially disapproved behaviors and overreporting of socially approved behaviors (Groves et al., 2011). For most questions, respondents appeared to have no issues reporting their use of marijuana, even given the context of a video recorded cognitive interview with a federal government agency. The lack of social desirability bias is specifically addressed in the evaluation of Question 7 (impaired driving) below, but one set of questions particularly highlights the acceptability of reporting on marijuana use in the context of a survey. Questions 8 and 9 inquired about respondent interactions with medical professionals about marijuana use:

> 8. In the past 12 months, has a health professional asked you about your marijuana use?
>
> 9. In the past 12 months, has a health professional advised you to:

More than one respondent to these items explained during probing that they deliberately underreported their use to their doctor or primary care practitioner. One respondent, who reported using marijuana four days out of the last 30, explained that the health professional did not offer advice because she did not answer truthfully. She said, "I did not want their information." Another, who reported using marijuana 25 out of the last 30 days, said that when asked about marijuana use by a health professional, she answered "No" because of

> *a fear of, when you go to a medical professional, like you don't know if they're going to write it down and put it on your insurance…and what if your job finds out? That's my fear. It was completely confidential and if I knew it was just going to be the doctor giving me information I would be forthcoming with it, but my fear is always oh my god, what if they put it on the paper, it goes in, it's on my record, my job finds out, that kind of thing.*

This respondent feared this sort of reprisal even though she lived in a state where adult nonmedical use of marijuana was fully legalized. However, certain questions were vulnerable to underreporting. Question 17 asked about where respondents acquired their marijuana products:

> How do you usually get the marijuana you use? Do you:

This question saw some refusal on the basis of respondents' fears of the consequences of disclosure. One explained that "it's still not federally legal" and that she didn't "know what the exact laws are here in [her state]." Question 12, which asked about the use of marijuana by others who live with the respondent, also saw refusal:

> Does anyone who lives with you use marijuana?

In addition to refusal to answer, some respondents indicated during probing of this item that they didn't "want to out anybody," even if they did provide a response to the question.

Overall, the study results indicate that social desirability bias may not affect data collection as much as might be hypothesized at first but that questions inquiring about factors external to the respondent, such as the location of marijuana purchase and the use of marijuana by those who did not consent to be in the survey, may still be vulnerable to underreporting for privacy reasons.

Certain questions are susceptible to the legal and regulatory policies of the respondent's jurisdiction. However, this susceptibility is not at the level of question interpretation, recall, judgment, or response—that is, the question-response process—but at the level of the types of responses rendered most or least likely to appear. For example, Question 13 asks about advertising of marijuana products or for marijuana stores:

> During the past 30 days, how often have you seen or heard an advertisement for marijuana products or stores? Include TV, radio, signs and billboards, newspapers and magazines, pamphlets or flyers, streetside marketing like sign spinners or sandwich boards, and online or cell phone advertisements.

In this non-representative sample, the share of respondents who reported seeing advertising at all was higher among those who lived in jurisdictions with some legalized use (medical-only or general adult use). This was also true among those who excluded CBD advertising from their understanding of the question. However, respondents across legal jurisdictions shared similar conceptions of what advertisements might look like. For example, one respondent in a jurisdiction where only CBD products were legal said, "I'm picturing billboards. I don't really see commercials for things like that," and another respondent in a jurisdiction where cannabis products were legal for adult nonmedical and medical use described a "billboard at a vape shop" that he saw.

Finally, the concept of legalization was poorly understood or even viewed as irrelevant by some respondents. As documented below in the evaluation of Question 16 (change in marijuana use since legalization), respondents had such varying conceptions of legalization that identifying consistent patterns of interpretation was difficult. For other questions on the instrument, respondents had difficulty coming to consistent conceptions of legalization, which indicates that the specific legal or regulatory policies in the respondent's jurisdiction may not condition question interpretation, recall, judgment, and response.

Question-by-Question Analysis

This section presents a detailed review of the findings for each question. Where appropriate, the impact of legal status, age, and other relevant subgroups is discussed.

1. **The next question asks about use of hemp or CBD-only products. Hemp and CBD-only products are typically found in stores such as grocery stores, gas stations, smoke shops, and malls. Do not count marijuana products when answering this question.**

   During the past 30 days, on how many days did you use hemp or CBD-only products?

   [# 0-30]

Response	*Number of Respondents*
0	32
More than 0	58

All respondents received this question, and all respondents were able to provide an answer. Responses to this item drew on a wide variety of understandings of hemp or CBD-only products that to some degree varied by the legal jurisdiction of the respondent and other subgroups.

Distinguishing between hemp or CBD-only products and non-hemp or CBD-only products

Respondents' understanding of this question varied because of the products they included, and, to a lesser degree, on their conception of the term "use." The question wording—hemp or CBD-only products—did not capture a similar conception of products across respondents. This was generally not because of vocabulary issues; only one respondent answered "None in the last 30 days" because she did not know what CBD was.

Instead, respondents understood the "only" portion of the question wording differently. Some included products that contained trace amounts of THC—what one respondent called "full-spectrum" products—as "CBD-only." Other respondents only included products without any THC. One, who answered "5" days, stopped himself when answering: "Oh wait? Was that about CBD-only? You have to change that answer." This respondent initially included a CBD/THC combination product but, upon further thought, excluded that and included only THC-free CBD distillate drops; in the end, his answer did not change because he used the distillate on the same days as he used another CBD/THC topical ointment.

Still others included non-consumable hemp products, such as wearable fabrics or rolling papers for marijuana cigarettes. One respondent, who answered "0," explained that she thought the question was asking about whether she used "hemp products like sheets and stuff like that…[and] CBD oil, CBD gummies. I don't use any of that." Finally, some respondents were not sure whether other non-THC components of the product counted against the "CBD-only" character. One respondent explained that her product included rapeseed oil, flaxseed oil, and olive oil. She read aloud from the label to the interviewer: "It says it's an infusion of CBD concentrate…and it says whole plant…I don't know what CBD-only means actually, maybe this would not be considered that." The respondent opted to stay with her initial answer of "5" days.

Respondents decided which products to include when answering this question by making several non-exclusive distinctions. One distinction was chemical, understanding this question to be asking about products that did not contain THC. Another was derivation or origin: if the product was derived from industrial hemp, then it could be included in answering the question; this distinction also related to legality, that is, was the product legal for purchase in a respondent's jurisdiction. A third was purpose: CBD products were thought of as having a "medical" use, while other products were thought of as "recreational." A fourth and final distinction was effects, where CBD-only products were those that did not have psychoactive effects. The products included according to these distinctions were inconsistent across respondents.

Respondents' uncertainty in deciding which products to include when answering this question was particularly amplified with regard to psychoactive cannabis products derived from hemp or CBD such as delta-8 THC. Delta-8 THC is a psychoactive cannabinoid derived as part of the cyclization of CBD from industrial hemp that has a debated regulatory status in the United States.[4] Because delta-8 THC is psychoactive, some respondents excluded it because they conceived of this question as either asking about non-THC products or about products without psychoactive effects. For example, one respondent, who reported hemp or CBD-only product use 30 out of 30 days, explained excluding delta-8 THC by saying "well, delta-8's THC." Because delta-8 THC is derived from industrial hemp and CBD, however, others counted their use of delta-8 THC when answering this question. These respondents, such as one who answered "15" days and explained that "they take the CBD and do a chemical process to it," understood that delta-8 THC has some relationship to hemp or CBD products. One respondent said that "Delta-8…is pretty much marketed to show that it's from hemp."

In general, respondents understood "using" hemp or CBD-only products as "consuming" or "applying" them. For example, one respondent, who answered "2" days, said she thought of "something that you consume somehow, like a substance as opposed to, I don't know, a shirt." However, this tendency was not universal. One respondent, who answered "3" days, brought up a hemp shirt he had worn a few times in the past month. This respondent initially excluded CBD products that he smoked and vaped and thought only of his shirt.

Deciding on the number of days

Respondents decided how to count the number of days in several ways. As with other questions asking respondents to count the number of days or times they used substances, choosing either 30 or 0 days was relatively easy for regular users or non-users.[5] Those who answered in the middle of this range employed several estimation strategies. Some relied on a specific event for recall. For example, one respondent who used a CBD salve 5 days knew that that was the number "because I sprained my hand last week and that was the number of days it took to get better." Others tried to convert their weekly usage into a month:

> If I said once a week, I wouldn't be saying enough…but if I said 2-3 times a week it would probably be too many. So, I'll say 12-15 times per month or something along that nature.

In other instances, the counting rationale respondents offered did not align with the response they provided. One respondent, who answered "20" days, explained that "out of the last 30 days, I use it every other day." She then clarified that she would actually say "five out of the seven" days and had issues multiplying up to 30 days.

However, not all respondents used "days" as the metric for counting. Respondents sometimes counted the number of times they used a product or the number of unique products used. For example, one respondent answered "In the past 30 days? Once," because she was thinking of one item that she actually used four days per week.

2. When you used a hemp or CBD-only product during the past 30 days, how did you use it? (Check all that apply)

Did you:

a. Apply it to the skin (for example, in a lotion, gel, oil, balm)
b. Smoke it (for example, in a joint, blunt, or cigar)
c. Eat it (for example, in brownies, cakes, cookies, or candies)
d. Drink it (for example, in tea, cola, alcohol, or tinctures)

[4] Tagen and Klumpers (n. 5).
[5] See, for example, Massey, M. (2018). Results of Cognitive Testing of Questions on Teen Alcohol and Marijuana Use for the Youth Risk Behavior Survey. Hyattsville, MD: National Center for Health Statistics. Available at: https://wwwn.cdc.gov/QBank/Report.aspx?1196; Willson, S. (2017). Cognitive Interview Evaluation of Survey Items to Measure Substance Use and Impaired Driving. Hyattsville, MD: National Center for Health Statistics. Available at: https://wwwn.cdc.gov/qbank/report.aspx?1186.

e. Vaporize it (for example, in an e-cigarette-like vaporizer or another vaporizing device)
f. Dab it (for example, using a dabbing rig, knife, or dab pen)
g. Use it some other way

Response	*Number of Respondents*
Apply it to the skin	25
Smoke it	12
Eat it	21
Drink it	16
Vaporize it	14
Dab it	3
Use it some other way	5

All respondents who reported use of hemp or CBD-only products in Question 1 received this question. Respondents indicated a wide range of products used, including skin creams and balms, gummies, pills, non-alcoholic beverages, waxes, bath salts, and tinctures, among others. Respondents also smoked and vaporized hemp or CBD-only "flower," that is, the plant itself. About half of the 58 respondents who received this item reported more than one mode of use. Parenthetical examples were only read at the respondent's request.

Respondents understood this question to ask which of the indicated actions they took with their product. Their understanding was conditional on what they thought constituted a hemp or CBD-only product. Thus, the main impact on question performance stemmed from the products respondents chose to include. This generally did not affect the response options that respondents chose. For example, one respondent, who said "Vaporize it," referred to a CBD-only vape without more than trace amounts of THC. Another respondent, who also said "Vaporize it," explained that she vaporized "the oil – it's a delta-8. Put it into the pen." While these products differed in their effects—the first was non-psychoactive, the second had psychoactive effects—both respondents understood "Vaporize it" to involve using a vape pen or similar device.

Product inclusion relied on similar categorizations as in the question asking about the number of days respondents used hemp or CBD products (Question 1). Whichever distinction or distinctions respondents employed governed which products they included in answering. Respondents included the same products in answering Question 2 as they did in answering Question 1.

The response options were generally understood consistently across respondents. For example, respondents who chose "Apply it to the skin" referenced skin creams, balms, body oils, and lubricants; respondents who said 'Dab it' explained that they were thinking of waxes or products used with a dabbing pen. However, there were some notable exceptions. First, many respondents who chose "Smoke it" actually intended to choose "Vape it." As one respondent who answered "Smoke it" asked, "wait a minute, vaping is smoking, right? Yeah, because I would think both, because I put it in a pen." Because "Smoke it" came before "Vape it" in the response options, this may have been an effect of response option order.

Second, respondents variously categorized their use of tinctures—solutions of CBD dissolved in other extracts or alcohol and ingested using a dropper on or under the tongue. Ambiguity in conception of tincture ingestion led to variable response patterns: of the sixteen respondents who indicated they used a tincture, seven categorized this as drinking, four as eating, one as both eating and drinking, and four as "some other way." For example, one respondent explained that "I'd say the drops would be eating it," while another respondent said that tinctures were "drink it since it's an oil." Still other respondents were so flummoxed that they could not identify a tincture as either eating or drinking. One respondent illustrated the overall confusion:

> It comes with a dropper. It's a liquid, so I'm not necessarily – you're drinking it from a cup, but you're certainly ingesting it orally…I think I'd probably check 'some other way' because drinking implies to me some sort of cup and swallowing. This is more absorption, putting it under my tongue. Honestly, it feels like it's closer to, say, skin, than drink.

Sometimes, respondents opted to choose multiple options to deal with the difficulty. One chose both "eat it" and "drink it," explaining that she doesn't "know what it means because it's neither. It's like, take it."

Other respondents who chose "Use it in some other way" included products like bath salts, for which application to one of the other categories was not immediately clear.

3. How do you usually get the hemp or CBD-only products you use? Do you:

a. Buy it from a retail store
b. Buy it from a medical dispensary
c. Buy it from a grocery store, gas station, mall, or other convenience store
d. Buy it from a dealer or friend
e. Get it for free or share someone else's
f. Grow it yourself at home or have someone grow it for you
g. Get it from somewhere else

Response	*Number of Respondents*
Buy it from a retail store	20
Buy it from a medical dispensary	7
Buy it from a grocery store, gas station, mall, or other convenience store	6
Buy it from a dealer or friend	5
Get it for free or share someone else's	11
Grow it yourself at home or have someone grow it for you	1
Get it from somewhere else	8

All respondents who reported use of hemp or CBD-only products in Question 1 received this question. Respondents indicated purchasing or otherwise acquiring hemp or CBD-only products from all locations, including retail stores like CBD specialty shops and smoke shops, medical marijuana dispensaries, from family or friends, as product samples, and online. Respondents were asked to choose only one of the options.

Understandings of product inclusion

Respondents understood this question to ask where they acquired their hemp or CBD-only products. This understanding was conditional on what they thought constituted a hemp or CBD-only product. Thus, the main impact on question performance stemmed from the products respondents chose to include: if respondents only used delta-8 THC or other psychoactive hemp-derived substances and considered those "hemp or CBD-only products," then they included those in their response. If they excluded these products and strictly referred to non-psychoactive hemp or CBD-only products, then they answered on that basis. Product inclusion did not meaningfully affect the response options that respondents chose. For example, one respondent said "Buy it from a retail store" and included both non-psychoactive CBD products and psychoactive Delta-8 THC in her response. Her conception of a "retail store" did not depend on the products; she referred to a local store with a website she used to look up specific product information. Another respondent, who also answered "Buy it from a retail store," did not include psychoactive hemp-derived products in her response but still referred to a "CBD-only store" that he compared to a grocery store.

Much as in Question 1 (on the number of days products were used) and Question 2 (on how products were used), respondents' decision of which products to include as "hemp or CBD-only" conditioned question response. Respondents answered based on how they understood what constituted a "hemp or CBD-only product," and they included the same products in answering Question 3 as they did in answering Questions 1 and 2.

