DRIVER BEHAVIOR & PERFORMANCE

TECHNICAL REPORT

FOUNDATION FOR TRAFFIC SAFETY

Examination of Cannabis Users' Perceptions and Self-Reported Behaviors to Inform Messaging to Deter Impaired Driving

MAR 2025

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Title

Examination of cannabis users' perceptions and self-reported behaviors to inform messaging to deter impaired driving

(March 2025)

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Foreword

Activities carried out by the AAA Foundation for Traffic Safety have a focused goal, "*saving lives through research and education.*" The work presented in this report is consistent with that goal. As the number of states allowing medical and/or recreational cannabis use increases and cannabis products become increasingly available, concerns loom about the limitations of methods to detect drivers impaired by cannabis and misconceptions among cannabis users about the potential impacts on driving. This study assessed the driving behaviors and related perceptions and beliefs among current cannabis users across a range of states with varying laws regarding cannabis use.

The rich information in this report can be incorporated into efforts by various entities, including transportation practitioners, policy makers, law enforcement, researchers, and advocates working to combat the negative impacts of cannabis use on traffic safety, regardless of the legality of cannabis use in a given locale.

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About the Sponsor

AAA Foundation for Traffic Safety
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Founded in 1947, the AAA Foundation for Traffic Safety in Washington, D.C., is a nonprofit, publicly supported charitable research and educational organization dedicated to saving lives by preventing traffic crashes and reducing injuries when crashes occur. Funding for this report was provided by voluntary contributions from AAA/CAA and their affiliated motor clubs, individual members, AAA-affiliated insurance companies, and other organizations or sources.

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List of Acronyms

SME	Subject matter expert
TREDS	Transportation Research and Education for Driving Safety
CMCR	Center for Medicinal Cannabis Research
THC	Delta-9 Tetrahydrocannabinol (unless otherwise specified)
SAMHSA	Substance Abuse and Mental Health Services Administration

Executive Summary

Cannabis is the most widely used psychotropic substance surpassing alcohol use in 2022 in the United States (Caulkins, 2024; Substance Abuse and Mental Health Services Administration [SAMHSA], 2023). As with other impairing substances, evidence suggests that driving under the influence of cannabis is also associated with an increased risk of crashes, injuries, and fatalities (Macdonald, 2018; Li 2013; Pearlson et al., 2021). There is a paucity of evidence on strategies to impact driving after cannabis use. To address this gap and enhance public safety, the Transportation Research and Education for Driving Safety (TREDS) team at University of California–San Diego implemented a comprehensive study in three phases:

- Phase 1: Interviews with subject matter experts (SMEs)
- Phase 2: A survey of 2,000 cannabis users across eight states regarding their driving behavior
- Phase 3: A survey of 800 cannabis users across states about their reactions to targeted messaging promoting safe driving practices after cannabis use

The Phase 1 interviews included 19 SMEs, from a variety of domains. The SMEs recommended a number of specific strategies for reaching cannabis users with safe driving messages:

- Address issues that the SMEs see as misconceptions and myths (e. g., cannabis is less risky than alcohol)
- Promote effective communication (e.g., avoid stereotypes)
- Address gaps in knowledge

With respect to messaging campaigns, SMEs endorsed collaborating with the cannabis industry for messaging and dissemination, using social media, and incorporating testimonials from cannabis users.

For the Phase 2 survey of 2,000 cannabis users in eight states, a questionnaire was developed with multiple-choice questions with open-ended items with probes. Eight states were chosen to obtain the breadth of cannabis regulatory laws in the U.S. at the time of the study: Michigan and Oregon (fully legal); Louisiana and Ohio (medical only and decriminalized); Oklahoma and Florida (medical only and not decriminalized); South Carolina and Texas (illegal for all use). Participants were recruited through survey companies in partnerships with Quester. Only respondents who were current consumers of cannabis (in any form and containing tetrahydrocannabinol [THC]) were selected to complete the full survey. A total of 26.1% of respondents described their use as medicinal only and 29.9% used recreational only, while 41.2% of respondents described their use as both. In the two fully illegal states, approximately half of respondents had travelled to another state to purchase cannabis.

Overall, 84.8% of consumers indicated that they drive the same day that they consume cannabis, compared to never driving after use (defined by either waiting 8 hours or more and sleeping or not the same day). This is slightly lower in legal states (78.4%) compared to the other state categories (medical, 86.5%; not legal, 87.9%). About 1 in 5 (19.0%) thought their driving was worse after use. Nearly half thought their driving was the same (46.9%), while others thought their driving was a little better (14.7%) or much better (19.4%). Only 29.2% of respondents believed a police officer could detect the influence of cannabis, 46.7% did not believe they could detect it, and 24.1% were unsure. This pattern was fairly consistent across all states.

In terms of awareness of the legal status of cannabis in their states, most of respondents in fully legal states (MI, OR) correctly identified their state as fully legal (90%+). In the four states legal for medicinal, 38.4% thought cannabis was fully legal, and in the two fully illegal states, 16.8% thought use was fully legal.

Based on their history of driving after using cannabis, respondents were categorized as shown in Table 1:

Table 1. Risk Categories

Risk Category	Description	Percentage of Sample
Ultra-high	Consumed cannabis an hour or less before driving	53%
High	Consumed cannabis 2-to-3 hours before driving	20%
Medium	Consumed cannabis 4 hours or more before driving but still within the same day (without sleep)	12%
Low	Consumed cannabis but did not drive until the next day (8+ hours, after sleep)	15%

Phase 3 queried 800 respondents across the same eight states for their reaction to specific cannabis and driving messaging. The tested messages were derived from existing and novel messaging and informed by the first two phases of the project. Eight sample messages with accompanying visuals were sent to respondents, who were classified as ultra-high-risk, high-risk, and medium-risk cannabis users as defined above. The respondents rated each of the messages for appeal, attention getting, relevance, believability, image reinforcement, and offensiveness. Three messages were well received and scored best across most parameters:

- “Driving high is driving Impaired—Find a safe ride home”
- “If you feel different, you drive different—Drive High. Get a DUI”
- “THC slows reaction time, distorts perception, and increases the risk of a car crash—Don’t Drive High.”

Respondents were also asked whether the messages were likely to impact their behavior related to cannabis use and driving (e.g., increasing their wait time between

consuming cannabis and driving, taking alternate transportation). “Feel Different Drive Different” had the largest proportion of respondents on increasing both wait time (62%) and taking alternate transportation (58%) among all respondents. All messages showed little behavioral impact on reducing cannabis use, eliciting ‘very likely’ to reduce use after viewing the message responses ranging from 20% to 29%. Trusted sources of cannabis information regarding safe driving included cannabis brands and companies for the ultra-high-risk and high-risk groups, and physicians, medical groups, safe driving groups, and labeling on products for the medium-risk group.

The results demonstrated high risk driving (driving within one hour of use) patterns in most cannabis users. Generally, users had a low level of knowledge about cannabis laws and regulations. Cannabis users were most responsive to the public safety messages that were factual, respectful, and avoided stereotyping. Detailed recommendations are provided for public policy stakeholders, law enforcement, and public health professionals.

Introduction

Cannabis is the most frequently used illegal drug in the United States; approximately 62 million people, or 22% of the U.S. population over the age of 12 years, used cannabis at least once in 2022 (SAMHSA, 2023), making it the third most commonly used substance, behind nicotine and alcohol (SAMHSA, 2023). Even between the outset of this project and preparation of this report, cannabis legalization has increased to 24 states legal for recreational use and another 14 additional states legal for medical use only (DISA Global Solutions Inc., 2024). New cannabis use by adults over 21 has increased noticeably, especially in the 35 to 50 age group (National Institute on Drug Abuse, 2023; Patrick et al., 2023). With the rising prevalence of cannabis use, concerns about its impact on driving safety have become increasingly urgent. States are struggling to keep up with safety concerns and are responding by compiling task force groups and outreach measures to address what has become a major public health concern.