In addition to differential product inclusion based on understandings of what constituted a "hemp or CBD-only" product, respondents conceived of where they "usually" got their products in different ways. For some respondents, "usually" referred to frequency: the location from which they most frequently or always acquired hemp or CBD-

only products. One respondent explained his purchasing habits by saying "I actually get my CBD online because you can buy it online because of the recent farm bill or whatever. So that's just what I do because it's way cheaper than going into a store." For others, "usually" referred to recency: the location from which they most recently acquired hemp or CBD-only products. One respondent told the interviewer that he had bought from grocery stores in the past, but "more recent" purchasing happened at a "CBD-only store." For both of these groups of respondents, when they had only used one type of product or acquired multiple products in the same way, "usually" was also understood as referring to the products they had on hand at that time. Finally, at least one respondent understood "usually" to refer to regular use and felt as though the question did not apply to her: "Usually does not apply to me, because I only had it the one time, and my mom bought it for me."

Understanding of response options

While all response options were chosen by at least one respondent, the response options were not always easily understood. First, some response options were specifically identified as inapplicable to the purchase or acquisition of CBD-only products. For example, none of the respondents who selected "Buy it from a dealer or friend" purchased hemp or CBD-only products from a dealer. Second, several respondents noted that the terms "retail store" and "grocery store" are not mutually exclusive. As one, who answered "Buy it from a grocery store, gas station, mall, or other convenience store," put it: "You said retail store, but, of course, a grocery store is a retail store. So that's redundant."

Third, some of the terms used, including "medical dispensary" and "retail store," did not neatly map onto respondent experiences. Many respondents answered "Buy it from a medical dispensary," but, upon probing, purchased their CBD-only products at a "recreational dispensary." For example, one respondent said that he "purchased the material at a recreational dispensary" and that "most recreational dispensaries are also medical dispensaries" in his state. Another explained that she purchased at an "online dispensary," even though "marijuana" is illegal in her state. To this respondent, a "dispensary" was a location that had "more structure" and displayed the "testing processes" behind the products they sell. The lack of direct inclusion of smoke shops—which were included in the Question 1 introduction, "hemp and CBD-only products are typically found in stores such as grocery stores, gas stations, smoke shops, and malls"—also led to confusion. One respondent, who selected "buy it from a retail store," was not sure which type of store to choose. "I don't know what you would consider a smoke shop," she said. "It's definitely not a grocery store…maybe a retail store, I guess?"

Fourth, the inclusion of the term "friend" in "Buy it from a dealer or friend" led to confusion. Respondents often received products for free from friends, as in the case of one who got a coffee drink. Additionally, respondents sometimes included products they received from family members for free or, in the case of one young adult, took from their parents. For these respondents, the term "friend" overrode the "Buy it" component of the response option. A third respondent described getting a CBD product from a friend, but upon probing, the respondent indicated that he purchased the product online from a company owned by a good friend. For this respondent, the origin of the product was more important than the direct purchasing activity. However, some respondents who received products for free from friends or family members chose "Get it for free or share someone else's."

Finally, the new process of online purchasing of hemp or CBD-only products resulted in respondent categorizing of online purchasing in three different ways. One of these was understanding online sales as a subset of "retail stores." Many of the respondents who answered in this way expressed initial confusion but settled on "retail store" after some thought. One respondent spontaneously reacted to the question by saying "I guess I do buy it from a retail store, but I order it through the mail…But I guess it is…a retail store…an online store." Another understanding of online purchasing was as an entirely new category. These respondents chose "Get it from somewhere else." Respondents who answered in this way ranged from one who purchased a subscription "men's grooming service" that happened to contain CBD products one month to one who asked "were any of those online?" and settled on "other" when hearing the response options a second time. In probing, several of these respondents explained that to them, a "retail store" had to be "brick-and-mortar" or "have a real-life location."

4. **Version 1:** The next set of questions ask about marijuana use. During the past 30 days, on how many days did you use marijuana?

   [# 0-30]

Response	*Number of Respondents*
0	10
More than 0	39

   Version 2: The next set of questions ask about marijuana use. Marijuana is also called pot, weed, or cannabis. Do not count hemp or CBD-only products when answering this question. During the past 30 days, on how many days did you use marijuana?

   [# 0-30]

Response	*Number of Respondents*
0	8
More than 0	33

All respondents received one of two versions of this question, and all respondents were able to provide an answer. This question contained a version experiment to examine the effect of additional question wording on inclusion of hemp or CBD-only products, both in answering this question and in the rest of the instrument. 49 respondents received Version 1, and 41 respondents received Version 2.

Responses to this item primarily varied in the products respondents included as "marijuana." In general, respondents understood "marijuana" to refer to a psychoactive plant product used for medical or nonmedical purposes. Respondents did not tend to include non-psychoactive CBD products derived from industrial hemp. For many, there were clear differences between what they conceive of as "CBD" products and "marijuana." One respondent who had vaped CBD and used "marijuana" in a variety of forms 30 out of 30 days explained that to him, "CBD will keep you calm, cool, and collected and give you a body high versus flower which actually gives you a head high." To this respondent, CBD-only products and "marijuana" products had differing effects. Another respondent, who answered 0 days, explained that the question was irrelevant because she is "drug tested every time [she goes] to the doctor" because of other medications she takes. For this respondent, "marijuana" and CBD-only products differed in their chemical composition. Finally, the order of the questions—that the instrument asked about hemp or CBD-only product use first—appeared to matter to some respondents. One explained that "I kind of stopped thinking about CBD when the questions changed to marijuana." Very occasionally, however, it was not possible to determine if a respondent included a CBD-only product. One daily user, for example, explained that to her, "it's all different things. Sometimes I smoke flower, sometimes I eat edibles, sometimes I take a tincture…" The respondent was not able to describe which of these products she considered "CBD-only" and which applied to her response to Question 4.

Additionally, even respondents who had used delta-8 THC—a psychoactive cannabinoid derived from industrial hemp during the cyclization of CBD—and other psychoactive products derived from industrial hemp excluded these products from their conception of "marijuana." One respondent, who vaped delta-8 THC and smoked "marijuana," distinguished between what she called "reefer"—delta-9 THC—and her delta-8 THC products that had a different "flavor." Another respondent, who used nonpsychoactive CBD-only distillate, psychoactive delta-8 THC, and delta-9 THC products, excluded all of his delta-8 THC products and focused on the "flower" and the "bud high" he gets from smoking the actual plant.

<u>Vocabulary issues</u>

Version 2 of this question introduced four terms to which the question could refer: marijuana, pot, weed, and cannabis. Respondents had two consistent patterns of interpretation with regard to these terms. For most

respondents, the terms were equivalents: when they heard any one of them, they would think of a psychoactive plant product used for medical or nonmedical purposes. One respondent put this particularly well:

> Yeah. Those are probably the four major words for it. I don't think that there is anything else that you could say, that if they don't understand that that they're going to understand another one. Yeah, no, no, definitely just those four.

However, for some respondents, "cannabis" stood out as different than the other terms. To them, as one respondent explained, "When I hear cannabis, I thought that could be CBD too." These respondents thought of "the flower, like the plant itself," or as one respondent put it, "a holistic approach to using marijuana and, like, using it as a plant medicine" when they heard the term "cannabis." Nevertheless, this interpretation did not lead to response error, because respondents focused on the term "marijuana" when answering the question and excluded their CBD product use, if any.

Several respondents noted a negative reaction to the term "marijuana," although there was no observed impact on question performance. For these respondents, the term "marijuana" has a "racist background," has "been demonized so much," and is an "alarmist…kind of anti-Mexican term." Some respondents associated the term with the "war on drugs" or explained that it was the term "the police use." These respondents preferred the term "cannabis," sometimes qualified as "medical cannabis," "high THC cannabis," or "psychoactive cannabis." Though respondents brought the negative connotation of "marijuana" up in probing, none indicated any confusion about what the term meant. As such, there was no observed impact on response. As one respondent put it, "it's so ingrained in our culture that I think that with marijuana, everyone would know that they're talking about psychoactive cannabis."

Impact of question version

The two versions of this question were intended to evaluate whether the addition of question wording defining marijuana and instructing respondents to exclude hemp or CBD-only product use would convey what was meant by "marijuana" and decrease the incidence of hemp or CBD-only product inclusion. Across both versions of the question, respondents to this item generally understood "marijuana" to refer to a psychoactive plant product used for medical or nonmedical purposes. Those who had a chemical knowledge of the plant understood this question to refer to products containing delta-9 THC and generally excluded other psychoactive products, like delta-8 THC, that are derived from industrial hemp. Out of 49 respondents to Version 1, only two included CBD-only or hemp products in their response. Out of 41 respondents to Version 2, only one included CBD-only or hemp products in their response. Given the non-representative nature of the sample, the difference between these two proportions is not large enough to make any conclusive statement about the impact of question wording on product inclusion. The broader impact of the version experiment on the instrument is discussed in the section of the report covering overall findings.

Recall

Respondents decided how to count the number of days in responding to this question in several ways. As in other questions asking respondents to count the number of days or times they used particular substances, choosing either 30 or 0 days was relatively easy for regular users or non-users. Choosing close to the extremes also appeared relatively easy: respondents who selected 25 or 26 days, for example, often relied on a specific event that interrupted daily use. One respondent threw up her hands and smiled when the interviewer asked her how she came up with the number 25:

> I'm a daily user. I fully admit it…I use it every day except that I had a procedure done this month that needed anesthesia and some recovery and so the doctor advised, with the anesthesia, not to use it. So I didn't use it, but, otherwise, I smoke it daily.

Those who answered a low number sometimes relied on a specific event, like one respondent who recalled splitting a marijuana edible into four pieces that she consumed on four days, but also included those who described their use as a "social activity" and estimated the number of times they might smoke with friends.

Respondents who answered closer to the middle of the range used several estimation strategies, from using a specific event for recall (one respondent said she'd recently "been kind of taking a break") to an estimate based on the types of products they used in the past month (a respondent who received gummies as a gift and considered when she might have tried them). Other respondents seemed unwilling to choose 30 out of 30 days and deliberately underestimated their use, as in the case of one who initially said "as many [days] as possible" and later clarified to "at least 20" days. As in the case of Question 1, some respondents initially converted 30 days into a month and then attempted to divide the month into days they used products and days they did not.

5. **When you used marijuana in the last 30 days, did you use any other substances at the same time or within a few hours? (Select all that apply)**
   a. A tobacco or nicotine product like a cigarette, cigar, blunt, or vape
   b. Alcohol
   c. Cocaine
   d. Heroin or illicit fentanyl
   e. Methamphetamine
   f. Prescription opioids either not prescribed to you or used in a way that was not directed by your doctor.
   g. Other drugs
   h. I did not use marijuana with other substances

Response	*Number of Respondents*
Co-use with 1 or more substances	54
No reported co-use	20
Skipped	16

Respondents received this question if they reported marijuana use on more than zero days during the past 30 days to the prior item that asked about use of marijuana. Over half of respondents reported co-use of a listed substance with marijuana. The most common co-used substance reported was alcohol, followed by tobacco, with some respondents reporting co-use with both alcohol and tobacco. Additionally, several respondents reported co-use with varying combinations of alcohol, tobacco, "Other drugs," and opioids. No respondents reported co-use with cocaine, heroin or illicit fentanyl, or methamphetamine.

Respondents' understanding of the question varied on two dimensions. First, respondents understood the concept of co-use to either include or exclude incidental co-use, that is, any conceivable consumption of any of the listed substances alongside or close in time to consumption of marijuana, regardless of intentionality. Second, respondents varied in whether they included or excluded on-label use of prescription medications in the domain of substances relevant to the question.

In this question, very few respondents included hemp or CBD-only products in their understanding of "marijuana." Respondents appeared to primarily conceive of marijuana as a psychoactive plant-based drug and, if they were knowledgeable, associated it with delta-9 THC. Consequently, the patterns of interpretation identified did not meaningfully vary on this dimension.

<u>Conceptualizations of co-use</u>

Some respondents understood use with marijuana to include only intentional co-use, but most respondents interpreted co-use more broadly to include any type of co-use, that is, intentional or incidental. Respondents who understood the question to be asking about intentional co-use thought of purposeful consumption of one of the listed substances to heighten the effects of either marijuana or the reported substance. Depending on the respondent, this could be for either nonmedical or medical purposes. For example, one respondent who reported co-use with alcohol explained, "It makes the high and the effect of alcohol way more intense. It kinda feels – I would say it feels good…I

don't like drinking alcohol and not smoking." In contrast, some respondents described purposefully combining marijuana with other substances to treat or manage an aspect of their health. For example, one respondent combined it "with [her] pain killers to help with pain."

Importantly, evidence of this pattern also came from respondents who excluded only incidental co-use with a substance, indicating that they saw the question as asking only about purposeful co-use with marijuana. For example, one respondent who answered "I did not use any other substance with marijuana" spoke of enjoying "beautifully crafted cocktails" and "having wine with dinner" but did not report co-use with alcohol because, "It's not like a planned, correlated, let's get fucked up scenario." To her, the question asked, "whether I was partying with it [the other substance]."

Most respondents, however, understood the concept of "co-use" to include all consumption of any substance in the response options alongside or close in proximity to the use of marijuana, regardless of the reason for consumption. This pattern of interpretation was evidenced in several ways. First, many respondents who reported co-use with a substance spoke of enjoying marijuana alongside or within a few hours without the intention of amplifying or boosting the effect of the marijuana or the reported substance, with some mentioning directly that combining it with marijuana was coincidental or not intentional. For example, one respondent who answered alcohol said, "It's more like a coincidence in that it's the same hours of the day where I like to be a little buzzed. Those are the hours of the day that people like to socialize and alcohol is often part of that and…fun!" Another respondent who reported alcohol and tobacco, when asked if they are trying to amplify the effects, said, "Yeah, it's not intentional."

Furthermore, a number of respondents' descriptions of types of co-use indicated a wider, non-intentional interpretation of the item, including co-use with prescription medications taken as directed, very rare instances of co-use, or even describing situations when co-use is typically avoided. For example, one respondent mentioned taking her anxiety medication after having used her medical marijuana, noting that the combination was not intentional, "it's because I have to take them every night." Another respondent who reported use of opioids did so because the timing may have coincided with her marijuana use, saying, that there was "probably some overlap" between ingesting the marijuana and taking the opioid. One respondent who drinks very rarely reported alcohol, saying "I want to say that I haven't used it with other substances, but I think that there's been a night where I maybe had a beer and used it." This understanding—inclusion of even hypothetical or poorly-remembered co-use—appeared across respondents. Another, who also reported alcohol, explained "to be honest I don't like drinking and THC together. So, I'm sure there is a chance I have, but it is not common or preferred, really."

For those who understood the question to be asking about co-use in a broad sense, the issue of timing and how they thought about "within a few hours" appeared to affect respondents' answers in different ways. As discussed above, some respondents reported co-use even though they typically try to avoid it because some use of the substance occurred within a few hours. As an example, one respondent who had used marijuana to help her sleep after having taken shots of alcohol a few hours before at a birthday party reported "alcohol." In contrast, another respondent did not report alcohol even though it emerged during probing that some co-use took place "earlier in the evening." For this latter respondent, there was a "big enough gap" that she did not count alcohol for this question. Overall, both interpretations of co-use were observed across the range of response options.

Conceptualizations of substance domain

In addition to type of co-use, a secondary pattern of interpretation was observed relating to whether the domain of substances included on-label use of prescribed medicine. Several respondents reported co-use with prescription medications, including prescription Tylenol, allergy medications, and anti-depressants, which indicated that they conceived of the question as including medicines. For example, two respondents chose "Other drugs," one saying, "I'm prescribed Adderall, so with that technically." The other respondent referenced "…a host of other [prescription] medications because I have a lot of chronic conditions." However, other respondents did not report co-use with their prescription medications. These respondents thought the question was about "illicit drugs" or that "Other drugs" referred to "recreational" or "party drugs." For example, one respondent who answered "I did not use any other substances with marijuana" said, "Not illicit. Just my prescription drugs."

Variation in responses related to this pattern of interpretation was particularly evidenced by respondents' understanding of the response option on prescription opioid use. The exact wording of the response option directs respondents to include only use of opioids "not prescribed to you or used in a way that was not directed by your doctor." Some respondents, however, included prescription opioids that they used in line with a physician's orders, indicating that they either focused on the term "prescription opioids" and ignored the rest of the response option or, more broadly, conceived of the domain of substances of this question as including legally prescribed medications. However, another respondent who used opioids as part of breast cancer treatment did not report co-use with a prescription opioid that she uses "more than directed." For her, this question did not reference physician-prescribed pain relief, even when that substance was used in an off-label manner.

Negative reactions/Response categories

In this study, the current list of response options did not appear to reflect the substances respondents typically co-used with marijuana. First, not all of the categories asked about were relevant to this sample of respondents. For example, one respondent said, "It's just that I've never thought about using any of those things and never will. To me they're so unrelated, besides alcohol." Respondents frequently reacted with surprise or laughter when interviewers said "cocaine," "heroin," and the other illicit substances on the list. Second, in some cases, the inclusion of illicit substances on the list caused offense. As one respondent said, the whole list makes him go, "whoa!" He felt that the question was awkward for someone who has not done anything more than marijuana, "ever, in his life...I'm just someone who is trying to stay well. And now I'm grouped in with a bunch of bandits. And that doesn't seem right."

Third, other substances, such as those respondents spoke of thinking of in probing as "Other drugs," suggest that meaningful patterns of response are not currently captured by the existing response options. Respondents reported intentionally combining drugs like mushrooms and acid or LSD, as well as prescription drugs and non-prescription supplements, with their marijuana use. For example, one respondent spoke of co-use with psychedelics for both "therapeutic and recreational" purposes. For this respondent, psychedelics, "some cactus products," and "mushrooms," are in the same category as marijuana: "Same with THC!" Another respondent discussed "microdosing" with mushrooms and her perception of the potential "medicinal benefits" of mushrooms and acid. These respondents made a clear distinction between, on the one hand, marijuana and other "naturally occurring, plant-based" substances, and, on the other, cocaine, heroin, and methamphetamine, what they described as the "crazy drugs" directly enumerated in the response options. Finally, a few respondents also mentioned caffeine, with one suggesting she would write in caffeine if given the option.

6. When you used marijuana in the last 30 days, did you try to replace your use of any of the following substances? (Select all that apply)

a. A tobacco or nicotine product like a cigarette, cigar, blunt, or vape
b. Alcohol
c. Cocaine
d. Heroin or illicit fentanyl
e. Methamphetamine
f. Prescription opioids either not prescribed to you or used in a way that was not directed by your doctor.
g. Other drugs
h. I did not replace my use of other substances with marijuana

Response	*Number of Respondents*
Replaced with 1 or more substances	19
Replacement with 0 substances	55
Skipped	16

Respondents received this question if they reported marijuana use on more than zero days during the past 30 days (Question 4). Most respondents did not report replacing use of other substances with marijuana. Among those who reported replacing a substance with marijuana, most reported alcohol, followed by tobacco and "Other drugs." One

respondent reported replacing opioids while a few respondents reported replacing varying combinations of alcohol, tobacco, "Other drugs," opioids, or methamphetamine. No respondents reported replacing cocaine or heroin or illicit fentanyl.

Most respondents understood this question broadly to be asking about replacing other substances with marijuana to avoid or do less of something more harmful or to take the place of a less desired substance. However, respondents' interpretations in three aspects of the question impacted responses. These included how direct or intentional replacement should be, whether the question domain included on-label use of prescribed medicine, and the timeframe of replacement.

Intentionality

Some respondents understood the question as asking about intentional and direct replacement of a substance with marijuana. Intentional and direct replacement was evidenced by those who reported specific instances of replacing a substance with marijuana. For example, one respondent answered "alcohol" explaining that she replaced "the alcohol with gummies" after surgery when she did not "feel like drinking" but wanted something to "take the edge off" her pain. Another respondent, who reported tobacco, explained that she uses marijuana to replace cigarettes. When friends suggest that they go out and have a cigarette, she says, "or we could have, like, a blunt instead." Similarly, another respondent selected methamphetamine as a more harmful or "crazy" substance that he would choose to replace with marijuana, saying, "That's another, instead of when people would come to hang out with me, instead of partaking in that and getting all crazy and s***, here's a bowl."

Additionally, some respondents considered but excluded possible instances they considered too indirect to count. For example, as one respondent who answered, "I did not use marijuana to replace other substances" explained,

> I think that it kind of happened a little bit naturally where I used to maybe have three or four drinks when I was out with my friends on a Saturday night, and I just don't do that anymore and a big part of it is that I have this instead. [Laughs] So it kind of fills the same role as alcohol did for a while and less like "oh, I'm drinking too much and this is my way that I'm going to deal with that."

Another respondent who also answered "I did not use marijuana to replace any other substances" explained that even though she drinks less when she smokes marijuana, "when I'm high I'm like, well I don't need to drink. Maybe it is a replacement, I haven't really thought of it that way."

However, some respondents conceived of replacement more broadly than intentional and direct substitution. One group of these specifically included unintentional replacement. For example, one respondent reported using marijuana to replace a "tobacco or nicotine product," saying "I never think of it that way, but that might be what's happening." He explained further that in trying to quit vaping nicotine, if he subconsciously feels a craving for tobacco, he can use marijuana to alleviate the craving. Another who also reported tobacco, explained that he smokes fewer cigarettes when using marijuana because the high from marijuana lasts longer. He said, "You get a nicotine buzz off of a cigarette, that only lasts a certain amount of time. When you do it from 'mary,' 'mary' is two hours, three hours, four hours."

This pattern also appeared outside of the context of replacement with tobacco. One respondent who reported replacing alcohol with marijuana explained that

> I did not set out to reduce my use of alcohol. Cannabis was something that I started using to help my mental health. It is purely by side effect that I'm using alcohol less.

When asked if he wanted to answer alcohol to this question, however, he said, "Yes, I think that it is important to note that my alcohol use decreased." Similarly, another respondent who reported replacing alcohol did so by explaining that his use of alcohol has "dropped way more than [he] would ever have expected" because he can use marijuana and be "fully functional" the next day.

Domain of substances

Respondents differed in their conceptualization of the substance domain, with some including and some excluding on-label use of prescription medications. These divergent conceptions resulted in inconsistency in how respondents tended to think about the "Other drugs" response option and whether respondents reported replacing these medications with marijuana. Unlike in the previous question about using other substances at the same time or within a few hours of marijuana use, where respondents conceived of the "Other drugs" category as including a range of substances—including prescription medications, supplements, and psychedelics such as acid and mushrooms—in response to this question, respondents in this sample who reported "Other drugs" spoke exclusively of prescription medications.

Respondents who included on-label prescription medications in their conception of the domain of substances conceived of the degree of replacement with marijuana broadly to include both partial and complete replacement. For example, one respondent discussed [their] use of anti-nausea medication. With marijuana, they said, "I still do take it [the anti-nausea medication], but not as often." Other respondents reported "a huge reduction in medicine" or complete replacement of medications. For one respondent who used to take anti-depressants, "I don't need to take anything [anymore], I just smoke weed."

Other respondents excluded medications, evidencing that they understood this question to be asking about, as one respondent put it, "illicit substances." For example, one respondent excluded his prescription medication, saying "I assume given that the way the opioids question is phrased that my like, regular, use of [prescription medication] does not count." When asked if prescription medications would count as "Other drugs," he answered, "At that point I assumed that they ["Other drugs"] were illicit." Another respondent mentioned her use of marijuana to avoid taking opioids saying, "So there were probably days when I smoked more to try and avoid – because I really don't like taking the opioid," but she selected "I did not replace any substances with marijuana" because she thought that the question was asking about problematic usage. When the interviewer asked if she thought the question was asking about trying to get off opioids, she said, "yes."

Timeframe

Lastly, inconsistency was observed in whether or how respondents thought about the timeframe of replacement. The question states "in the last 30 days," but while some respondents thought this meant that replacement had to have started or occurred within the last 30 days, others reported replacement that began longer ago but that they see as ongoing. One respondent explained that marijuana has replaced the actual action of smoking for her but that the beginning of this replacement took place some time ago. She said, "I guess tobacco yeah, even nine years later, yeah." This respondent understood replacement as a continuous and ongoing process. Another respondent answered "Other drugs" thinking of the sleeping pills she was prescribed "not in the past couple of years but, when I did have more extreme insomnia, I was given, I forget what, some kind of sleeping pills that I can use occasionally. So that's how I interpreted your question." In contrast, another respondent who uses medical marijuana in place of opioids, did not report replacing, saying, "I'm gonna say no to that for everything because I've been on medical marijuana for two years, so I haven't been on opioids or any narcotics for two years." This respondent dated replacement from when she started the act of replacing and did not count the ongoing replacement of opioids or narcotics in answering this question.

Reverse replacement

In one case of response error, a respondent reported a reverse replacement. This respondent answered "A tobacco or nicotine product," but in probing explained that for him, tobacco replaces marijuana: "I guess it would be like the inverse." While potentially rare, this example illustrates that some respondents may understand this question to include replacing marijuana with a substance on the list as opposed to only the other way around.

7. **During the past 30 days, have you driven a vehicle while still affected by marijuana use?**
   a. Yes

No

Response	*Number of Respondents*
Yes	20
No	54
Skipped	16

Most respondents reported not driving while still affected by marijuana use. Sixteen respondents are not included in the discussion because they reported no marijuana use in the past 30 days.

Differing conceptions of "while still affected"

While most respondents understood this as a question about whether they drive while still feeling the effects of marijuana use, some respondents understood the question as referring to driving any time after having used marijuana.

For one group of respondents, "while still affected" meant they could still feel the effects of marijuana or that they felt high. For example, one respondent answered "no" because he thought being high would impair his driving. He said that when he's high, "360-degree spatial awareness isn't so good and reaction times may not be so good." He went on to say that he assumed that if he were driving while feeling high, he "would hit something" and that he wouldn't trust his reaction time. Another respondent described his reasons for not wanting to drive while high saying, "I just don't like to drive when I'm high. I get a little more jumpy; I get a little more unsure of myself and I like to be a confident driver. I think that's a good driver." Like this respondent, many respondents answered "no" because they never drive while they feel the effects of marijuana. These respondents described being high as being "intoxicated" or "under the influence." A few respondents agreed that driving while high impaired their driving but described their trips while high as "short" or "familiar." For example, one respondent answered "Yes" but said that she would never drive "more than 1/8 of a mile super high."

In contrast, other respondents answered "yes" because they didn't think that being high negatively affected their driving. One respondent noted that while he would never drive under the influence of alcohol, marijuana doesn't "affect reflexes in the same way." Additionally, several respondents explained that they felt marijuana positively affected their ability to drive, for example, making them "feel less aggressive," "more cautious," or "more careful." Again, with a reference to alcohol, one respondent said, "It's not like alcohol where you wonder if you should be driving."

For a second group of respondents, driving "while still affected" referred to driving after having used marijuana even if they were not actively feeling any effects. One respondent answered "yes" because she felt that marijuana was still in her system and she would test positive on a drug test, even though she does not drive while "immediately under the influence." Another respondent who understood the question to include "…how it affects you in all ways. When you are high, afterwards, and the next day too," answered "yes" because he has driven when "coming down" from a high. However, another respondent, noting that one could say that she "technically" drives after using marijuana because "they say that it stays in your system for 30 days," answered "no" because she does not smoke and then drive right away. This respondent based her decision to drive on the "number of hours [since using marijuana], how I feel, both." Still another respondent answered "yes" because she drives after using marijuana but does not feel high. This respondent uses such a low dose she does not feel anything "except a little less pain."

A final group of respondents answered "no" to this question because they hadn't driven at all in the past 30 days regardless of whether they felt the effects of marijuana or not. For example, one respondent said, "But I don't drive at all. Like, I don't even have my license yet."

Medical users

Slightly more respondents in this study who use marijuana medically or use it both medically and nonmedically reported driving "while still affected" compared to those who use marijuana purely nonmedically. These

respondents tended to believe that their ability to drive is not negatively affected by marijuana or that it has a positive effect on their driving. By contrast, those who used marijuana primarily nonmedically or socially were more likely to think of driving while high as risky and never safe.

Little evidence of social desirability bias

Social desirability bias is the tendency to present oneself in a favorable light and can occur when survey respondents overreport socially approved behaviors such as voting and underreport socially disapproved behaviors such as drunk driving.[6] While one might expect this question to be subject to socially desirable reporting, little evidence of social desirability bias was observed. Only in one case did a respondent note concern about answering "yes," saying "I just don't know who the people who are analyzing these answers view this…" In contrast to this respondent, many respondents who answered "yes" did so without hesitation, and in some cases, stated that they were "being honest" or answering in "full disclosure." Alluding to the idea that driving after using marijuana is not generally accepted, one respondent said, "I know it's something that shouldn't be done, but it's something I've done for the past 30 years." Further, as noted above, several respondents reject the idea or assumption that marijuana impairs one's ability to drive, one noting that the question seemed "loaded," and seemed to view answering "yes" as a way of communicating this point of view.

Previous testing on similar items

CCQDER has evaluated two similar items previously for possible inclusion on the CDC Behavioral Risk Factor Surveillance System survey:[7]

- During the past 30 days, how many times have you driven within 2 hours of smoking or 4 hours of eating marijuana?
- During the past 30 days, how many times have you driven while perhaps under the influence of alcohol AND marijuana?

Cognitive interviews revealed problems with both versions. The first question presented challenges with recall and judgment. Respondents had to determine (judge) whether they had smoked or eaten marijuana within 2 or 4 hours, respectively, before driving and how many times within the past 30 days (recall), to come up with an answer. Respondents generally did not ever think of the frequency of their driving under such conditions and thus did not know how often they drove, which led to satisficing and rough estimation.[8] The second question proved equally as difficult for respondents as the prior question. Respondents had difficulty answering about both alcohol and marijuana and tended to answer about alcohol only.

By asking "yes" or "no," the current version of the question presents less burden in terms of recall. It also does not conflate alcohol with marijuana by asking about both at the same time. However, as discussed above, cognitive interviewing results indicate that the current item may not be a reliable measure of driving "while still affected."

8. In the past 12 months, has a health professional asked you about your marijuana use?

a. Yes
b. No
c. I haven't seen a health professional in the past 12 months

Response	*Number of Respondents*

[6] Groves, Robert M., Floyd J. Fowler Jr, Mick P. Couper, James M. Lepkowski, Eleanor Singer, and Roger Tourangeau. *Survey methodology*. John Wiley & Sons, 2011.
[7] Willson, S. (n. 7)
[8] Satisficing refers to a set of response strategies employed by respondents when fully answering a survey question would require substantial cognitive effort, typically resulting in a response that seems satisfactory though not necessarily optimal or accurate. See Krosnick, J. A. (1991). Response strategies for coping with the cognitive demands of attitude measures in surveys. *Applied Cognitive Psychology*, 5(3), 213–236.

Yes	49
No	31
I haven't seen a health professional in the past 12 months	10

All respondents received this question, and all respondents were able to provide a response. Most respondents reported that a health professional had asked them about marijuana use in the past year. Even if respondents had not used marijuana in the past twelve months, or, indeed, ever, respondents were able to apply this question to their experiences.