Evidence suggests that driving under the influence of cannabis is associated with an increased risk of crashes, injuries, and fatalities (Macdonald, 2018; Li et al., 2013; Pearlson et al., 2021). Causes of these incidents include impaired motor and cognitive function, failure to use seat belts, poor judgment, speeding, and other driving errors. In the largest study to date on acute cannabis use and driving, the current research team found that users often believe the impairing effects of cannabis dissipate much sooner than objective measures show, leading to a significant public safety risk (Marcotte et al., 2022).

Detecting cannabis impairment poses significant challenges due to the varying effects cannabis has on individuals and the lack of a standardized, reliable method for using biofluids to detect impairment (Brands et al., 2021; Fierro et al., 2014). Unlike alcohol, where blood alcohol concentration (BAC) levels can be accurately correlated with impairment, cannabis affects drivers in complex ways that are not easily quantified. The psychoactive compound THC can remain in the body for days or even weeks, making it difficult to determine actual impairment at the time of driving (Brands et al., 2021).

Various public safety campaigns have been launched to address the dangers of cannabis-impaired driving. However, these campaigns often fall short due to a lack of clear, consistent messaging and the challenges in effectively reaching high-risk groups (Governors Highway Safety Association [GHSA], 2022). Additionally, measuring the effectiveness of these campaigns is complex and often inconclusive, and is often not undertaken.

To address the knowledge gaps and enhance public safety, the current study investigates comprehensive insights through three phases:

- Phase 1: Interviews with SMEs

- Phase 2: A survey of 2,000 cannabis users across eight states regarding their driving after using cannabis
- Phase 3: A survey of 800 cannabis users about their reactions to targeted messaging promoting safe driving practices after cannabis use.

This report provides a detailed account of the findings. By synthesizing these insights, more effective communication strategies and interventions can be developed to reduce the incidence of cannabis-impaired driving.

Phase 1: Subject-Matter Expert Interviews

To ensure the effectiveness and relevance of our research, a diverse group of SMEs was engaged to inform the design of the survey. These experts, drawn from fields such as public health, law enforcement, traffic safety, and cannabis research, provided critical insights that guided the structuring of the survey. Their input helped identify the key topics to cover, the most pressing questions to ask, and the essential knowledge gaps to address. By leveraging their expertise, the aim was to develop a comprehensive and targeted survey that would yield meaningful data on cannabis use and driving behavior.

Method

Participants

Participants (N = 19) were recruited by word of mouth from existing contacts and from other SMEs themselves. The SMEs represent the domains of driving and/or substance use research, government agencies such as state departments of transportation, organizations concerned with substance-use safety, and traffic safety industry members. Participants were offered a $100 gift card as payment for their time and expertise.

Interviews

Interviews were conducted online via Zoom at the participants' convenience. Some participants that belonged to the same organization were interviewed together as a group, with no more than four participants being interviewed concurrently. SMEs were provided with an information sheet, approved by the Institutional Review Board (IRB) at the University of California–San Diego, outlining the purpose and expectations for the interview prior to each meeting. Semi-structured interviews lasted approximately 1 hour and were attended by project investigators. An interview guide (see Appendix A) outlined the topics for discussion; however, questions were often tailored to the SMEs field of expertise and background. While the guide provided a touchstone for topics of

interest, discussion was encouraged and questions beyond those provided in the guide occurred by both investigators and SMEs.

Results

General Concerns

The SMEs felt there is considerable uncertainty among relevant experts as well as the driving public concerning the necessary timeframes between cannabis consumption and being fit to drive, with estimates ranging from 2 to 24 hours. There is also debate regarding whether any level of cannabis impairment can be considered safe for driving, complicating the establishment of legal per se limits. Furthermore, cultural variances in messaging and educational campaigns indicate a need for tailored approaches to effectively reach diverse communities. Opinions differ on whether cannabis use (even during off-work hours) should be permitted in safety-sensitive occupations, with perspectives ranging from complete prohibition to allowance. Additionally, crafting effective messaging for varied age groups—from children to adults—remains challenging.

Public Knowledge Gaps

The SMEs identified several significant gaps in public knowledge concerning cannabis impairment and driving. Firstly, there is a prevalent lack of awareness regarding the distinctions between cannabis and alcohol impairment, with many individuals not equating cannabis use with a similar driving risk. Experts have divergent opinions on whether cannabis consumers can accurately assess their level of impairment and make responsible driving decisions—some believe users understand their limits while others disagree. The public often mistakenly associates cannabis impairment primarily with overt physical signs like stumbling, typical of alcohol impairment. There is also confusion over how long it takes to become unimpaired, with estimates varying from 2 hours to over 24 hours.

Myths and Misconceptions

The SMEs identified what they believe to be ‘myths and misconceptions’ about cannabis use and driving. One common myth reported by SMEs is that cannabis improves driving ability or enhances focus, making users believe they are safer drivers. Another widespread misconception they cited is that driving under the influence of cannabis is less risky than driving drunk—regardless of the amount of cannabis consumed—causing many to underestimate its dangers. One SME felt some users believe that legalization or decriminalization means it is lawful to drive after consuming cannabis, under the misconception that it leads to no legal repercussions. The SME felt

that users 'wrongly think that law enforcement cannot detect cannabis impairment;' however, in reality the issue is complicated (Marcotte et al., 2023). Users also thought that they can avoid displaying signs of being high. Another cited 'misconception' holds that regular or heavy cannabis users are not impaired due to tolerance; the SME felt this was a dangerous misconception, pointing out that tolerance does not negate impairment. They noted that there is a belief that specific THC blood levels are "safe" for driving despite individual variability in impairment. Additionally, some users erroneously think that consuming edibles or vaping cannabis does not impair driving as much as smoking, ignoring that all forms of consumption can impair ability. All of the SMEs felt more education is necessary to debunk these myths and disseminate accurate information about cannabis impairment and driving risks.

Barriers to Effective Communication

The SMEs identified several barriers that hinder the effectiveness of messages about cannabis use and driving. A significant barrier is the belief among many users that driving under the influence of cannabis is not dangerous, with some believing it enhances their driving. This misconception leads to resistance against safety messages. Additionally, there is widespread confusion about cannabis impairment laws, the impact of cannabis on driving ability, and law enforcement's detection methods. Many users are unaware of legal limits or believe that police cannot detect if they are high. The association of cannabis use with a countercultural identity also poses a barrier, as some users perceive authoritative messaging as judgmental. Frequent and heavy users tend to downplay the risks, arguing that their tolerance means they are not impaired while driving. The normalization of cannabis use due to legalization has led some to view moderate consumption before driving as acceptable, similar to social drinking. A lack of perceived risk or significant consequences, influenced by personal experiences and insufficient enforcement, further diminishes the impact of safety messages.

To overcome these barriers, SMEs proposed several strategies to enhance communication. Involving cannabis users in the creation of messaging can ensure resonance with the target audience and avoid a judgmental tone. Messages should avoid stereotypes or imagery that could alienate users and instead depict cannabis users as ordinary individuals. Employing straightforward, factual language about laws, risks, and detection methods is more effective than humor or scare tactics. Tailoring messages for different demographic groups, such as youth, medical users, and heavy users, can enhance relevance and impact. Collaborating with dispensaries and the cannabis industry to integrate risk messaging at the point of sale is also recommended. Emphasizing responsibility and the safety of others, rather than the fear of arrest or punishment, may be more impactful. Clearly defining impairment, as it is not universally understood, is crucial. Personal stories and advocates can humanize the risks of driving impaired, making the messages more relatable and persuasive.