Respondents' patterns of interpretation varied based on three components: who counts as a health professional, what counts as marijuana use, and—most importantly—what counts as an ask. Conditional on their conceptions of the first two components, which were fairly consistent across respondents, respondents either understood this question to include only direct inquiries from health professionals about marijuana use or to also include indirect asks on things like intake forms.

When considering the phrase "health professional," the most salient understanding was "primary care provider," which could include a physician, nurse practitioner, or physician assistant. One respondent, who answered "Yes," explained that she thought of "my general doctor or a nurse practitioner. Every time I go to the doctor they are like, 'Do you smoke?'" However, this understanding was not universal. Some respondents also considered a wide range of medical personnel, including many other medical specialists, mental health practitioners, dentists, vision professionals, emergency room staff and physicians, phlebotomists, and naturopaths. For those respondents who had sought out medical cards for medical cannabis, most, but not all, also included the practitioner they saw in that appointment. Additionally, several respondents did not immediately consider mental health, dental, and vision professionals when answering this question.

Most respondents appeared to understand "marijuana" to mean psychoactive delta-9 THC products, referencing their medical marijuana use and direct questions from medical professionals using the word "marijuana." However, a few respondents answered based on their CBD-only or hemp product use. For example, one respondent explained that "my doctor and I do talk about [CBD]. She's very aware of it." This respondent included delta-8 THC gummies that she uses to manage a medical condition. Relatively few respondents thought of CBD-only or hemp products when answering this question.

The most impactful difference in question interpretation was respondents' conception of what "asked" meant. Respondents universally understood "asked" to include instances where medical professionals directly and verbally inquired with patients about marijuana use. One respondent pondered the question for a minute and said "I went to the doctor in early December. They asked me, 'Do you smoke, cigarettes, marijuana?'" However, some respondents had more expansive conceptions of "asked" that included patient intake forms. For example, one respondent, who answered "Yes," explained that "the intake always includes that—a list of really like, do you feel safe at home, do you consume alcohol, do you consume any opiates, do you consume tobacco, you know, any of those, so I have to fill out that questionnaire every other month, every time I go see them." Inclusion of intake forms was not universal. Another respondent, who answered "No," explained that she'd "never been asked directly about it but I've like, put it on forms."

Underreporting of mental health, dental, and vision professionals

Respondents generally answered "Yes" if they could remember even one ask involving a medical professional during the past year, "No" if they could not remember even one ask involving a medical professional during the past year, and "I haven't seen a health professional in the past 12 months" if they did not remember seeing a medical professional in the past year. However, there were exceptions. Notably, certain medical professionals were sometimes excluded. One respondent, who answered "I haven't seen a health professional in the past 12 months," excluded her interaction with a dentist even though she'd "been to the dentist two times this year." This judgment pattern also extended to vision professionals and, less frequently, to mental health professionals. In general, this did not impact question performance, because many respondents who had seen these dentists, optometrists, or mental

health professionals had seen other medical professionals, such as a primary care provider, in the past twelve months. There is also no evidence of respondents excluding questions about marijuana use from these providers and thus no evidence of response error.

9. In the past 12 months, has a health professional advised you to:

a. Cut back on or stop using marijuana
b. Start or continue using marijuana medically
c. They did not provide any advice about marijuana use.
d. I have not seen a health professional in the past 12 months.

Response	*Number of Respondents*
Cut back on or stop using marijuana	6
Start or continue using marijuana medically	15
They did not provide any advice about marijuana use	52
I haven't seen a health professional in the past 12 months	11
Unable to provide response	4

With the exception of some interviewer error in not administering the question, all respondents received this question, including those who responded, "I have not seen a health professional in the past 12 months." Most respondents reported that they had not been provided advice by a health professional in the past 12 months. However, a few respondents were unable to select a response. These individuals generally found the response options to not fit their experiences. For example, one respondent said that the professional "told me don't use it." This respondent felt that the advice to explicitly not use marijuana differed from the response options given in such a way that she could not provide a response to the question.

Respondents' understandings of the question varied based on three terms: "health professional," "marijuana," and "advised." Patterns of interpretation differed based on combinations of understandings of each of these terms. The most crucial term for respondent understanding was "advised": respondents either understood this question to inquire about direct and explicit recommendations from a health professional or to include unspoken understandings gleaned from medical visits.

Who is a health professional?

As in the prior item about health professional inquiries, the most salient interpretation of "health professional" was "primary care provider." For example, one respondent, who answered "Start or continue using marijuana medically," explained that "my PCP [primary care provider] told me to continue, it's working, just to continue as I'm doing." Respondents included physicians, physician assistants, and nurse practitioners as primary care providers. Additionally, respondents cited a wide range of other healthcare workers, including mental health professionals, optometrists, and physicians who were authorized to prescribe marijuana medically.

Some respondents pointed out that they had multiple interactions with a medical professional with differing forms of advice. For example, one respondent explained that his primary care provider and his psychiatric doctor had different opinions on marijuana use. His psychiatric doctor "said I could be on [medical marijuana]," although he recommended other medications instead, while his primary care provider told him to "back down." This respondent chose "Cut back on or stop using marijuana" because the interaction with his primary care provider seemed more salient to him and because his psychiatric doctor did not explicitly endorse his marijuana use. Another respondent answered "They did not provide any advice about marijuana use" based on interactions with her primary care provider. In probing, however, she added that she excluded her therapist from consideration. Had she included her therapist, she would have changed her answer to "start or continue using marijuana medically."

What product is considered?

Compared to the prior item on health professionals asking about marijuana use, more respondents considered what they identified as hemp or CBD-only products when answering this question. In particular, respondents thought of conversations they had with their health professionals about the medical benefits of CBD oils and the use of psychoactive hemp-derived products like delta-8 THC. For example, one respondent explained that her doctor has asked what she does to control her pain. She responded, "You know, full disclosure, CBD, and I'm recently exploring the use of marijuana products. This respondent answered "They did not provide any advice about marijuana use" because after she told her doctor about her CBD and marijuana use, "They're not saying anything about what to do." Another respondent, who used delta-8 THC hemp-derived gummies, answered "Start or continue using marijuana medically" because the impression she got from her nurse practitioner was "if it's working, keep at it." This respondent focused on her hemp-derived products because her state has not yet legalized any use of marijuana. However, these respondents were the exception; most respondents continued to think strictly of delta-9 THC or "marijuana."

What constitutes advice?

Most respondents had a narrow interpretation of the term "advised" that constrained which interactions they counted when answering the question. These respondents generally considered only direct positive or negative recommendations from a medical professional as advice. For example, one respondent, who answered "Start or continue using marijuana medically," included her interaction with a medical marijuana specialist who issued a medical marijuana card. Another, who answered "Cut back or stop using marijuana," explained that his doctor "advised me to temporarily stop" because of concerns of the effects of marijuana use on his stomach health.

However, some respondents noted different levels of tacit agreement on the part of their health professional. One of these types of agreement was the health professional making a non-explicit endorsement of the respondent's marijuana use. For instance, one respondent described her conversation with her neurologist saying, "I mean, my neurologist, when we have our conversation, she doesn't say like, 'Yes keep doing it,' she's like, 'Okay, I'm glad it's working for you' kind of thing." This respondent answered, "Start or continue using marijuana medically," because to her, "I'm glad it's working for you" was enough of an endorsement to count it. Nevertheless, tacit agreement was not uniformly included as advice. Another respondent described her doctor implicitly telling her to "resume what you've been doing" because the marijuana use was working; this respondent answered, "They did not provide any advice about marijuana use," because they interpreted the tacit instruction to continue using marijuana as not constituting an explicit instruction to continue use.

Finally, some respondents did not even consider the receipt of a medical marijuana card from a medical marijuana specialist to constitute advice, because the provider did not explicitly endorse their marijuana use. One respondent described his interaction in the following way:

> You basically go up to them—they first try to tell you, "Are you sure, are you sure you want to?" They give you all these warnings. And then once you're okay with it—I guess yeah, they'll start telling you, "Ok, you can start using it."…from a starting point, usually you're the one that tells them.

For this respondent and for others, the fact that respondents approached medical marijuana specialists, not the other way around, and that the interaction did not always contain much direction on how to use marijuana led to exclusion of these interactions from advice. The practical effect of this is that even among those respondents who primarily used marijuana medically and who lived in jurisdictions where medical use was legal, a majority answered "They did not provide any advice about marijuana use."

Response options

Differing understandings of what constituted advice affected how respondents understood the response options. Those who answered "Start or continue using marijuana medically" included those who were explicitly told to start using (for example, by a primary care doctor) or continue use (a medical marijuana card renewal). However, they also included various circumstances in which respondents judged medical professional indifference or silence on new or ongoing marijuana use to be advice. Those who answered "Cut back on or stop using marijuana" also

included those who were told to stop using (temporarily or permanently) by medical professionals and those who understood ambivalence or lack of positive feedback as a tacit instruction to stop.

Those who answered "They did not provide any advice about marijuana use" included both those for whom the subject never arose as well as those only asked on intake forms. Some of these respondents are those who underreport their marijuana use to their health professional, as in the case of one respondent who explained "they asked me, but I didn't say, 'Yes, I smoked marijuana.' I just said, 'No, I haven't or whatever.'" For these respondents, the advice of the medical professional was conditional on respondent willingness to share information about marijuana use. Additionally, some respondents were those for whom tacit agreement (or disagreement) about their marijuana use was not enough for them to choose "Start or continue using" or "Cut back on or stop using." For example, one respondent who uses medically explained that "they haven't said anything about it, and they know it's in my system because I'm a cancer patient." Because the professionals did not provide an explicit direction to continue, this respondent selected "They did not provide any advice about marijuana use."

Finally, those respondents who answered "I have not seen a health professional in the past 12 months" only included those who had not seen their primary care provider in the past year. One respondent remembered upon probing that she had been to the dentist, but she did not count that visit.

Some respondents noted that the existing response options do not cover the type of advice they have received. In particular, respondents pointed to advice not about changing quantity of marijuana consumed but to changing mode of use. One respondent explained that her medical professional had not told her to stop or continue but rather said "I'd really much prefer you use edibles than smoking weed." This respondent, along with others discussed previously, was unable to provide a response to this question because of her differential understanding of advice.

10. During the past 12 months, did you want to cut down or stop using marijuana?

a. Yes
No

Response	*Number of Respondents*
Yes	31
No	56
Refused	2
Skipped	1

Most respondents reported not wanting to cut down or stop using marijuana in the past 12 months. Some respondents who received this question and had reported not having used marijuana in the past 30 days in a previous item answered "no," however, and two respondents in this situation could not provide an answer because they felt that it was not applicable to them. For one respondent, the question was skipped due to lack of time.

Respondents conceived of this question in several different ways. First, and for the most part, respondents understood this question as asking whether they wanted to reduce the amount of marijuana they use or discontinue use altogether. Second, however, many respondents appeared to think of the question as whether they had cut down or stopped using marijuana, not necessarily whether they wanted to. Third, a few respondents thought about whether they could cut back or stop if they wanted to. Finally, very rare or infrequent users, or, as noted above, respondents who reported not having used marijuana in the past 30 days in question 4, found the question to not apply to them

<u>Wanting/not wanting to cut down or stop</u>

Those who understood the question to be asking about whether they wanted to reduce or quit using marijuana directly discussed the reasons for this desire. For example, one respondent who answered, "yes" explained that marijuana was "holding me back a bit too much." When asked if this was something that he wanted, he said, "Yeah, I did want to cut down, and I did." Others who answered "yes" referenced wanting "to be more productive," "to live a more healthy lifestyle," and "to get off it" due to concerns about possible memory loss.

Conversely, several respondents clearly expressed not wanting to cut down or quit marijuana. Several of these respondents who answered "no" emphatically responded at the time of question administration, saying, for example, "Absolutely not" or "Absolutely no." Others cited reasons they did not want to cut back or cease using marijuana, including being "pretty happy" or "comfortable" with their current use level, disinterest "in changing [their] habits," experiencing positive effects including symptom alleviation for conditions like anxiety, insomnia, and pain, and using marijuana for "relaxation," "having fun," and enjoyment. Some of these respondents particularly pointed to the negative effects of cessation, including one who specified that pausing marijuana use leads to resumption of fibromyalgia symptoms.

A few respondents specifically excluded times when they cut back or stopped because it was not something that they wanted or actively sought to do, suggesting that they understood the question to be asking about whether it was something they desired. For example, one respondent who answered "no" did so because circumstances, not her own volition, caused her consumption to decrease: "I don't think there was any intentionality to it…It was just not literally living with like 7 stoners at all times."

Finally, some respondents offered other unique reasons for wanting to cut back or stop using marijuana including wanting to switch away from a particular mode of consumption (vaporizing to edibles) or another wanting to share less with others who "end up smoking all" of his weed.

Having cut down or stopped

A second group of respondents understood the question to ask whether they had cut down or stopped using marijuana. In probing, these respondents spoke of situations where they cut back or stopped using marijuana that blur the lines between wanting and needing or having to cut back or quit, with some expressing mixed feelings or uncertainty with how to answer. For several respondents, this was in the context of work. For example, one respondent who answered "yes" explained, "I wanted to cut back because certain jobs are looking into that now. And it's like, I want to get a higher job yes, but at the end of the day, do I really want to give up my…my sanity?" Another respondent, who also answered "yes" and quit smoking marijuana after graduating from an EMT program, when explaining her answer said, "I would say yeah and no." While she wanted to change jobs, she did not actually want to give up marijuana, since while using she felt "young and free."

Other respondents who understood the question as asking whether they cut back or stopped did so because starting and stopping using marijuana is part of their normal use pattern. Respondents in this group answered "yes" saying, for example, that they "go through phases" or that it "ebbs and flows." As one respondent explained, for example, after using it for a couple of weeks, "I'm pretty ready to take a break from it." However, sometimes respondents in this group faced challenges responding. One respondent mused: "Did you want to...? No...but when I didn't want to smoke, I didn't smoke. Did I want to? Then yes, because there were times when I didn't want to smoke and then I didn't."

Respondents specifically pointed to cost and tolerance as reasons that they did cut back or stop using. In these contexts, it was not always clear that cutting back or stopping was desired. For example, one respondent said "the only reason I said yes is because of the cost. It is quite a costly habit. Yeah, and it takes a lot of money. That's the only reason I said to cut down." Other respondents answered "yes" on the basis of taking "tolerance breaks," or brief cessations to reduce tolerance and increase the effects of marijuana use. However, sometimes these created difficulty for respondents, because the use of a tolerance break does not map easily onto wanting to cut back or stop using. For example, one respondent was unable to provide a response:

> This one is tricky. I have a very high tolerance, so there is a part of me that wishes I could take a break for a couple days or something to bring it down, but I don't think I could. But there is always a part of me that is like, "You should take a tolerance break. You could save some money!" So yes, not because I think it's bad, but because your tolerance – if you use anything without any breaks, your tolerance can go up.

Respondents sometimes answered "yes" even if they did not stop using or cut back on marijuana because, hypothetically, they can see reasons for wanting to stop or cut back. For example, one respondent who uses marijuana to help manage his epilepsy condition said, "The only reason I would want to cut back on it is purely from a cost standpoint…That's from wanting to save cash not from the motivation of wanting to stay away from it." Another respondent who also uses marijuana medically explained that she has been wanting to take a break, "…mostly because of tolerance. Yeah, I just don't want to have to spend as much money is mostly the reason…and I guess I also don't want to have to rely on it to feel better…trying to see how it goes." This last respondent also mentioned the idea of not wanting to have to rely on marijuana to feel better.

Able to cut back or stop

A small group of respondents understood this question not to ask whether they wanted to cut back or stop, or if they had cut back or stopped, but rather whether they (hypothetically or actually) were able to cut back or stop using marijuana. For example, one respondent assumed this question was asking about habitual or problematic marijuana use, which she emphasized does not apply to her. She explained that she "can stop. It's not a habit. It's not a habit, so if I don't see it, I don't use it. You know, so it doesn't matter."

Sense of inapplicability

Finally, respondents who reported not having used marijuana in the past 12 months felt the question to be inapplicable. Many of these respondents found this question confusing. Most respondents in this situation answered "no," saying for example, "I don't smoke marijuana." And "I don't feel like it's enough to um…yeah." Two respondents were so flummoxed that they did not provide an answer.

What is marijuana?

In this question, very few respondents included hemp or CBD-only products in their understanding of "marijuana." Respondents appeared to primarily conceive of marijuana as a psychoactive plant-based drug and, if they were knowledgeable, associated it with delta-9 THC. Consequently, the patterns of interpretation identified did not meaningfully vary on this dimension.

11. During the past 12 months, were you able to cut down or stop using marijuana every time you wanted to or tried to?

a. Yes
No

Response	*Number of Respondents*
Yes	56
No	24
Refused	2
Skipped	8

Most respondents reported being able to cut down or stop using marijuana in the past 12 months. Some respondents who received this question and had reported not having used marijuana in the past 30 days in question 4, answered "no," while two respondents in this situation felt they could not provide an answer (refused), one because he has not tried to cut down and another because she does not use marijuana. Interviewers individually skipped still others in this situation if they had noted that the previous question was not applicable to them. The question was also skipped for two respondents due to lack of time.

Several patterns of interpretation emerged for this question. Some respondents considered their ability to lessen or quit using marijuana, measured by their past actions. However, many respondents understood this question to ask whether they were addicted to marijuana or if they exhibited problematic use patterns. Finally, for respondents who reported not having used marijuana in the past 12 months, for some very rare or infrequent users, and for those who

have not wanted to or tried to cut down or stop using marijuana in the past 12 months, the question was not applicable.

Able to cut down or stop

Respondents who understood the question to be asking about their ability to reduce or stop using marijuana referenced specific instances in which they felt they demonstrated this ability. For example, respondents who said they were able to stop using discussed pausing the use of marijuana because of a medical procedure, when sick, when pregnant, when employment purposes demanded it, or even simply when they felt it was hindering their daily activities. One respondent pointed to a specific event that highlighted her ability to pause marijuana use: a visit from a family member. She explained, "For instance, if my mother is here for a visit….she's here for two weeks at a time, so I'm not gonna be smoking no weed." For some respondents, however, pauses in marijuana use are part of how they use marijuana in general. One respondent explained that he was able to stop or not smoke when he doesn't want to smoke, saying, "When I'm like, I don't want to smoke today, then I don't smoke." This ability counted enough for him to say "yes." One respondent who answered "no" explained, "Usually – again, maybe in the morning or in the middle of the day, it's easier for me to make a plan where I say, oh, I'm not going to smoke tonight…but then I'll say usually by the time the evening comes around, it's not that that initial assessment was wrong, but usually I'm so tired of whatever has happened during the day and just stressed out… now I just want an intoxicant anyway at night."

For many of these respondents, the qualifier "every time" was particularly impactful. One reacted in the following way, "Every time? Not every time, but the majority." For this respondent, the "majority" of times he was able to cut back was outweighed by the few times he was unable to cut back. Others thought of whether they were able to stop and stay off marijuana for as long as they had intended. For example, a respondent answered "no" because she was not able to stay off marijuana for as long as she intended when taking tolerance breaks. She explained, "In the last 12 months, in particular, I think there's been a couple times when I've said that I was going to [stay off for a week] and then have not, basically." However, another respondent answered "yes" even though he was not always able to stop for as long as he had planned, saying that he might "stop for a day" and wish that he had "made it three days or whatever."

Is marijuana an addiction/problem?

Another group of respondents understood the question as asking whether they are addicted or if marijuana use is a problem for them. These respondents immediately discussed characteristics of addiction, including "a mental feeling of need to take it," "cravings," withdrawal symptoms like "cold sweats, sickness, big headaches" when they stop, or not thinking "about [marijuana] all day." Many of these respondents answered "yes" because these behaviors or symptoms did not apply to their circumstances. Some respondents who said "yes" said directly, for example, "I don't feel that I have an addiction," "for me it's a non-addictive substance that I can stop and start as needed," or "it doesn't affect my life in any way." One respondent noted that there were occasions when he would tell himself that he would not use marijuana on a day, then "do it anyway," and afterwards feel "some regret." Nevertheless, he still answered "yes" because he understood the question as referencing physical dependence and struggling to stop using. He considers himself to not be "in that category."

Still others who answered "yes" did so because they understood the question to ask about addiction but did not use marijuana often. One of these respondents explained that

> I'm worried that my "no" would be interpreted wrong…[laughs] 'cause the "no" sounds like it could either mean I didn't need to do that at all or I wanted to and I failed...I think that's [yes] the best choice for the situation I described to you but I'm not happy with it, let's just say that [laughing].

One respondent who answered "no" said, "I didn't try to because I don't use it that much, so no. [laughs] I am not an addictive person." This respondent still understood the question to ask about problematic use.

Additionally, some respondents considered hypothetical instances in which they might cut down or stop using, and in doing so approached the question through the lens of problematic use or addiction. As one put it, "I looked at it as, would I have been able to stop if I had really wanted to cut down on it." This respondent answered "yes," while the other respondent who said that they could stop if they tried, said "no," because he did not want to cut down or stop.

Not applicable or no desire to cut down or stop

A final group of respondents viewed the question as inapplicable. These respondents viewed the question as not applying to them because they did not want to or try to cut down or stop marijuana use. For example, one respondent, who answered "no," simply stated, "I've never really tried to cut down or stop. It's a choice I choose not to make." Another respondent explained that she "did not try to," but when pressed, answered "yes." Thus, the group of people for whom the question did not seem to apply led to divergent patterns of response. This group also included respondents who reported not having used marijuana in the past 12 months.

"Cutting down"

Respondents understood the concept of "cutting down" in several ways. Some respondents thought broadly of the overall amount they used, including one who answered "yes," he "was definitely smoking more in a day" twelve months ago than he now is. Other respondents, who answered "yes," mentioned cutting "it down to smaller doses" to make it last or manage their supply. A couple of respondents thought of cutting down by switching the mode of use such as vaping instead of using edibles. Another, who answered "no," mentioned unsuccessfully trying to cut down by switching from vaping to tinctures because the taste of the tinctures was "nasty."

Response options

"Yes" responses included those who feel that they don't have a problem, those who were able to cut down or stop, some of those who did not want or try to cut down or stop using, and some infrequent users. "No" responses included those who were not able to stick to goals, stay off, or stop every time they tried, some non-users in the past 12 months, some who did not want or try to cut down or stop, and some infrequent users. The patterns of interpretation evidenced did not neatly map onto specific response options.

What is marijuana?

In this question, very few respondents included hemp or CBD-only products in their understanding of "marijuana." Respondents appeared to primarily conceive of marijuana as a psychoactive plant-based drug and, if they were knowledgeable, associated it with delta-9 THC. Consequently, the patterns of interpretation identified did not meaningfully vary on this dimension.

One respondent included delta-8 THC, and one included hemp or cannabis oil, which she did not believe contains THC or makes her "high."

12. Does anyone who lives with you use marijuana?

a. Yes
b. No

Response	*Number of Respondents*
Yes	40
No	48
Refused	2

More respondents reported "No" than did "Yes." However, as explained further below, "No" responses can have different meanings. Two respondents refused to answer the question, one out of privacy concerns and the other because the respondent lives alone and, therefore, felt the question did not apply.

Respondents broadly understood this question to be asking about marijuana use among those with whom they cohabitate. Some variation was seen in how respondents interpreted several aspects of the question. including who to include as "who lives with you," currently or sometimes, what counts as marijuana use, and how to know. While this variation did not substantially impact question performance, it does highlight potential areas or sources of uncertainty for respondents that could result in greater inconsistencies among a larger sample of respondents.

Most respondents understood the question to include anyone who lives with them. This is reflected in the wide range of people with whom respondents mentioned living including spouses, boyfriends and girlfriends or partners, parents, step-parents, grandparents, siblings, children, and roommates. Respondents appeared to conceptualize "who lives with you" as referring to others who share the same household or housing unit. For instance, one respondent excluded his father even though he can "smell the usage," because while they live in the same building, the respondent lives in a separate apartment. The concept of who to include in "who lives with you" may be less clear for those experiencing transient housing. For example, one respondent hesitated before answering "no" and said, "I actually am homeless, and I actually am in a housing assistance program, so it's like I have a roommate, but my roommate, I don't know if they use marijuana. I don't know if they qualify as being a part of my household."

It also appears that most respondents thought the question was asking about people who currently live with them. For example, a couple of respondents who have multiple living situations, for example, a room at both mom's and dad's or a room at home and "at the dorm," answered based on where they are "currently" (as in that day) living. However, a couple of respondents with adult children who do not usually live at home answered "yes." In one case, the respondent was thinking of her daughter who is usually away at college but was home recently for the holidays. The other also answered "yes" even though his son "doesn't live with [him] that often."

Inconsistency was also observed in terms of what counts as marijuana use in terms of frequency. For example, a couple of respondents answered "yes" because their roommate uses "Once in a blue moon [laugh]" or is an "relatively infrequent user – 1-4 times per month." Others, thinking of someone who "only uses it in special circumstances" or "very infrequently," answered "no," one noting that his wife's use seemed "too rare to count as 'use.'"

Finally, in most cases, respondents seemed to know whether the people living with them use marijuana. Respondents tended to know, for example, whether their spouse or partner uses marijuana. In some cases, respondents knew because they smoke with the person they live with. For example, one respondent who lives with a roommate and answered "yes," saying "I know he smokes" because they smoke together sometimes. Others knew because the other person uses openly or there are other signs. For instance, one respondent, when asked how he know his father uses marijuana, responded, "He doesn't try to hide it at all!" Another mentioned that he can "smell it" on his daughter, so he knows that she uses marijuana.

However, some respondents appeared to answer based on the assumption that the person who lives with them uses (or does not use) marijuana. In the case of one respondent who answered "yes," thinking of his grandson, said that in DC, "A kid his age, everyone smokes!" However, several parents of teenagers answered "no" but in probing revealed that they were not always certain. For instance, one respondent, who answered "no," thought of her son. She explained that as far as she knew, he did not use marijuana but noted also that he "goes out a lot and he's 17, so he could be using marijuana, alcohol…but he doesn't come home looking high or anything like that." Other respondents were less sure. One respondent, speaking of a roommate said, "I'm pretty sure she does some…maybe she doesn't. I think I don't know" and eventually answered "no." This last example particularly demonstrates that in some instances, respondents may not have a strong basis on which to answer.

<u>Response options</u>

"No" responses picked up situations in which no one who lives with the respondent uses marijuana as well as circumstances such as when respondents live alone. "Yes" responses include people who know and people who assume that those living with them use marijuana.

Privacy concerns

This item raised privacy concerns for some respondents. For example, during probing, one respondent who had refused to provide an answer said they did not want to answer because, "I don't want to out anybody." Another respondent who answered "no" said in probing that he did not want to discuss his partner's use or lack of use. These results suggest that this item, perhaps more than others that this study tested, may be susceptible to item nonresponse.

13. During the past 30 days, how often have you seen or heard an advertisement for marijuana products or stores? Include TV, radio, signs and billboards, newspapers and magazines, pamphlets or flyers, streetside marketing like sign spinners or sandwich boards, and online or cell phone advertisements.

a. A few times in the past 30 days
b. Several of the past 30 days
c. Nearly all of the past 30 days
d. I have not seen or heard marijuana product advertising in the past 30 days

Response	*Number of Respondents*
A few times in the past 30 days	23
Several of the past 30 days	15
Nearly all of the past 30 days	19
I have not seen or heard marijuana product advertising in the past 30 days	32
Unable to obtain response	1

All respondents received this question. Most respondents reported seeing some form of advertising in the past 30 days.

Respondents generally understood this question to ask about various types of visual advertisements for marijuana products or marijuana dispensaries. Their understandings varied on two dimensions. First, respondents differentially included hemp or CBD-only products; second, respondents differentially included storefronts or dispensaries themselves, and email distribution lists from those sources, as constituting an advertisement.

What is marijuana?

Many respondents described seeing advertisements for marijuana products like "marijuana accessories…like bongs, or a rolling tray" on social media or billboards that advertised marijuana dispensaries. For these respondents, the question clearly indicated that "marijuana products" did not include hemp or CBD-only products, even psychoactive ones like delta-8 THC. For example, one respondent, who answered "Several of the last 30 days," explained that she saw billboards on a drive through nearby states where adult-use marijuana is legal. "It's kind of like firework billboards," she said.

> At the edges of states where there's legal marijuana there'll be a lot of billboards that say like…want weed? They're very explicit. They're just like, weed is legal. This exit has weed…it's just that kind of thing.

However, other respondents included hemp or CBD-only products or store advertising. For example, one saw a billboard "at a vape shop" advertising delta-8 THC, which he considered "more in the category of CBD." Another explained that her chiropractor and her "pharmacy has it, so if I go into my pharmacy at least once a month I see the sign, 'CBD sold here.'" Still other respondents pointed to targeted social media ads for hemp or CBD-only

gummies and vaporizers. These respondents included hemp or CBD-only products despite the specification of "marijuana" in the question stem. This inclusion was not universal, and it did not meaningfully differ by legal jurisdiction. The sole respondent who was unable to provide an answer could not because they did not know whether to include hemp or CBD-only product advertising in their response.

Impact of subgroups: product use

Inclusion of CBD-only products was heavily impacted by product use but in counter-intuitive ways. Respondents who only reported hemp or CBD-only product use rarely included hemp or CBD-only product advertising in their response. In fact, many of them deliberately excluded CBD-only products. One, for example, explained that because marijuana was not legal in her state, she thought it was unlikely she would see anything. "As far as advertising, that would be it. Just CBD and delta-8 here." Other respondents explicitly excluded CBD and delta-8 THC products because they are "hemp-derived." On the other hand, many respondents who used delta-9 THC—marijuana—included CBD shops, delta-8 THC products, and hemp or CBD-only products in their answers. Some specifically mentioned signs that say things like "Sell Delta-8." The tendency to include hemp or CBD-only products was especially prominent among those who used marijuana products socially or nonmedically and was less prominent among those who used marijuana products primarily for medical purposes. Nevertheless, including these products was a judgment call for respondents that was not always easy. One said, "when I hear the question, I'm confused about the oils [CBD] in a sense. And the confusion is coming in, because it seems you need two questions."

What is an advertisement?

In considering this question, respondents thought of forms of traditional advertisements such as billboards, social media ads, and flyers. Other advertisements included Instagram "stories" from friends (not companies) "advertising" product availability, email newsletters and rewards programs from dispensaries or shops, and flyers posted in public areas. Inconsistency was seen in whether respondents included dispensary or smoke shop storefronts. Some respondents conceived of the very existence of a dispensary, vape shop, or CBD shop as an "advertisement" for a marijuana product. These respondents answered on the basis of the number of times or number of days they saw a store or dispensary. One, for example, explained that she passes "two, three of them, my daily drive…I'm always seeing the sign." Another, who included hemp or CBD-only products, noted that "on my regular route, I drive by a CBD store so I see it regularly." However, some respondents explicitly excluded storefronts from their consideration, because "that's just like, them advertising their location…not so much a product." Lack of clarity over whether to include storefronts led respondents to different responses to the question.