User Population Insights

SMEs provided valuable insights regarding the population of cannabis users and their driving behaviors. Regular or heavy cannabis consumers often develop a tolerance, leading them to downplay the risks of driving high and believe they drive well under the influence, an opinion especially prevalent among younger males aged 18 to 34. Additionally, many cannabis users are poly-substance users who frequently combine cannabis with alcohol, increasing the risks of impaired driving. Cannabis use is often linked to social and recreational activities, further normalizing its usage in various contexts. There is a notable lack of concern among many users about the consequences of driving high, exacerbated by confusion regarding laws, limits, risks, and detection of impairment. Some believe they cannot be caught or prosecuted for driving under the influence of cannabis. This group includes both recreational and medical users. Moreover, users often resist or disregard authoritative warnings about the dangers of driving high and lack specific plans to avoid such behavior. These insights underscore the need for targeted communication strategies tailored to these behaviors and beliefs.

Desired Public Knowledge

Experts emphasize the need to improve public understanding of cannabis in general and how cannabis affects driving. Many people are unaware that cannabis can significantly impair motor skills, reaction time, and decision-making abilities, much like alcohol. But also, unlike alcohol, the direct relationship between substance amount, timing, and effects on impairment are not as cut and dry. The SMEs said that it is especially important to debunk the myth that cannabis use can enhance driving. Clear, straightforward information about these risks needs to be communicated effectively to the public.

Additionally, there is a need for better education on the legal aspects of cannabis use and driving. People should understand legal THC limits, the penalties for driving while impaired, and how police detect impairment. Emphasizing the importance of waiting long enough after consuming cannabis before driving is crucial, as effects vary from person to person. Personal stories and advocates can help make these risks feel real and relatable. Working with the cannabis industry to include safety messages at the point of sale can ensure users get this information when they need it most. Ongoing research and data collection are essential to keep these educational efforts relevant and effective.

Changes Since Legalization

SMEs noted that since the legalization of cannabis, there has been a noticeable increase in its normalization and societal acceptance, which includes the act of driving after usage. Individuals are now more openly using cannabis in public areas and during

events. Despite some progress, many users still fail to adequately plan to avoid driving while impaired. Additionally, there may be an uptick in combining cannabis and alcohol consumption while driving. Public attitudes have shifted, with a growing sentiment that cannabis impairment poses less risk than alcohol impairment. Regular users often downplay the dangers due to their developed tolerance, leading to a more relaxed perspective on driving under the influence of cannabis. Furthermore, there is significant confusion regarding the laws, risks, and detection methods associated with cannabis-impaired driving, which contributes to these attitudes.

The regulatory environment has rapidly expanded to accommodate legal cannabis access. However, some states have faced delays in setting up retail sales outlets and licensing. There remains a lack of clear legislation regarding cannabis impairment and driving, and as a result there is a lack of consistency in application of laws across states. Since cannabis legalization, daytime incidents of driving under the influence of cannabis may have increased, though there has not yet been a significant rise in traffic fatalities or injuries. Gathering precise data on cannabis impairment remains challenging due to inconsistent reporting and coordination between law enforcement and data analysis teams. Moreover, there is a continual lack of perceived risk of consequences for driving while impaired among cannabis users.

Regional Campaigns

SMEs offered several insights into the hurdles and strategies for effectively communicating about cannabis impairment and driving. These campaigns primarily aim to encourage safer behaviors among users. Various mediums, including media, webinars, and point-of-sale materials, are employed to enhance awareness. Legalization has heightened the normalization and acceptance of cannabis, even for driving post-consumption. Political disputes have prolonged legalization efforts, particularly around licensing, and current indifference in addressing the shortage of retail outlets may have delayed progress. This has contributed to users' limited understanding of cannabis laws, with illicit markets persisting in some regions and certain stores illegally selling or distributing cannabis.

SMEs voiced concerns about the casual attitude towards driving under the influence and the potential negative outcomes from overconsuming edibles. Campaigns should employ clear, straightforward language without humor. Authorities have worked with marketing firms to develop effective messaging. Advocacy efforts have transitioned from opposing legalization to focusing on safety and education. Despite these efforts, the SMEs reported that there are still too few Drug Recognition Experts to meet the goals.

SMEs suggest collaborating with the cannabis industry to craft messages and advocate for responsible usage. Utilizing simple, non-judgmental language about impairment and driving risks, avoiding humor or scare tactics, and consistently

repeating straightforward messages can help shift social norms. Employing digital platforms and content marketing to reach target demographics, avoiding authoritative language, and offering concrete avoidance plans for driving under influence are also seen as effective strategies. Sharing personal stories, appealing to users to avoid harming friends or family, and emphasizing real consequences like arrests and crashes can resonate significantly. Clarifying specific laws, risks, and detection methods, and incorporating feedback from focus groups and surveys, further bolster campaign effectiveness.

Summary and Next Steps

To prepare for surveying cannabis users about their usage and driving habits with the aim of developing targeted public safety messages, input from SMEs was sought. The findings from interviews with SMEs reveal several key themes concerning public awareness, myths, misunderstandings, and obstacles to effective communication about cannabis impairment and driving. These insights are pivotal for creating robust strategies to improve public safety and education. The subsequent phases of the study were designed, using feedback from the SMEs, in partnership with Quester. These phases include a survey of 2,000 cannabis users concerning their driving habits, and a survey of responses of 800 cannabis users to driving safety messages. The results from these surveys will be crucial in crafting effective communication strategies to reduce the risks associated with cannabis-impaired driving.

Phase 2: A Survey of 2,000 Cannabis Users and Driving Behavior

In order to understand how driving safety messaging will impact the cannabis using population, the composition, experience, motivations, and knowledge of that population must first be known. The decision to survey 2,000 cannabis users across eight states with varying degrees of cannabis legality is crucial for understanding the nuanced behaviors and decisions related to cannabis use and driving.

Cannabis legalization policies differ widely across the United States, creating a unique landscape for studying user behaviors. Some states have fully legalized recreational cannabis use, while others maintain strict prohibitions or allow only medical use. This variation provides a natural experiment for examining how legal frameworks influence cannabis consumption patterns and related driving behaviors. Prior studies have suggested that legalization may lead to increased cannabis use and normalization, potentially affecting the incidence of impaired driving (Pollini et al., 2015). However, the extent to which these legal changes impact users' decisions to drive after consumption remains unclear.

Research on how cannabis users decide whether or not to drive after use has revealed several key factors. Users often rely on self-assessment to gauge their impairment, which can be highly subjective and unreliable (Robbe & O'Hanlon, 1993). Factors such as the method of consumption, the amount used, and individual tolerance levels play significant roles in these decisions. Additionally, users' knowledge and perceptions of cannabis impairment laws vary, users' self-determination of cannabis-related driving impairment is not always accurate, and there are possible misconceptions that tolerance may offset the impact in frequent users (Marcotte et al., 2022).

Despite these insights, there is still a substantial gap in understanding the specific circumstances under which cannabis users choose to drive. Our survey aimed to fill this gap by collecting detailed data on users' behaviors and decisions in states with different legal statuses. By examining factors such as frequency of use, timing of use relative to driving, awareness of legal implications, and personal beliefs about impairment, we hope to gain a comprehensive understanding of the factors influencing cannabis-impaired driving.

The findings from this survey provide critical insights into how legalization impacts driving behaviors and informs the development of targeted interventions and public safety campaigns. By addressing the diverse contexts of cannabis use and legal environments, this research contributes to a more nuanced understanding of cannabis-impaired driving and supports the creation of effective, evidence-based policies and educational initiatives.