Response options

In general, respondents understood the response options to divide the 30-day period into ten-day increments. That is, "a few" meant more than zero days but fewer than ten, "several" meant ten to 20 days, and "nearly all" meant more than 20 and up to 30. Some respondents identified differences in the thresholds; for example, one respondent called "5-6 days" "several" and identified a hypothetical 17 days as "nearly all." More crucially, however, respondents answered based on two methods of counting: by days and by unique instances advertisements were seen. The most common conception was that of days, as specified in three of the four response options. Respondents who answered based on the number of times they saw an advertisement may have done so because of the first response option. All respondents who counted in this way answered "A few times in the past 30 days." One respondent who correctly used "days" to calculate her answer explained this confusion: "I thought you meant how many instances of billboard or something have you seen, and then you got to days at the end, and that reset the question for me."

14. During the past 30 days, how often have you seen or heard an advertisement or message about preventing harmful marijuana use or avoiding marijuana use? (Include TV, radio, signs and billboards, newspapers and magazines, pamphlets or flyers, streetside marketing, and online or cell phone advertisements.)

a. A few times in the past 30 days

b. Several of the past 30 days
c. Nearly all of the past 30 days
d. I have not seen or heard marijuana prevention advertising or messaging in the past 30 days

Response	*Number of Respondents*
A few times in the past 30 days	17
Several of the past 30 days	7
Nearly all of the past 30 days	3
I have not seen or heard marijuana prevention advertising or messaging in the past 30 days	61

All respondents received this question. Parenthetical text was only read when examples were asked for. In contrast to the question on marijuana product or store advertising, most respondents did not report seeing any form of marijuana prevention advertising or messaging in the past 30 days.

To the extent that respondents could conceive of an anti-marijuana message, respondents understood this question to ask about whether they had encountered anti-marijuana messaging at all in the past 30 days. However, this item was mostly characterized by lack of knowledge and relied on respondents imagining hypothetical messages or drawing on long-term memories of anti-drug education. For example, one respondent who answered "I have not seen or heard marijuana prevention advertising or messaging in the past 30 days" said that she pictured "those addict commercials where like, 'Do you need help?'…I don't think of marijuana when I think of those advertisements for addict things." Others drew on the D.A.R.E or "Just Say No" campaigns that they remembered from their youth. Finally, several respondents pointed to signs and billboards that read "Don't Drive High" or "Drive High, Get A DUI" that they encountered while driving.

However, some inconsistency was observed in how respondents characterized product packaging of marijuana, with some respondents including warning messaging on the product as a form of "prevention advertising" and others excluding this messaging from consideration. For example, one respondent referred to "this little thing in the packaging that kinda talks about not smoking if you're pregnant or if you are having problems or something, but I think that it's a legal thing they have to put in." For respondents in certain, but not all, states or jurisdictions where marijuana sales are legal, these messages are part of the purchasing experience. However, not all respondents considered these messages "prevention advertising or messaging"; one respondent excluded the state-mandated warning on his marijuana products. Another respondent included a broader message around product safety that had less to do with the addictive, medically harmful, or psychoactive effects of marijuana use and more to do with consumer protection. This respondent discussed "reports of them finding mold in flower" or reports on local news of area dispensaries "not passing the lab tests or the lab results."

Respondents' understanding of the response options did not appear to meaningfully differ from their understanding of the same options in the prior question. That is, respondents divided up the 30-day period into ten-day increments, where "a few" meant less than 10 days, "several" meant ten to 20 days, and "nearly all" meant more than 20 and up to 30 days. Interviewers did not generally separately probe these response options from those of Question 13.

No substantive difference in respondents' answers was observed by legal jurisdiction, by primary experience of marijuana use, or by products used (hemp or CBD-only or "marijuana"). Younger respondents (less than 50) reported seeing prevention messaging in the last 30 days more often than did older respondents. No respondents included hemp or CBD-only products in their conception of marijuana prevention advertising or messaging.

15. How has your marijuana use changed during the COVID-19 pandemic? Has it:

a. Increased
b. Decreased
c. Stayed about the same
d. I never or rarely use cannabis

Response	*Number of Respondents*
Increased	23
Decreased	8
Stayed about the same	40
I never or rarely use cannabis	17
Skipped/Blank	2

All respondents were asked the question. The largest group of respondents answered that their use "stayed about the same." The question was skipped for two respondents due to lack of time.

Respondents interpreted the question in one of two ways. Most respondents thought that the question was asking whether their marijuana use changed because of the pandemic, while a second, sizable group of respondents thought that the question was asking whether their use changed during the pandemic. For a third group of respondents whose marijuana use "stayed about the same" or who answered that they "never or rarely use cannabis," it was not always clear or applicable whether the respondent was considering whether their use changed because of or during the pandemic.

Because of the pandemic

Respondents who thought about whether their use changed because of the pandemic considered pandemic-related factors and based their response on the extent to which these factors affected their marijuana use. In the words of one respondent, "I thought that question was asking about how the pandemic has changed things for me and I don't think it really has in terms of quantity." Respondents mentioned a range of factors related to the pandemic that may or may not have affected their marijuana use. Several respondents spoke of the stress they experienced stemming from the pandemic. In the words of one respondent who answered that their use increased said, "It's [marijuana] my go-to for stress reduction and we're in a pandemic. Every day stresses me out." Other pandemic-related issues included "isolation issues," "boredom," being "stuck at home," "fewer opportunities to socialize," and factors related to switching from office-based work to working from home.

Respondents in this group answered based on changes to their marijuana use that they attributed to the pandemic. For example, when one respondent was asked whether her use increased because of the pandemic or just during it, she said that her use increased "because I couldn't get out and people just started bringing it to me." Another respondent who reported that her use had decreased explained that this was because she was "not seeing people as often," which was how she would "primarily find" herself smoking before the pandemic.

Several respondents expressly excluded changes to their marijuana use that happened during the pandemic that they did not attribute to the pandemic. For example, one respondent who had increased her marijuana use to help with her insomnia answered, "stayed about the same" because it "had nothing to do with the pandemic." Another, whose use increased because it went from zero to using it regularly during the pandemic, similarly answered "stayed about the same," because "it was not because of the pandemic."

During the pandemic

Among those who thought about possible changes to their marijuana use during the pandemic, some answered based on non-pandemic related factors only, while others considered factors related to the pandemic in combination with factors unrelated or incidental to the pandemic that affected their marijuana use. Non-pandemic related factors included not enjoying marijuana as much, stomach issues, and a bad break up. One respondent mentioned that they "happened to get a medical card," and another "became a medical patient." Some respondents in this group reported increased use while stating that the change on which they were basing their answer was not "attributable" but "coincided with COVID-19 times" or was "totally incidental to" or "wasn't because of" the pandemic or that "…it has little to do with COVID. It just happened to be an overlapping time period."

A few respondents included both issues related to the pandemic as well as other factors affecting their marijuana use. For instance, one respondent who reported increased use spoke of living with a new partner who "uses it regularly," which was incidental to the pandemic, as well as "pandemic conditions" that led him to "desire some kind of…intoxicant or what have you." Another respondent who answered that his use decreased spoke of challenges in accessing marijuana due to the pandemic but also a general desire to cut back. A third who answered that her use increased explained that the increase was "almost coincidence" at the beginning of the pandemic when she found a milder variety, but also that "it increased because there weren't as many obligations" because of the pandemic. Because these respondents included both pandemic-related causes and unrelated changes, these respondents also understood the question to ask about change in use during, not exclusively because of, the pandemic.

Response options

Several respondents whose marijuana use started during the pandemic selected "increased," because one could "technically" say that their use increased from zero. Similarly, respondents whose marijuana stopped during the pandemic selected "decrease." However, some respondents expressed that the available response options did not precisely reflect their experience. For example, one respondent who ultimately answered "stayed about the same" said that it was "tough" to answer given the available response options because he "actually started using during the pandemic, technically."

Issues with timeframe

Several issues arose with the timeframe for this question including a lack of consistency with how respondents thought about the timeframe covered by "during the COVID-19 pandemic." As found in previous CCQDER research, results of this current study indicate that respondents do not have a uniform or consistent understanding of when the COVID-19 pandemic began.[9] When asked, many respondents said that they thought it began in March 2020, but responses also ranged from winter 2019 to April 2020. Many respondents also noted that they felt that the pandemic was "still ongoing" at time of the interview. Overall, this suggests that "during the COVID-19" pandemic is not a stable, clearly defined, or consistently understood timeframe.[10]

The length of the timeframe, nearly two years at the time interviews took place, as well as the multiple and varying phases of the pandemic caused difficulty for some respondents who employed a range of strategies when coming up with their answers. Some respondents focused on a particular phase of the pandemic, often the beginning. One respondent answered that his use increased during the beginning of the pandemic when he had been laid off and local and state jurisdictions "shut down the city" but noted that as his schedule went back to normal, his use "went right back" to where it was. Others tried to think of overall changes in their use, comparing their use before the pandemic with their current use, while others tried to take an average, many seeing any increase in use during a particular phase (usually the beginning or during lockdown) as being "cancelled out" by decreases or going back to baseline during other phases. As described by one respondent who answered "stayed about the same," "It's [her usage] gone down, it's gone up." When she was most affected by the pandemic, on lockdown, it decreased, but over the whole period, the average was "pretty steady."

Change in aspects other than quantity

Some respondents thought about changes in their marijuana use in aspects other than the quantity they consumed. For example, one respondent, who reported that his use decreased, thought of the mode and overall amount of THC consumed. He switched from smoking to tinctures, which tend to last longer so that he can take a tincture once rather than smoking several times. He also believes the overall amount of THC he consumed was less because,

[9] Cibelli Hibben, K., Ryan, V., Hoppe, T., Scanlon, P.. (2022). Analysis and Results of Time Reference Web Probes on the RANDS COVID-19 Survey. Hyattsville, MD: National Center for Health Statistics. Available at: https://wwwn.cdc.gov/qbank/report.aspx?1220.

[10] Fowler Jr, Floyd J., and Carol Cosenza. "Design and evaluation of survey questions." *The SAGE handbook of applied social research methods* 2 (2009): 375-412.

when his company was shut down for a few months, he made an effort not to get high all day. Similarly, another respondent mentioned adopting the use of dabs and concentrates, meaning that overall, he used less cannabis even though the amount of THC is the same. However, this respondent answered that his use had "decreased" due to several other factors incidental to the pandemic, not on the basis of the mode change.

Medical versus nonmedical users

In this sample, more nonmedical users answered that their use "decreased" while no respondents who described using marijuana medically reported decreased use. Some nonmedical users attributed the decrease in their use to having fewer social opportunities due to the pandemic, while others mentioned factors unrelated to the pandemic. Several respondents who use marijuana medically mentioned the importance of marijuana for self-care or managing aspects of their health. For example, one respondent noted that because her cannabis use is so important to her, despite the financial stresses of the pandemic, she wouldn't cut it out unless it was absolutely necessary.

16. Overall, how has your marijuana use changed since marijuana was legalized in your state?

a. It has increased
b. It has decreased
c. It has stayed about the same
d. I never or rarely use cannabis
e. Marijuana is not legal for use in my state

Response	*Number of Respondents*
Increased	22
Decreased	1
Stayed about the same	29
I never or rarely use cannabis	11
Marijuana is not legal in my state	23
Skipped/Blank	4

The largest group of respondents answered that their use "stayed about the same," while many reported that their use "increased" or that "marijuana is not legal in my state." The question was skipped for four respondents due to lack of time.

Respondents faced multiple decision points when considering how to answer this question. These included what legalization refers to, where or what location to consider, what counts as marijuana, and the type of change (because of or since legalization and in the quantity of use of some other way). Each of the decision points and how respondents conceptualized them is discussed below. Variation in respondent understanding at each of the decision points led to a number of inconsistencies and a wide array of pathways respondents could follow during the response process. Consequently, no discernable construct could be determined, with the exception of a group of respondents for whom the question was not applicable because they never or very rarely use marijuana. Even some of these respondents, however, were unsure whether to select "I never or rarely use cannabis" or, for respondents in medical-only or CBD-only states, "marijuana is not legal for use in my state" if they were aware of the legal status.

What is legalized?

The first decision point respondents considered was what was meant by legalization. Respondents approached the concept of legalization in three ways: whether anyone can buy, access, or use marijuana; whether they personally can buy, access, or use marijuana; or, less commonly, whether the respondent could get in trouble for buying, accessing, or using marijuana.

Respondents who understood legalization as referring to anyone being able to access, buy, or use marijuana often used the term "full legalization" or referred to marijuana being "fully legal." In the words of one respondent, it's

"like you can smoke it on your front porch if you want to." Importantly, these respondents appeared to conceive of medical and nonmedical (or adult-use) legalization differently. One, for example, referred to "two different waves" of legalization, medical and nonmedical. For the purposes of this question, he answered based on nonmedical adult use legalization. This way of thinking about legalization is evidenced by respondents in states where marijuana has been legalized for nonmedical adult use, none of whom selected "marijuana is not legal for use in my state," suggesting that they were considering full adult-use legalization. Additionally, some respondents who used marijuana nonmedically in medical-only states answered "marijuana is not legal for use in my state" because, while marijuana is legal for medical users in their state, it is not legal for all adults. For example, as one nonmedical-using respondent who lived in a medical-only state explained, he doesn't have a medical card, so "it's not legal for me" or any other adult without a medical card. Respondents who use marijuana medically in medical-only states who answered that "Marijuana is not legal for use in my state" hold a similar understanding, because, while they are personally able to access it, not everyone can buy, access, or use it. As one such medical user in a medical-only state noted, "marijuana is technically not legal," in contrast to other states where "anyone over 21 can go in and purchase."

For another group of respondents, the question was more narrowly understood as whether they personally were able to buy, access, or use marijuana either for their type of use or at all. For example, one respondent in a medical-only state who answered that her use has increased said,

> Well, I would say it has increased because if it was illegal in my state I wouldn't be using…I feel that the state has given folks who deal with chronic pain and other chronic illnesses an opportunity to get some relief in a natural way. Or holistic way. And I wouldn't have had the opportunity if it was not legal in my state.

Another respondent in a medical-only state, said, "It has increased because I got the medical marijuana card." Both of these respondents were answering based on a conception of legalization allowing their personal medical marijuana use.

Some respondents answered based on whether they could buy, access, or use marijuana, but the distinction between nonmedical and medical use was not particularly relevant. These respondents only considered their ability to access marijuana and ignored or did not mention state or local laws. For example, several respondents in CBD-only states who answered other than "Marijuana is not legal for use in my state," when asked about the status of legalization expressed uncertainty or stated that it was not something they paid attention to. For example, one respondent who said that her use "Stayed about the same" said, "I don't think marijuana is legal here. I'm not sure." Another, who answered that her use "Increased" said, "I don't really think about it." Another group of respondents in states where marijuana is only legal for medical use similarly only considered their ability to access marijuana for medical purposes. One, who answered "Stayed about the same", when asked about the laws in her state said, "I don't really follow it. Because even when I was younger, marijuana was something that was really easily and readily available…It made no difference to me what the legality was." Along the same vein were a couple of respondents in medical-only states who are not medical users but answered other than "Marijuana is not legal for use in my state," because they are able to get buy, access, and use it the way that they want. One gets her product from other people, noting, "I guess it's legal medical in [medical-only state] now, but that has made no impact on me" and that her use "minimally" relates to formal legalization.

Some respondents understood legalization to refer to lack of prosecution or lower penalties for possession or use. These respondents referred specifically to "decriminalization." This concept affected the way respondents answered in different ways. One respondent, for example, stated, "I guess technically in [state] when I was living there it was decriminalized. So my use did increase when it was decriminalized," and thus answered that his use increased. Another respondent, who lived in a medical-only state, explained that "it's not legal [in his state], it's decriminalized" and answered "Stayed about the same."

<u>Where is it legalized?</u>

While the question asks about change in marijuana use since it was legalized "in your state," inconsistency was observed in how respondents understood the location on which to base their answer. Most respondents considered the legal status of marijuana in the state in which they currently live. For example, one respondent in a CBD-only state said, "[Marijuana is] not legal for use in my state." Another in a medical-only state said, "I guess it's legal medical in Pennsylvania now." However, some respondents considered where they could buy or access marijuana, which for some respondents is in their state of residence, but also included neighboring jurisdictions. For example, one respondent in a CBD-only state answered that her use had "increased" based on a pop-up shop she goes to that is located just across the border in another state. Another respondent, who uses nonmedically and lives in a medical-only state similarly answered that his use had increased, mentioning that it is "legal to get" in a neighboring jurisdiction.

Others considered the legal status in a state where legalization occurred, even if that is not their current state of residence. One, who currently lives in a CBD-only state, explained that "it's not legal for use [in his state of residence], but I did live in [State A] for a little while and it, I would say it increased then." This respondent answered that their marijuana use increased based on their experience when living in [State A[when marijuana had been legalized for nonmedical adult use. Another who answered that her use increased explained that while she now lives in [State B], she was living in [State C] when it became "legal medically" and spoke of increases to her use upon receiving her medical card there. These results point to the salience of the varying legal statuses of marijuana in proximate or other jurisdictions and the possibility that some respondents will consider the legal status of marijuana in places other than their current state of residence unless instructed otherwise.

Finally, a couple respondents considered legalization at the federal level. One answered "Marijuana is not legal in my state" because she did not think that "weed" is legal in any state until it is legal on a federal level. The other answered "I never or rarely use cannabis" because even though she would like to start using it medically, she is not able to until it is legal at the federal level due to her husband's security clearance. For these respondents, this question bears no relationship to their jurisdiction's laws, and how they understand legalization is determined by the national regulatory environment.

What is marijuana?

Most respondents included delta-9 THC-containing marijuana in answering this question. A few respondents included their use of CBD-only or hemp products—for example, CBD lotions and gummies and delta-8 THC. The respondent who included delta-8 THC said, "Now we're talking specifically marijuana, not hemp? Because I am thinking it's including the delta-8 THC that is available legally in my state when I hear that…it's probably increased just because it's easier and more available." When asked if she understood the question to include marijuana, hemp, and delta-8 THC products, she said, "Yes, because the delta-8 THC comes from hemp."

Causal or incidental change

Most respondents understood the question to be asking whether their use changed because of changes in jurisdictional laws governing marijuana use, but several answered based on change in their use that was incidental to the legal process, suggesting that they understood the question to be asking about generic change in their use in the time period since marijuana laws changed. Respondents who understood the question to ask about change because of legalization said, for example, "Yeah increased, absolutely…A big reason why I started smoking again was because it was legalized," "well, I would say it has increased because if it was illegal in my state I wouldn't be using," and "definitely increased (laughs). It just got legalized like two weeks ago, so yeah, I've been using it a lot." Another example demonstrating a causal interpretation of the question is a respondent who considered the effect of legalization but because she is an occasional user who gets her marijuana from other people, never buying it for herself, determined that it had had no effect, saying "No. It hasn't affected me."

On the other hand, some respondents did not see the question as asking about a causal relationship between formal laws changing and their marijuana use. For example, when asked what he thought the question was asking, one respondent said, "Recreational legalization happened in 2016, what have I been doing since 2016?" For him, the question was about change in his use during the timeframe, not any causal relationship. Other respondents explained

the change they reported to their use as incidental to the legal process. For example, one respondent explained that his use had "decreased over time" because he was enjoying marijuana less and due to possible health complications. Another respondent, who said "increased," noted that even though marijuana was legalized "a while ago" in her state, she only started using again a couple of years ago and that legalization "wasn't really a motivator, a factor." Another answered that her use "increased" but that the legal change did not cause her increase, noting that "it was legal before I got the card. I don't know for how long."

In addition to variation in whether respondents considered change because of or since legalization, some respondents thought about changes in their marijuana use in aspects other than the quantity they consumed, such as the type of products or mode of consumption. For example, one respondent who answered that her use "increased" explained, "Um….as far as usage, I would say no. But I just appreciate the different products that I can get from a dispensary. Maybe the variety of products has changed."

Issues with timeframe

Similar to the previous item about change in use during the COVID-19 pandemic, this question proved challenging for some respondents due to the long timeframe. Respondents frequently struggled to recall the timing of legalization. Thinking about where they lived, one respondent said, "…it's been 5 years or something like that now? No, it hasn't. 3 years now, it's been 3 or 4 years if I'm not mistaken…" The question was also difficult for some younger people in the sample. For example, as one respondent who has never lived in a state where marijuana was not legal when he was of legal age explained, "That was kinda a hard one for me to answer because I've been in a place where it's been legal for 8 years, 9 years." Another respondent struggled to remember exactly when marijuana was decriminalized in his state, noting that it happened while he was in college.

Other issues

Discussion with respondents revealed that legalization is a process that can unfold very differently and at varying paces in different states. Several respondents observed that nonmedical adult use legalization does not automatically translate into the ready availability of marijuana or have much effect on how people are able to obtain and use it. For example, a respondent who recently moved to a state that recently legalized adult nonmedical cannabis use and answered that her use increased since legalization explained that while marijuana has now been legalized medically and nonmedically in her current state of residence, "…there aren't any stores, so you have to like, grow your own plant and things like that. I'm not going to do that." Another respondent in a state that recently legalized nonmedical adult use answered that his use has stayed about the same, noting that how he gets marijuana has not changed and that he has not seen any stores open up, or at least "Not in [his] neighborhood." In contrast, a few respondents in a different state where marijuana was recently legalized for nonmedical adult use remarked on the explosion of retailers that started selling marijuana as soon as it became legal. As one respondent, said, "[where R lives] there's like 30 dispensaries here already." Her answer was that her use "definitely increased (laughs)," adding "It just got legalized like two weeks ago, so yeah, I've been using it a lot."

17. How do you usually get the marijuana you use? Do you:

a. buy it from a retail marijuana store
b. buy it from a medical dispensary
c. buy it from a grocery store, gas station, mall, or other convenience store
d. buy it from a dealer or friend
e. get it for free or share someone else's
f. grow it yourself at home or have someone grow it for you
g. get it from somewhere else

Response	*Number of Respondents*
Buy it from a retail marijuana store	14
Buy it from a medical dispensary	15
Buy it from a grocery store, gas station, mall, or other convenience store	0

Buy it from a dealer or friend	24
Get it for free or share someone else's	12
Grow it yourself at home or have someone grow it for you	4
Get it from somewhere else	3
Skipped or refused	18

In general, all respondents received this question. After a brief period of interviewing, this question was skipped for respondents who reported no marijuana use in the item (Question 4) relating to marijuana use in the last 30 days and rarely or never using marijuana in the item (Question 15) relating to change in use during the COVID-19 pandemic. This change was made because respondents who only used CBD products or extremely rarely used marijuana found the question impossible to answer and frustrating. Additionally, a few respondents refused to answer because of privacy concerns. Respondents indicated purchasing or otherwise acquiring marijuana products from all locations except "a grocery store, gas station, mall, or other convenience store." As in the item about acquisition of hemp or CBD-only products, respondents indicated difficulty choosing only one option.

Respondents understood this question, conditional on their understanding of what constituted "marijuana," to ask where they acquired their product. Thus, this question is affected by the broader issue affecting all questions about "marijuana": which products should respondents include when answering? This question was less susceptible to inclusion of hemp or CBD-only products than other items on the questionnaire, as some respondents who primarily or only used hemp or CBD-only projects excluded delta-8 THC and other psychoactive derivatives from consideration. For instance, one respondent who hadn't "bought any other than the CBD with the delta-8" chose "buy it from a dealer or friend" because when she gets marijuana—by which she meant psychoactive delta-9 THC-containing flower—she gets it "from friends or relatives, you know, we just share it or whatever." In this case, the respondent excluded her purchase of delta-8 THC from consideration. However, some respondents still included psychoactive cannabis products that did not contain more than trace amounts of delta-9 THC. For example, one respondent indicated she bought products from a retail marijuana store, but upon probing, clarified that those were the CBD products she used, and her answer for "marijuana" products would be "get it for free or share someone else's."

In addition, respondents conceived of where they "usually" got their products in different ways. For some respondents, "usually" referred to frequency: the location from which they most frequently or always acquired marijuana products. One respondent explained her purchasing habits by saying "I do tend to procure through friends…sometimes I share someone else's—actually, no, people usually give it to me. I'm a total mooch." For others, "usually" referred to quantity: the place where they get the most marijuana. As one respondent explained:

> There is usually in quantity and there is usually in frequency. Sometimes I will get quantities from a friend who I get it for free from. Other times, I would say more frequently, like if there is something interesting in a shop, I might pick up a very small amount. And that would be a retail shop. Usually…I guess I would have to say that I get it from a friend.

This respondent settled on the "quantity" interpretation of "usually" and answered "buy it from a dealer or friend," although he acquired his product for free.

Vocabulary issues: "marijuana store"

Respondents were occasionally unfamiliar with some terms used in the response options. The most prominent of these was the term "retail marijuana store." To many respondents, this would more appropriately have been called a "dispensary." Consequently, the term "retail marijuana store" was not always chosen when respondent experiences seemed to indicate it should have been. For example, one respondent, after the question was administered, answered "the dispensary." When probed, however, she explained that "I guess it's a 'retail marijuana store' because it's not a medical dispensary. It's not medical, I don't have to show a card or anything like that." For other respondents, the question was complicated because nonmedical or retail dispensaries are in the same building, or even the same space, as medical dispensaries. One respondent explained that retail "dispensaries" and medical "dispensaries" are the same thing: "they have a medical section and a recreational section. They have medical prices

and recreational prices. Show your card and you get the medical discount." Along with other respondents, this respondent had difficulty even with the term "retail marijuana store," preferring instead to use the term "retail dispensary."

Impact of regulatory environments

The unique legal environments governing marijuana sales in different jurisdictions created difficulties for some respondents in choosing a response option. One respondent, who lived in a state where only CBD products were legal but purchased her marijuana in Washington, DC, explained that she bought her marijuana at a "pop-up shop." The respondent explained that a pop-up shop was not like a retail store because "you would have to be invited," it isn't open every day, and it's not easy to identify when walking down the street. On the other hand, a pop-up shop isn't like buying from a dealer because "buying from a dealer, you won't know exactly what strain you're getting…you don't really know exactly how it's going to affect you." Other respondents who purchased in Washington, DC, which does not have a regulated nonmedical adult use market, mentioned similar "unaccredited" "little businesses." For these respondents, no response option adequately captured their marijuana acquisition experience, and they chose "get it from somewhere else." However, the phenomenon appears to be limited to Washington, DC, as no respondents in other states mentioned other types of stores.

The regulatory context of each respondent impacted their selection of response options, but the context did not limit respondents as much as might have been anticipated. For example, respondents who lived in jurisdictions with legal adult use or medical-using respondents who lived in medical marijuana-only states both chose from the first two options, "Buy it from a retail marijuana store" and "Buy it from a medical dispensary." However, respondents in these legal jurisdictions still frequently described buying from a dealer or a friend or getting marijuana for free. Conversely, respondents from states where purchasing marijuana for adult use is illegal still reported some purchase from retail marijuana stores. For these respondents, their access was not impeded by the laws because they purchased from a state where marijuana was legal. For example, one respondent from a CBD-only state described purchasing his marijuana from Washington, DC, on regular trips, "maybe once a month."

18. Version 1: When you use marijuana or cannabis, are you usually using a CBD product?

a. Yes
b. No
c. Don't know

Response	*Number of Respondents*
Yes	7
No	26
Don't know	1
Unable to obtain response	2

Version 2: When you use marijuana or cannabis, which of the following best describes the product you use most often?

a. High THC, Low CBD
b. High THC, High CBD
c. Low THC, Low CBD
d. Low THC, High CBD
e. Other
f. Not sure

Response	*Number of Respondents*
High THC, Low CBD	24
High THC, High CBD	3
Low THC, Low CBD	2
Low THC, High CBD	6

Other	0
Not sure	13

All respondents received this question with the exception of a few respondents skipped because of time constraints. Because the initial phrasing of the question performed poorly, as described below, the question wording was substantially revised in consultation with the Cannabis Strategy Unit. Revisions to the question performed somewhat better, but the question's performance was still limited.

In Version 1, interpretations differed for each respondent and across all response options. Consequently, there was no way to determine any consistent pattern of interpretation. For example, some respondents who answered "Yes" did so because they thought of the CBD naturally occurring in the plant, while some respondents who answered "No" did so because the CBD naturally occurring in the plant was too low for them to count. Other respondents answered "Yes" because of the CBD-only products they used, while some respondents who answered "No" did so because they excluded CBD-only product use. In the extreme, respondents were unable to answer the question as administered. The only consistent reaction to this question across respondents was confusion. For example, one respondent, who answered "No," said,

> I don't know what that means. I don't know what that means. Like is that saying there's like a combined CBD-THC? Is there CBD in pot? Like in the bud, smoking like bud, like the plant leaves? Is there CBD in there? Is that what it's talking about? I don't know.

This respondent's reaction was typical of many respondents, who, drawing on varying interpretations of the question that they considered equally valid, did not know how to best answer.

Version 2 of the question generated more consistent interpretations. Respondents to this question primarily considered the chemical composition of the product they consumed most often, referring to the CBD-THC ratio or percentages of CBD and/or THC in the product. When prompted to consider their products in this way, many respondents were able to fit their product use into one of the four major categories. For example, one respondent explained that "usually, I would say most of the time I do low-THC, low-CBD." When asked to explain how she knew the composition, the respondent said "they're labeled. They're required to put the specific amount of THC and CBD on every product they sell." In states with legal nonmedical or medical marijuana use, product labeling was a potential reference point for respondents. Other respondents relied on assumptions about of the effects (one said "I'm assuming what I'm feeling is the THC, but I don't have the test to tell me that") or information from their product source (another acquired high-CBD, low-THC marijuana flower from a friend and explained "his aunt gets it and that's the type of, uh, I guess genetic makeup that she uses").

Version 2: Variation in product inclusion and vocabulary understanding

Conditional on the products respondents included and their knowledge of key terms and product composition, respondents understood Version 2 to ask about the relative amount of CBD and THC in their most frequently used product. Variation in interpretation persisted in product inclusion and in respondent understanding of vocabulary and product details.

First, many respondents did not know whether to include hemp or CBD-only products in their response. One respondent excluded her CBD-only tincture "because of where [the question] was placed…in that marijuana section." However, another respondent, who used both hemp and CBD-only products and delta-9 THC "marijuana," thought specifically of gummies she uses that are made with delta-8 THC. Respondents who only used hemp or CBD-only products based their response on these products, as in the case of one who chose "Low THC, High CBD" because he uses "full-spectrum hemp products" not "CBD isolate products."