Method

The research team partnered with Quester, a market research firm, for questionnaire development and implementation. A mixed quantitative and qualitative study design was employed to assess patterns of use, product procurement, engagement in driving after cannabis use, beliefs about impairment for themselves and others, law enforcement interactions, and messaging preferences. Using findings from the SME interviews and literature review, the research team identified priority interest areas for the questionnaire. Multiple-choice questions along with open-ended items were created with probes moderated by Quester's proprietary artificial intelligence (AI) software. Quester programmed the questionnaire into content to be completed in approximately 25 minutes. A 'soft launch' was conducted in late November 2023 with the goal of obtaining roughly 20 completed surveys per state. The goal of the soft launch was to pause field surveying early in the process to ensure the collection program was working as expected, check for any respondent pain points, check the data for respondent understanding, and review open ended questions to make sure respondents were answering as intended and to adjust probing where necessary.

State Selection

A unique aspect to the study is the decision to survey cannabis users in regions of the country where legalization differs, capturing the major categories of (a) illegal cannabis states, (b) those where only medical cannabis is legalized, and (c) states with recreational use legalized. The aspect of decriminalization was also a factor when determining which states would be appropriate to survey. With Quester's help in determining adequate recruitment opportunity, the following states were selected: Florida, Louisiana, Michigan, Ohio, Oklahoma, Oregon, South Carolina, and Texas (see Table 2). States were evaluated on factors including per se laws and delta-8 THC and delta-9 THC regulations to ensure equally distributed features. Other characteristics of interest for comparison of the states included whether a state was considered an "island" of legality, whether the other states surrounding it geographically had contrasting legal status, and whether it was believed legalization was imminent (Werner-Simon, 2023).

Table 2. State Cannabis Characteristics based on 2021 SAMSHA NSDUH

State	Cannabis Legality Status	Decriminalization Status	% of Cannabis Using Adults**
Florida	Medical Only		15.5%
Louisiana	Medical Only	Decriminalized	19.8%
Michigan	Recreational	Decriminalized	25.8%
Ohio*	Medical Only	Decriminalized	20.5%
Oklahoma	Medical Only		25.5%
Oregon	Recreational	Decriminalized	29.8%
South Carolina	Illegal		16.3%
Texas	Illegal		13.3%

**Ohio legalized recreational cannabis use in December 2023 during the implementation of the survey; for the purposes of this Phase 2 survey, Ohio has Medical Only legalization status. In the subsequent Phase 3 study, Ohio is reclassified to Recreational Use legalization for analysis.*

***Percentage of Cannabis Using Adults is defined as at least one use in a year according to the 2021 SAMHSA National Survey on Drug Use and Health for each state by adults 18 years and older (SAMHSA, 2022).*

Participants

Participants were initially recruited to complete a brief "screener" questionnaire, which collected demographics, cannabis use history, and driving history; participants were not aware of the purpose of the study at the time of the screener questionnaire. Participants were identified by the marketing company Quester via partner organizations on a quota basis, using intermittent monitoring to obtain a sample of participants to match state demographics in terms of gender, age, ethnicity/race, income, and geographical region. The 2020 census was used to establish demographic targets. Inclusion criteria to complete the initial screener questionnaire included

residence in the state of interest, at least 21 years of age, and the ability to read English. Additionally, respondents needed to have a driver's license, access to a car, and drive at least one day per week. Finally, only respondents that were current consumers of cannabis (in any form, containing THC) were selected; this is defined by being a self-stated current user, consuming cannabis in any form within the past 3 months, and consuming cannabis in any form at least once every 3 months. Exclusion criteria included employment in the cannabis, marketing/market research, or advertising/public relations industries. Selected participants were prompted to complete the full survey immediately following the screener questionnaire, using quota sampling as described above. Once the goal number of participants in each use category was reached, further participants in that category were also excluded. For example, once >250 cannabis users in Florida completed the full survey, cannabis users in that state who initiated the screener questionnaire would not be prompted to complete the full cannabis questionnaire. Once the goal number of participants was met for all target cannabis use groups, the screener questionnaire and full survey were closed.

Weighting process. For the data from each state, several steps were taken to ensure that the final survey data was representative of the entire state with respect to gender, age, income, and Race/ethnicity. A demographic profile of each state was obtained via the U.S. Census website (data.census.gov), see Table 3.

Table 3. Target Demographic per State Based on Census

	FL	LA	MI	OH	OK	OR	SC	TX
Gender								
Male	49%	48%	49%	49%	49%	48%	48%	49%
Female	51%	52%	51%	51%	51%	52%	52%	51%
Age								
21–34	23%	26%	25%	25%	25%	27%	24%	28%
35–54	32%	33%	32%	30%	36%	35%	33%	36%
55+	45%	41%	43%	45%	39%	38%	43%	36%
Income								
Less than $50k	44%	47%	38%	40%	48%	31%	41%	40%
$50k–$99.9K	32%	30%	32%	35%	33%	32%	35%	30%
$100k or more	24%	23%	30%	25%	19%	37%	24%	30%
Race/Ethnicity								
White	52%	57%	75%	77%	61%	76%	62%	41%
Black	16%	33%	15%	15%	8%	2%	27%	13%

Hispanic	28%	7%	5%	5%	13%	11%	8%	39%
Asian	3%	2%	4%	2%	3%	7%	2%	6%
Other	1%	1%	1%	1%	15%	3%	1%	1%

As fielding was in progress, the demographic profile of all respondents entering the survey was monitored for each individual state to ensure that the demographics of everyone entering the survey (regardless of whether they qualified) were within +/− 5% of all demographic targets (i.e., a "rep sample"). Managing samples this way is cumbersome, takes time and slows down fielding, prompting Quester to discontinue rep click sampling but continue to manage the sample so that all those accessing the survey were within +/− 12% of all demographic targets; this was done so that when the final data was weighted, it was not too far off on any demographic point that would severely hinder data accuracy by giving too many respondents very high weights. In this test, three of the states had rep click end before fielding, while the other five were rep click for the entirety of their field time. For some states, fielding went smooth enough to maintain rep click throughout; for others, fielding was going slowly and thus rep click needed to end to speed up fielding. Upon field close, the researchers pulled a data file of "all access" data (completes, terminates, partials) and trimmed the data down to contain only each state's rep click data. Below are the counts for each state:

Table 4. Rep Click Data by State

	Final Completes	Rep Click Completes	Rep Click Terminates	Rep Click Partials	Total in Rep Click
Florida	253	200	714	48	962
Louisiana	251	251	1041	72	1364
Michigan	254	104	374	21	499
Ohio	255	255	1023	43	1321
Oklahoma	254	254	1047	70	1371
Oregon	251	251	861	66	1178
South Carolina	252	252	1139	80	1471
Texas	253	169	684	46	899
Total	**2023**	**1736**	**6883**	**446**	**9065**

For data analysis, a rake weighting process was used; with raking, a set of variables is chosen where the population distribution is known (in this study, gender, age, income, and race/ethnicity indication as listed above), and the procedure iteratively adjusts the weight for each case until the sample distribution aligns with the population for those variables. In the end, each respondent has one weight that is applied to all data

runs; this process ensures that the data more accurately represents the state population, and improves the validity of statistical tests run on the data.

Survey Implementation

Survey data was collected from November 28, 2023, to February 13, 2024. Once screened for inclusion and exclusion criteria (as described above) participants were asked to consent to their data being collected with anonymity and confidentiality. Survey items consisted of multiple choice, select all that apply, open-ended, and entered information items as determined by previous survey research studies, SME feedback, and research team survey development discussions, including input from Quester. Survey items and data collection type can be seen in Appendix B. Participants were free to discontinue the survey at any time; Quester determined at what point abandoned surveys were not viable for overall data collection and adjusted recruitment to fill quotas.

All study procedures were approved by the IRB at the University of California–San Diego.

Results

The following results indicate the responses of 2,023 survey takers, just over the target 2,000 respondents in the study aims. Findings of note will be described below. Results within each section and subsection below will be presented by the overall sample and state comparisons first followed by any relevant legalization status comparisons. Comparisons are reported in percentages of the sample, with subgroups percentages being compared to all other groups in an analysis using a z-test method; similar to a t-test comparison but for larger populations to take account for normal distribution. Significant differences are reported at a 95% confidence interval.

High-risk group analyses appear in a separate section. The results of qualitative data can be found in the discussion section due to the conversational and summative nature of those survey items. Discrepancies in the number of respondents for a particular topic can be attributed to (a) a branching question designed to collect information for whom that item applies, or (b) missing data in the case of skipping items or exiting a survey early.

Sample Demographics

Age. Overall, the average age for users taking the survey was 42.2 years. Current age of participants was compared by state and by age group; categories were 21 to 34 years, 35 to 44 years, 45 to 54 years, 55 to 64 years, and 65 or more years of age.

- Oregon has an overall greater average age of respondent than other states at 44.4 years, and a larger proportion of the 65 and older survey group than other states.
- In contrast, Texas has a lower overall average age of survey take at 39.6 years, including a statistically lower proportion of the 55 to 64 age group and a statistically higher proportion of the 35 to 44 age group.
- Non-legal states (SC and TX) had a larger proportion of 35 to 44 age group (35.7%) than the other legalization groups (legal, 29.5%; medical only, 29.1%), whereas the legal states (MI and OR) had a higher proportion of 65 and older users (13.7%) compared to the other states (medical, 9.7%; non-legal, 7.2%).

Gender. In the sample at large, 57.2% of respondents are male, 41.9% are female, and 1.0% (n = 18) identified as genderqueer or non-binary.

- The proportion of male-to-female respondents is larger in Florida, with males representing 63.5% of respondents and females only 36.0%.
- Conversely, the proportion of female respondents in Michigan is larger at 51.0% compared to male respondents representing 48.0%.
- Of the 18 non-binary respondents, each state has at least one individual represented in this category, with Oregon having the most at four.
- Female representation was higher in the legal states at 46.5%, compared to medical (40.8%) and non-legal (39.5%) states.

Race/Ethnicity. Note that these results represent a combination of multiple survey items regarding race and ethnicity (see Survey Outline); Other signifies a combination of those who responded to the race categories American/Indian, Pacific Islander, and 'some other race.' The breakdown of race/ethnicity for the sample is as follows: White: 56.9%, Black: 19.1%, Latinx: 18.5%, Asian: 2.9%, and Other: 2.6%.

- Compared to other states, Florida has a lower proportion of White respondents at 42.4%, while the Black and Latinx populations are higher at 24.2% and 30.3%, respectively.
- Louisiana and South Carolina, too, have larger proportions of Black respondents compared to other states at 35.9% and 32.3%, respectively, mirroring the makeup of the overall population in those regions.
- Michigan (76.9%), Oregon, (73.9%), and Ohio (67.9%) are overwhelmingly represented by White respondents compared to the sample average and other states.

- Not surprisingly, Texas has a statistically large proportion of Latinx respondents (45.0%); this trend also bears out in the legalization status groups in that the legal states have larger White representation and the illegal states have a smaller White representation and instead have larger Black and Hispanic representation.
- Oklahoma is the only state that contains more than a 2.0% representation of Other race respondents (13.1%), due to the proportion of American Indian/Native American respondents in the sample.

Income. Individual income for those surveyed indicated the largest proportion earning less than $49,999 (39.9%), followed by those earning $50,000 to $99,999 (36.6%), and those earning $100,000 or more (23.5%).

- Michigan, Oregon, and Texas all boast a higher proportion of respondents representing earned income of $100,000 or more, at 31.9%, 30.1%, and 29.6%, respectively, compared to the sample average and other states.
- Conversely, respondents from Oklahoma show only 15.0% of respondents in the $100,000 or more income category but have a significantly larger proportion in the $49,999 or less category, 52.0%.
- Incomes trend lower in medical-only states, where 45.1% of respondents have an income of less than $49,999. Legal and non-legal states have a relatively even split across the three income categories.

Household income is a little more evenly distributed among the whole sample with 33.0% earning less than $49,999, 34.6% earning $50,000 to $99,999, and 32.4% earning $100,000 or more.

- Again, Oklahoma had a larger proportion of respondents in the $49,999 or less income category (43.9%), as did Louisiana (39.9%).
- Michigan (39.9%), Oregon (44.0%), and Texas (40.0%) mirror the trend of personal income by having larger proportions of household income at $100,000 or more.
- Like personal incomes, household income in non-legal states tend to split evenly among income categories but, unlike personal incomes, the household income in medical-only states is also divided more evenly and it is the legal states that have a heavy representation in the $100,000 and above income category at 42.0% of the sample.

Marital Status. Overall, 54.4% of respondents are either married or living with a partner and 46.6% are either single or not married, including divorced, separated, or widowed.

- Oregon is the only state that has a significantly different makeup of marital status in that 61.5% of respondents are married/living with partner compared to 38.5% single/not married.
- No significant differences are represented in the legalization status groups.

Living Environment. Sample households contain on average 2.9 people, including the respondent. Proportionately households that have 1 individual comprise 18.9% of the sample, 2 members: 28.5%, 3 members: 21.0%, 4 members: 18.3%, 5 members: 9.4%, 6 members: 2.9%, 7 members, 1.7%, and 8 or more members represents less than 0.5% of the sample.

- Significant state-wise comparisons include a lower average for Ohio (2.7 persons) and a higher average for South Carolina (3.1 persons), with a subsequently higher proportion of households containing 4 members (25.9%).

Overall, households contain on average 0.8 children under the age of 18; 53.8% contain zero children and 46.2% contain more than one.

- Oregon has a larger proportion of households without children under 18 at 60.9%, while households in South Carolina and Texas contain a larger proportion of households with at least one child under 18 (52.4% and 53.8%, respectively), with Texas exhibiting a large proportion of households containing 2 children under 18 (22.7%) compared to the sample average (15.9%).
- Average household person count (3.1 persons) and average child count (1.0 child) is also larger in non-legal states, with a larger proportion having more than one child in the household at 53.1%.

Of the sample respondents, 37.0% rent their residence, while 58.3% own their residence, and 4.7% live with someone else (including family) rent-free.

- This last category is most prevalent in Oklahoma, where 7.0% of respondents live with others rent-free.
- Michigan and South Carolina contain a higher proportion of residence-owning respondents at 66.7% and 65.8%, respectively.
- In Ohio, 45.3% rent, a higher proportion than other states.

Overall, medical-only states have a larger proportion of renters at 39.5%, compared to legal (35.3%) and non-legal (33.5%) states. The largest proportion of respondents (46.9%) identify as living in a suburban area, compared to rural at 23.1% and urban at 30.0%.

- The proportions of suburban living are highest, statistically, in Michigan (60.5%) and South Carolina (55.2%).
- Louisiana and Oklahoma show larger proportions of rural living than the sample average at 29.9% and 33.8%, respectively.
- Urban living proportions are larger in Florida at 36.7% and Ohio at 36.3%, which results in a higher rate of urban respondents in the medical-only states (34.0%) compared to the other legalization groups.

Education. Education categories have been collapsed for analysis into 'high school or less' (including less than 12th grade completion, GED, and diploma), 'some college' (including some college credit but not degree and associate's degrees), 'bachelor's degree' (remaining a singular category), and 'graduate degree' (including master's, professional, and doctorate degrees). Those with a high school or less education represent 26.7% of the sample, those with some college represent 23.2%, those with a bachelor's degree represent 37.4% (the largest sample proportion), and those with graduate degrees represent 12.6%.