Second, many respondents remained unsure how to answer this question. This stemmed not from lack of clarity on question intent, as in Version 1, but from lack of knowledge of the terms included in the question—that is, "CBD" and "THC"—or of their precise product makeup. The first issue was especially, but not exclusively, prominent among older respondents. One respondent, aged 65, selected "not sure" and explained that she doesn't "know the

terminology. I couldn't tell you what's in it. I just don't know." Even younger respondents, when confronted with these response options, sometimes initially reacted with "all those letters…" Uncertainty over the meaning of "CBD" and "THC" led some respondents to select "Not sure," because "I don't know what that is," while other respondents selected an option based on assumptions driven by product effects. One respondent, when asked about the meaning of THC and CBD, explained that "I really don't—I know what CBD oil is but the TB—T—I'm really not clear on that now." She chose "the low and the low" because she didn't "wanna have nothing too high…I just don't need it to be at the highest level. I need it to be low-low." For this respondent, the term "low" was a good-enough heuristic for her to assume product composition without precise knowledge of the product-specific jargon.

The second issue, knowledge of product makeup, persisted across age groups. Several respondents, especially those in states where marijuana use was not legal for all adults, were familiar with the terms "THC" and "CBD." However, they answered "Not sure" because they did not have access to product packaging or other details that broke down the percentages. One respondent who lived in a CBD-only state laughed and explained:

> It's whatever people give me. I don't [know], that's the thing. I think that's a problem specific to places that aren't legal right now. I mean, the flower I get—I don't know. I just get it because that's what I can get. I don't know the make-up of it, and I'm sure people in California are the complete opposite.

Other respondents in this situation selected one of the main categories based on their best guess of what products likely contained. One respondent said that she "would say high THC…probably low CBD…there is not usually a lot of – well, if you want to have high CBD with your THC you have to buy a more CBD-oriented product that has THC in it." Still others answered based on the effects they felt:

> I know from experience just from trying a lot that I am currently high THC, high CBD. It's probably a lot more THC than CBD, but it's definitely a 'CBD-ish' product. It has a lot of good 'body' effects, as opposed to just the mental state of it…I can kind of feel the effects of both when I'm on it.

Responses like these illustrate that informed users understood the terms "high-THC" and "high-CBD" not as equivalents (for instance, 25 mg THC and 25 mg CBD) but as relatives defined by their ratio (for example, 20:1 THC-CBD) or their effects (body versus mind).

Finally, some respondents sought out a moderate option: medium-THC, medium-CBD. Instead of choosing "other," these respondents opted to choose either high-THC, high-CBD, or low-THC, low-CBD.

Appendix 1: Jurisdiction Recruitment and Analysis

For the purposes of recruitment and analysis of the impact of the legal status of cannabis products on question response, study principal investigators divided U.S. states and the District of Columbia into four categories. These categories are based on legalization status at the time of NCHS Ethics Review Board clearance submission in April 2021.

1. **Early adult-use legalizers:** These jurisdictions legalized retail sales of adult nonmedical cannabis in 2016 or earlier and legalized medical cannabis in 2000 or earlier. These medical cannabis legalizations were broad-based and not limited to CBD products derived from hemp.
2. **Recent adult-use legalizers:** These jurisdictions legalized retail sales of nonmedical cannabis after 2016 and legalized medical cannabis after 2000. Exceptions included in this category include Massachusetts, which legalized medical cannabis in 2012 and adult nonmedical cannabis in 2016. Medical cannabis legalizations were broad-based and not limited to CBD products derived from hemp.
3. **Medical-only marijuana:** These jurisdictions have legalized medical cannabis on a broad basis but have continued to penalize adult nonmedical cannabis use.
4. **CBD-only:** These jurisdictions have only legalized CBD or low-THC products or have accepted the provisions of the Agricultural Improvement Act of 2018, commonly known as the "2018 Farm Bill," which removed CBD derived from hemp from the schedule of drugs under the Controlled Substances Act and placed it under the regulatory jurisdiction of the Department of Agriculture.

At the time of project design, Idaho and Nebraska had not yet allowed for licensed hemp cultivation under the 2018 Farm Bill and otherwise fully criminalize marijuana use and possession. CCQDER excluded participants from these states from this study. A full list of jurisdictions and their associated categories is included in Table 6.

Table 6: Jurisdictions by Study Legal Categories

c)	*Category*	*d)*	*Jurisdiction*		
e)	*Early adult-use legalizers*	f)	Alaska	j)	Maine
		g)	California	k)	Nevada
		h)	Colorado	l)	Oregon
		i)	District of Columbia	m)	Washington
n)	*Recent adult-use legalizers*	o)	Arizona	t)	New Jersey
		p)	Illinois	u)	New Mexico
		q)	Massachusetts	v)	New York
		r)	Michigan	w)	Vermont
		s)	Montana	x)	Virginia
y)	*Medical-only marijuana*	z)	Alabama	jj)	Missouri
		aa)	Arkansas	kk)	New Hampshire
		bb)	Connecticut	ll)	North Dakota
		cc)	Delaware	mm)	Ohio
		dd)	Florida	nn)	Oklahoma
		ee)	Hawai'i	oo)	Pennsylvania
		ff)	Louisiana	pp)	Rhode Island
		gg)	Maryland	qq)	South Dakota
		hh)	Minnesota	rr)	Utah
		ii)	Mississippi	ss)	West Virginia
tt)	*CBD-only*	uu)	Georgia	aaa)	South Carolina
		vv)	Indiana	bbb)	Tennessee
		ww)	Iowa	ccc)	Texas
		xx)	Kansas	ddd)	Wisconsin
		yy)	Kentucky	eee)	Wyoming

	zz) North Carolina
fff)	*This study included respondents from jurisdictions in bold.*

For the purposes of comparative question evaluation based on legal jurisdiction, CCQDER considered any individual recruited in one of the above groupings to be analytically equivalent to individuals recruited in another jurisdiction in the same category. For example, following the categorization outlined, a respondent from Texas was considered analogous to a respondent in Wisconsin (both CBD-only jurisdictions), but only to the extent that researchers could determine that the regulatory context of the participant influenced question response. Additional factors, such as the use of specific cannabis products or individual sociodemographic characteristics, may have independently influenced question response despite respondent location in a similar legal jurisdiction.

Respondent jurisdictions are mapped in Figure 2, and the broad distribution of study participants is shown in Figure 3. In Figure 2, number labels indicate the number of respondents interviewed located in that jurisdiction; a missing number label indicates that no respondents in this study were interviewed in the corresponding jurisdiction.

Figure 2: Map of Study Sample by Legal Jurisdiction

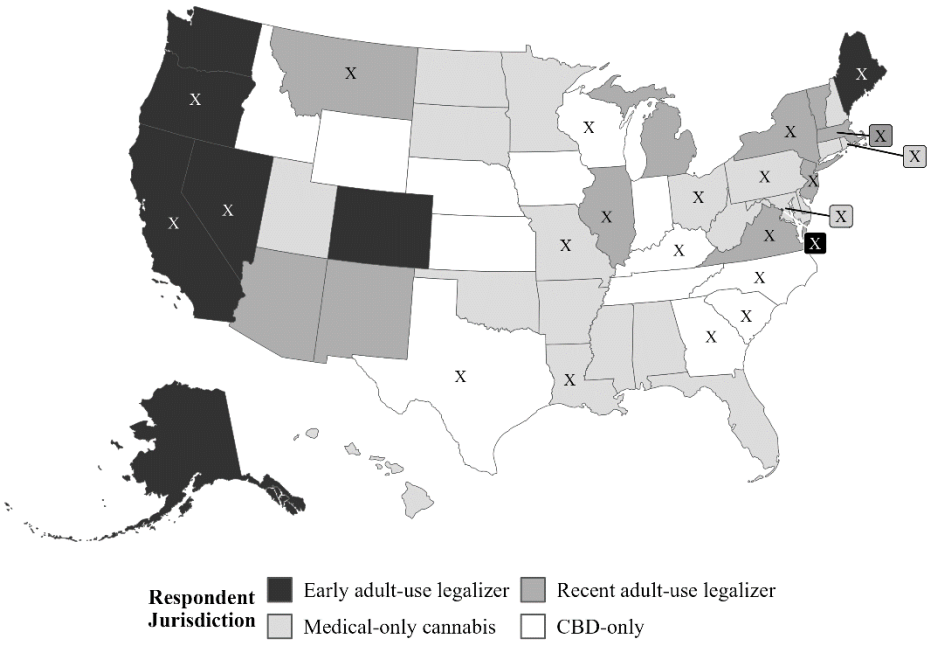
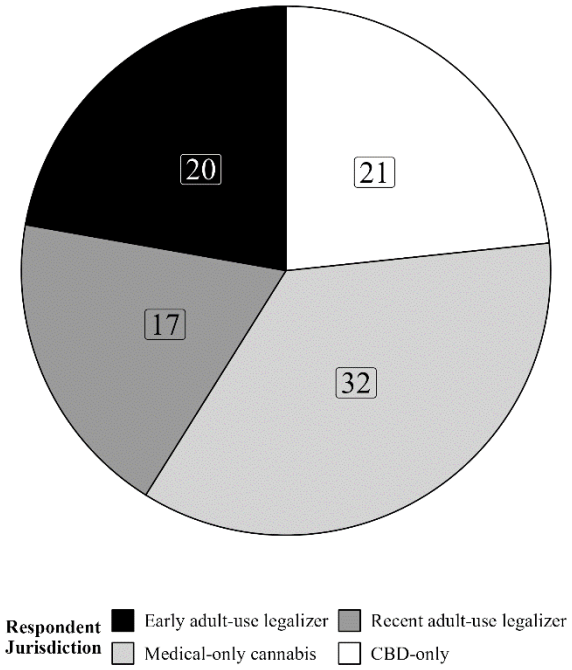


Figure 3: Study Sample by Legal Jurisdiction Category



Appendix 2: Questionnaire

Interviewers should read the questions as written aloud to the respondent and read aloud all response options, with the exception of items in red, open-ended responses, or response options limited to Yes/No. The instrument may be probed concurrently or retrospectively depending on your preference; please document your choice in the notes.

1. **The next question asks about use of hemp or CBD-only products. Hemp and CBD-only products are typically found in stores such as grocery stores, gas stations, smoke shops, and malls. Do not count marijuana products when answering this question.**

   During the past 30 days, on how many days did you use hemp or CBD-only products?

   [# 0-30]

   [Ask if response to #1 is 1 - 30 days, otherwise skip to Q#4]

2. **When you used a hemp or CBD-only product during the past 30 days, how did you use it? (check all that apply) Only read parentheticals in red if asked for clarification.**

   Did you:

   a. Apply it to the skin (for example, in a lotion, gel, oil, balm)
   b. Smoke it (for example, in a joint, blunt, or cigar)
   c. Eat it (for example, in brownies, cakes, cookies, or candies)
   d. Drink it (for example, in tea, cola, alcohol, or tinctures)
   e. Vaporize it (for example, in an e-cigarette-like vaporizer or another vaporizing device)
   f. Dab it (for example, using a dabbing rig, knife, or dab pen)
   g. Use it some other way

3. **How do you usually get the hemp or CBD-only products you use? Do you:**
   a. Buy it from a retail store
   b. Buy it from a medical dispensary
   c. Buy it from a grocery store, gas station, mall, or other convenience store
   d. Buy it from a dealer or friend
   e. Get it for free or share someone else's
   f. Grow it yourself at home or have someone grow it for you
   g. Get it from somewhere else

4. **Version 1 (assigned randomly):** The next set of questions ask about marijuana use. During the past 30 days, on how many days did you use marijuana?

   [# 0-30]

Version 2 (assigned randomly): The next set of questions ask about marijuana use. Marijuana is also called pot, weed, or cannabis. Do not count hemp or CBD-only products when answering this question. During the past 30 days, on how many days did you use marijuana?

[# 0-30]

[Ask if response to #4 is 1 - 30 days, otherwise skip to Q#8]

5. **When you used marijuana during the past 30 days, did you use any other substances at the same time or within a few hours? (Select all that apply)**
   a. A tobacco or nicotine product like a cigarette, cigar, blunt, or e-cigarette
   b. Alcohol
   c. Cocaine
   d. Heroin or illicit fentanyl
   e. Methamphetamine
   f. Prescription opioids either not prescribed to you or used in a way that was not directed by your doctor.
   g. Other drugs
   h. I did not use marijuana with other substances

[Ask if response to #4 is 1 - 30 days, otherwise skip to Q#8]

6. **When you used marijuana during the past 30 days, did you use it to try to replace your use of any of the following substances? (Select all that apply)**
   a. A tobacco or nicotine product like a cigarette, cigar, blunt, or e-cigarette.
   b. Alcohol
   c. Cocaine
   d. Heroin or illicit fentanyl
   e. Methamphetamine
   f. Prescription opioids either not prescribed to you or used in a way that was not directed by your doctor.
   g. Other drugs
   h. I did not replace my use of other substances with marijuana

[Ask if response to #4 is 1 - 30 days, otherwise skip to Q#8]

7. **During the past 30 days, have you driven a vehicle while still affected by marijuana use?**
   a. Yes
   b. No

8. **In the past 12 months, has a health professional asked you about your marijuana use?**
   a. Yes
   b. No
   c. I haven't seen a health professional in the past 12 months

9. In the past 12 months, has a health professional advised you to:
a. Cut back on or stop using marijuana
b. Start or continue using marijuana medically
c. They did not provide any advice about marijuana use.
d. I have not seen a health professional in the past 12 months.

10. During the past 12 months, did you want to cut down or stop using marijuana?
a. Yes
b. No

11. During the past 12 months, were you able to cut down or stop using marijuana every time you wanted to or tried to?
a. Yes
b. No

12. Does anyone who lives with you use marijuana?
a. Yes
b. No
c. Don't know
d. Refused

13. During the past 30 days, how often have you seen or heard an advertisement for marijuana products or stores? Include TV, radio, signs and billboards, newspapers and magazines, pamphlets or flyers, streetside marketing like sign spinners or sandwich boards, and online or cell phone advertisements.
a. A few times in the past 30 days
b. Several of the past 30 days
c. Nearly all of the past 30 days
d. I have not seen or heard marijuana product advertising in the past 30 days

14. During the past 30 days, how often have you seen or heard an advertisement or message about preventing harmful marijuana use or avoiding marijuana use? (Include TV, radio, signs and billboards, newspapers and magazines, pamphlets or flyers, streetside marketing, and online or cell phone advertisements.)
a. A few times in the past 30 days
b. Several of the past 30 days
c. Nearly all of the past 30 days
d. I have not seen or heard marijuana prevention advertising or messaging in the past 30 days

15. How has your marijuana use changed during the COVID-19 pandemic? Has it:
a. Increased
b. Decreased
c. Stayed about the same
d. I never or rarely use marijuana

16. Overall, how has your marijuana use changed since marijuana was legalized in your state?

a. It has increased
b. It has decreased
c. It has stayed about the same
d. I never or rarely use marijuana
e. Marijuana is not legal for use in my state

[Skip if response to #15 is d. and if response to #4 is 0 days.]

17. How do you usually get the marijuana you use? Do you:

a. buy it from a retail marijuana store
b. buy it from a medical dispensary
c. buy it from a grocery store, gas station, mall, or other convenience store
d. buy it from a dealer or friend
e. get it for free or share someone else's
f. grow it yourself at home or have someone grow it for you
g. get it from somewhere else

18. Version 1: When you use marijuana or cannabis, are you usually using a CBD product?

a. Yes
b. No
c. Don’t know

Version 2: When you use marijuana or cannabis, which of the following best describes the product you use most often?

a. High THC, Low CBD
b. High THC, High CBD
c. Low THC, Low CBD
d. Low THC, High CBD
e. Other
f. Not sure