- The proportion of those with high school or less education is lower in Michigan (20.1%), Oregon (19.9%), and Texas (20.5%), and higher in Ohio (33.3%) and Oklahoma (37.3%) compared to the sample average.
- The proportion of graduate degree education is lower in Florida (7.7%) and Oklahoma (7.9%), and higher in Louisiana (17.1%) and Oregon (18.1%).
- The distribution of respondents in the some college and bachelor's degree categories is not significantly different across the states sampled.
- Medical-only states have a larger proportion of high school or less educated respondents (32.2%), states where cannabis is not legal have a higher proportion of bachelor's degree educated respondents (26.8%), and legal states have a higher prevalence of graduate degree educated respondents (16.3%) compared to the other categories.

Employment. Employment designations have been collapsed for analysis: 'employed' includes full- and part-time employment, 'student' includes full- and part-time students, and the 'military,' 'retired,' 'full-time parent/homemaker,' and 'unemployed' categories are all remain singular. The majority of respondents (75.0%) are employed, either full- or part-time. The remaining respondents are composed of 11.9% retired, 7.4% unemployed, 3.9% homemaker, 1.7% student, and only one individual in the whole sample identifying as military (0.1%).

- Ohio's proportion of employed respondents was lower than the average at 69.0%, reflected in a statistically higher proportion of unemployed respondents at 10.8%.
- Florida likewise reported a higher proportion of unemployed respondents at 10.6%.

- All other employment categories were not significantly different in distribution across states.
- Medical-only states had a slightly higher rate of unemployment in the sample compared to the other state groups at 8.8%.

Cannabis Use

Prevalence: Based on the 9,057 participants who completed the initial section of the survey across the eight states, cannabis prevalence was calculated for use in the last 3 months. There were no significant differences in prevalence by legal status of states (see Table 5).

Table 5. Prevalence of Cannabis Use from Surveying Eight States

Prevalence	Total	FL	LA	MI	OH	OK	OR	SC	TX
Current User *	**33%**	35%	31%	35%	32%	33%	35%	30%	35%
Survey Criteria **	**26%**	30%	24%	27%	26%	24%	29%	23%	30%

**Use in last 3 months.*

***Use in last 3 months in those participants with a driver's license, access to a car, and driving at least one day a week.*

Most Recent Use. Keeping in mind that inclusion of participants was determined by cannabis use (in any form) within the past 3 months, only information about use within that timeframe is reported. Of sample respondents, 50.2% indicated that they had consumed cannabis the same day as responding to the survey, 37.8% responded that they had consumed within the prior week, 9.0% within the prior month, and 3.0% within the prior 2 to 3 months. The proportion of use that same day was statistically higher in Oklahoma at 58.2% and statistically lower in Oregon at 42.9%. Overall, medical-only states had a higher proportion of the same day use at 52.9%, likely owing to the need for cannabis as a daily medical treatment within that population.

Use Frequency. Within the sample at large, 44.1% of respondents consumed cannabis multiple times a day and 17.5% consumed once a day, 14.5% of respondents consumed 4 to 6 times a week, 13.8% consumed 1 to 3 times a week, 7.9% consumed 1 to 2 times a month, and 2.2% consumed once every 2 to 3 months. Those in Oregon had a lower proportion of consumers using multiple times a day at 36.9%, compared to the sample average. Michigan had fewer once-daily users at 12.5%, while Louisiana had more at 23.9%. Interestingly, Oklahoma had no respondents that consumed in the once every 2 to 3 months category, meaning all respondents consumed at least 1 to 2 times per month. As

with recent use, medical-only states had a higher rate of multiple uses per day (46.4%) as well as at least once weekly uses (91.8%).

Product Use. As a reminder, participants were told that for this study, all cannabis use indicated is cannabis that contains THC. Participants were asked to select any product use that applied to them. Within the whole sample, 68.6% consume dried flower, 64.1% consume edibles (or capsules), 45.3% vape concentrates, 23.1% dab concentrates, 22.6% consume oils/tinctures, 18.2% consumed topicals/transdermals, 13.9% consumed beverages, and 17.8% consumed other forms of THC. Dried flower use was higher in Oregon at 76.1% as was topical/transdermal use at 24.1%, whereas edibles were consumed in greater proportions in Michigan at 73.9%. Florida respondents consumed oils/tinctures (28.5%) and beverages (18.2%) at a higher prevalence; Texas likewise consumed beverages statistically more than the sample prevalence (23.3%), which contributes to a statistically larger proportion of beverages consumed by the non-legal state group (17.4%). Interestingly, 31.1% of non-legal state respondents indicated using 'other forms of THC' than the categories listed, nearly double the sample's prevalence.

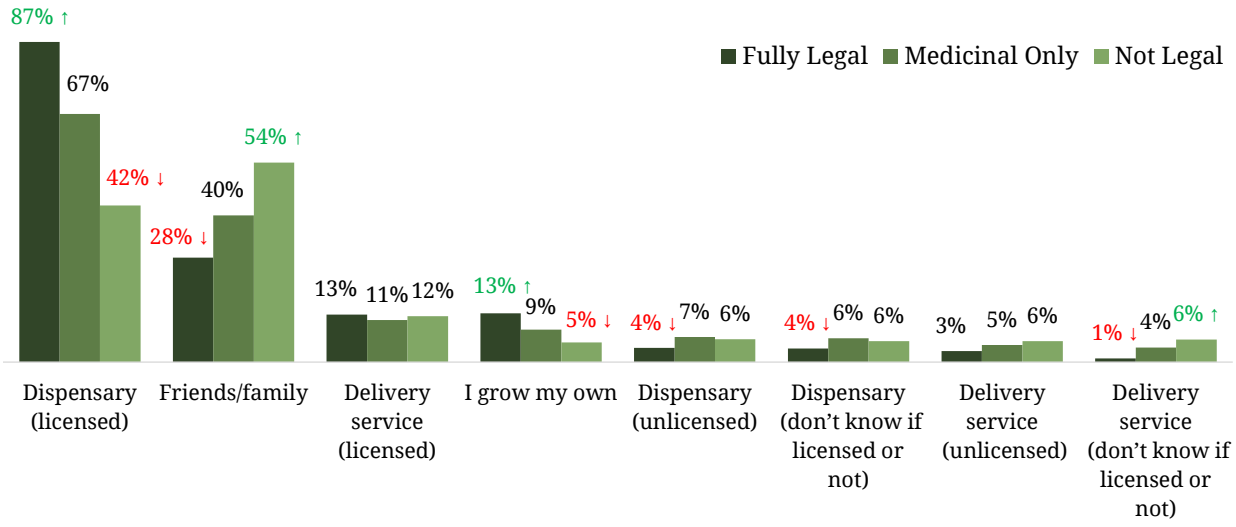
Reason for use. Respondents were asked for what reasons they currently used cannabis, being given the options 'medicinal purposes,' 'recreational purposes,' 'religious or spiritual purposes,' or 'other.' Respondents were allowed to choose as many categories as applied to their cannabis use. Of all respondents, 67.3% used medicinally, 71.1% used recreationally, and 41.2% of respondents used cannabis for both purposes. Medical use is statistically higher in Oklahoma, where the prevalence is 85.9%, and statistically lower in Michigan and Texas (59.4% and 60.1%, respectively). Recreational use, unsurprisingly, is highest in the legal states of Michigan (81.6%) and Oregon (79.1%). Across all states, 11.4% of respondents use cannabis for religious or spiritual reasons.

Social users. When asked who else in their social circle uses cannabis, respondents indicated their friends at 77.3% and family members at 57.3%. Cannabis use among spouses/partners and coworkers/colleagues were both under 40.0%. Less than 6.0% of respondents indicated that no one in their social circle uses cannabis. In comparing legalization groups, those in recreational states indicated to that their family also uses cannabis at a higher frequency (62.2%).

Cannabis source. Respondents indicated from which source they normally obtained cannabis (Figure 1). Most (73.0%) get their cannabis from a dispensary and 65.8% obtain it from a dispensary that they identify as licensed. This is higher in some of the legalized states like Michigan (86.5%), Oregon (86.6%), and in the medical-only state, Oklahoma (86.4%). Cannabis purchasing from an unlicensed dispensary or dispensary with unknown licensing is highest in Louisiana (10.5% and 9.0%, respectively) compared to the rest of the sample (5.9% and 5.6%, respectively). Those in Louisiana, South Carolina, and Texas also have a higher prevalence of obtaining cannabis from friends or family (48.6%, 54.9%, 52.9%, respectively), compared to the rest of the sample at 40.3%. These

results mirror the results from the legalization groups and can likely be attributed to the availability of dispensaries in each type of state.

Figure 1. Where Consumers Obtain Cannabis



From what source(s) do you normally obtain cannabis? Please select all that apply.
Base: Fully Legal = 509, Medical-only = 1009, Non-Legal = 505
Base: In a Non-Legal State + Gets Their Cannabis from a Licensed Dispensary = 191
Statistical comparisons are made across group columns, where one subgroup is compared to other subgroups combined; green numbers indicate significantly higher values, red numbers indicate significantly lower values at the 95% confidence level.

Those in South Carolina and Texas were asked if they had ever traveled to another state to purchase cannabis products; results showed approximately half of respondents (48.8%) did travel to another state and this was comparable between the two states. Of those respondents living in non-legal states, half of users (55%) knew it was not legal to transport the product back to their state, 23% thought it was legal, and 20% were not sure. Of those who did travel to another state to purchase because they were living in a non-legal state, 50% were aware it was not legal.

Descriptors. In indicating how they would describe their cannabis use, respondents were asked to select as many of the following as applied to them:

- Helps my mind
- Helps my body
- To relax in social situations
- Experienced
- Casual
- Long-time
- Frequent

- I treat specific symptoms
- Committed
- Cautious
- Experimental
- Reluctant (no other effective options available)
- Other
- None of the above

The descriptor of highest proportion in the sample was 'helps my mind' at 64.5%; this was statistically lower in Michigan (54.9%) and higher in South Carolina (71.1%). The next most common use descriptor was 'helps my body' at a prevalence of 62.3%; this was likewise statistically higher in South Carolina at 68.4%. Those in Oregon indicated that they were less likely to describe themselves as 'casual' consumers (33.2% compared to the sample prevalence of 43.1%) but more likely to consume to treat specific symptoms (43.8% compared to the sample prevalence of 36.2%). Florida respondents identified in larger proportion to the sample (in parentheses) as being 'long-time' consumers at 48.3% (42.1%), 'frequent' consumers at 43.7% (36.6%), and 'experimental' users at 12.8% (7.4%). Consumers described themselves as 'cautious' more often in Ohio (19.1%) and less often in Louisiana (9.5%), compared to the sample as a whole (14.1%). In states where cannabis is legal, the prevalence compared to other legalization groups was statistically lower when respondents described themselves as using cannabis to 'help their mind' (57.8%), 'help their body' (56.8%), and 'to relax in social situations' (44.4%). Respondents from medical-only states identified at a statistically higher frequency that they described themselves as 'frequent' users (39.7%) and to 'treat specific symptoms' (38.9%).

Driving behavior

Driving frequency. A total of 57.8% of respondents indicated that they drive daily; however, Oregon respondents had a significantly lower proportion at 48.8%. A total of 27.2% of respondents indicated they drive 4 to 6 days per week, with Michigan's proportion significantly higher at 34.1%. A total of 12.5% of respondents indicated they drive 2 to 3 days per week; Oregon respondents had a higher proportion at 19.9%, contrasting the low daily driving. Finally, only 2.5% of respondents indicated they drive only one day per week; the lowest of these was in Oklahoma with only one respondent.

Driving after cannabis consumption, wait times, and impairment. A total of 84.8% of consumers indicated that they drive the same day that they consume cannabis, compared to never driving after use as defined by either waiting 8 hours or more and sleeping or not the same day. The prevalence is statistically higher in Texas (89.9%) and lower in Michigan (77.5%) and Oregon (79.4%). The percentage of respondents who

drove the same day is lower in legal states (78.4%) compared to the other categories (medical, 86.5%; non-legal, 87.9%).

Using a five-point Likert scale from 'much worse' to 'much better,' respondents rated their ability to drive when recently having used cannabis; the center node of the scale was 'the same' and the option 'not sure' was also available. It is important to note that the team did not define what 'recently' meant when it came to the timing of cannabis use, it was left to the survey takers to interpret. The majority of cannabis users believed they either drove the same (46.9%), a little better (14.7%), or much better (19.4%). This was even more prevalent in Florida and Louisiana where 25.3% and 25.1% of respondents, respectively, believe they drive much better after recent cannabis use. Respondents in Oregon indicated they drive a little worse (14.1%) or much worse (5.9%) compared to the sample prevalence (9.7% and 3.2%, respectively). These results are also reflected in legal states having a higher percentage of 'worse' ratings compared to other groups (17.4%) and medical-only states believing they drive 'much better' (22.8%).

Respondents also indicated how often they would drive if they needed to go somewhere and consumed cannabis in varying amounts prior to their movement to that location. A total of 36.4% of respondents indicated that they would drive 'most of the time' (more than 50.0%) if they needed to be somewhere within an hour or less; for the same metric, 49.0% would drive within 2 to 3 hours, 63.3% within 4 to 5 hours, and 69.0% within 6 hours or more. In each time window, Oregon respondents were consistently (and significantly) opting for a more cautious driving-after-use pattern; less than 29.0% drive most of the time within an hour, 10.7% never consume if they know they need to drive within 2 to 3 hours (compared to 6.9% in the whole sample), and 56.4% drive most of the time within 4 to 5 hours. Respondents of Oklahoma likewise display more cautious behavior with 17.7% opting to take alternative transportation within an hour of use, compared to the larger sample at 12.7%. Non-legal states have a statistically higher proportion of respondents who will ever drive (including most of the time, some of the time, and every once in a while) within an hour of cannabis use at 79.5%, compared to fully legal states (72.6%) and medical-only states (74.4%).

Respondents were asked to identify any of the following reasons used to determine how long they need to wait to drive after consuming cannabis:

- What other substances I've used
- Weather
- If there are children involved
- If I am alone
- How far I'm going
- Whether I feel impaired or not
- Where I am driving is known for a lot of traffic stops and I might get caught
- How accessible alternative transportation is
- If there is a "designated driver"

- Whether I think I might get pulled over
- I'm familiar with where I am going
- Other (specify)
- None

Full sample respondents indicated their feeling of impairment was a factor in deciding to drive after consumption with highest prevalence at 56.8%. Other factors chosen often included how far respondents were traveling (43.2%), how familiar they are with their route (36.2%), whether children are involved (35.7%), and the weather conditions (34.5%). Additionally, 7.2% of respondents indicated that there are no factors they consider in determining how long they wait before driving after consumption. Respondents in Florida have a lower prevalence of using impairment as a factor at 50.4%. Respondents in Oregon consider how accessible alternative transportation is at a higher prevalence (25.2%) compared to the sample as a whole (18.9%). Respondents in Texas consider whether they think they may get pulled over at a higher prevalence (24.6%), compared to the total sample (18.6%). This is likewise reflected in a statistically higher prevalence of getting caught at a traffic stop (20.5%) or getting pulled over (23.9%) in the non-legal states.

Respondents were asked to identify all items that applied from the following list to indicate how to determine if they themselves are too impaired to drive:

- Slurred speech
- Trouble with balance
- Slow reaction time
- Trouble with recall
- Self-test via a phone app
- Friends/family
- By the amount I consumed
- Drowsiness
- Unusual mood or affect
- Heightened emotions
- Brain fog/not thinking clearly
- Other

Overall, the factors in determining impairment with the highest proportion of respondents include drowsiness (53.8%), brain fog (51.0%), and slow reaction time (50.4%). Florida respondents consider brain fog as a factor in lower proportion (43.5%), whereas Oregon respondents consider trouble with recall as a factor in higher proportion (29.1%, compared to the whole sample at 19.9%). Across legalization groups, factors in determining one's own impairment were fairly consistent. The same factors were presented to respondents as a way to indicate if others were impaired. Resulting trends were roughly the same. However, respondents tended to indicate factors at a higher proportion when judging others than themselves, especially for more visible

characteristics like slurred speech (21.7% for self, 39.3% for others), trouble with balance (36.5% for self, 43.2% for others), and unusual mood (24.7% for self, 32.2% for others). This was especially true for the non-legal states, where slurred speech (44.5%) and unusual mood (36.5%) were factors for determining someone else's impairment at a higher percentage than other state groups.

The 15.2% of respondents who do not drive the same day stated that they do not feel safe driving after using cannabis or alcohol so they use alternative transportation or only use after they are home for the night, as illustrated by the following open-ended responses:

> *I never drive the same day after consuming cannabis because it is not legal or safe to do so. I know that it stays in my system for a long time and affects me for a long time so I wouldn't put myself or anyone else at risk by trying to drive anywhere.*

> *Although it's a very small fraction, it's better safe to not drive at all. I am in the comfort of my home and safe. I notice a lot of reckless driving and most of the time I assume that it's because an individual is under of influence of cannabis, as I typically smell it when the reckless driver is passing by. I feel I am safe when it's just myself and husband in the comfort of our home.*

Alcohol and driving. Respondents were asked about wait times after drinking alcohol before driving; this was posed the same way as cannabis use and wait time (as previously discussed). In thinking about times where they needed to go somewhere and had drunk alcohol an hour or less before, respondents indicated driving after drinking with a prevalence of 56.5%; this included 'most of the time,' 'some of the time,' and 'every once in a while.' This prevalence was statistically higher in Texas respondents at 63.9%. Thinking specifically about when respondents choose to drive 'most of the time' (more than 50.0%) if they drank prior to driving, they do so at a prevalence of 13.2% within an hour, 18.9% within 2 to 3 hours after drinking, 29.7% within 4 to 5 hours after drinking, and 39.0% within 6 or more hours after drinking. These trends were consistent when examining differences in legalization status. It is important to keep in mind that the quantity of alcohol consumed in these scenarios is not specified.

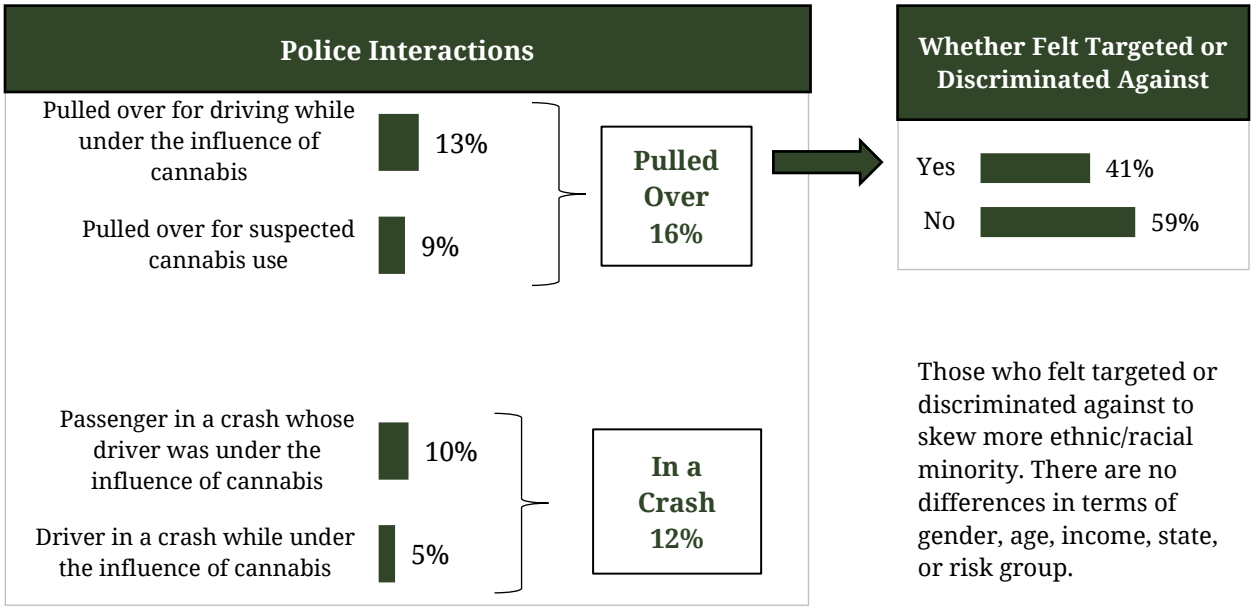
Law enforcement

In thinking about interactions with law enforcement, respondents were asked to indicate if they believed that, hypothetically, a police officer could detect if they were under the influence of cannabis when being evaluated. Only 29.2% of respondents believed a police officer could detect the influence of cannabis, while 46.7% did not believe they could, and 24.1% were unsure. This pattern was fairly consistent across all states and state groups.

Respondents also indicated whether or not they had experienced any actual interactions with police related to driving and cannabis use; resulting percentages are indicative of the 447 responses provided, remaining respondents are assumed to have not had these experiences. A total of 12.9% of respondents had been pulled over for driving while under the influence of cannabis, while only 8.5% had been pulled over specifically for suspected cannabis use. Only 5.3% of respondents were the driver in a crash while under the influence of cannabis, while 9.6%, nearly double, were the passenger in a crash whose driver was under the influence of cannabis. For respondents in states where recreational cannabis use is legal, the prevalence for these incidents is lower overall.

Among the approximately one in six users (16.4%; n = 331) who reported having been pulled over, about half (51.7%) were evaluated; however, the percentage was significantly lower in Michigan at only 30.0%. No other significant state group differences were observed for roadside evaluation, evaluator type, or type of test given. The evaluations were mainly physical (67.2%) or behavioral assessments (60.0%), and in 97.1% of cases, the officer who pulled them over did the evaluation. Saliva tests were conducted in 17.0% of the stops, blood tests in 14.0% and urine tests in 14.0%. Most drivers were eventually let go without further action (53.8% immediately and 32.2% after being detained), despite the fact that four in five respondents report that they were impaired at the time—30.8% said they were very or extremely impaired and 49.8% said they were somewhat or not very impaired, while 17.5% believed themselves not impaired at all. A citation was issued in 8.2% of the cases, and an additional 5.2% were arrested. The proportion of users who were arrested was much higher in South Carolina (12.6%) and Texas (11.1%). This trends, as expected, with their grouped prevalence (12.0%) given the lack of legal status in those states.

Figure 2. Respondents' Interactions with Police While Driving Under the Influence of Cannabis



Respondents were asked to gauge whether they felt targeted or discriminated against during the times they were pulled over (Figure 2). Of the 331 who indicated they had been pulled over, 41.4% believe they had been targeted or discriminated against; this was highest in South Carolina at 50.8% and lowest in Oregon at 30.7% (though not significantly different from the whole sample).

Half of cannabis users do not believe a police officer can detect if they are under the influence of cannabis. Those respondents report only using a small amount if they know they have to drive and not feeling impaired, so they do not think there are noticeable effects. Some participants reported having been pulled over in the past while high and that the officer gave no indication that they could tell they had been using cannabis. They do not feel that they look or act noticeably differently after they have used cannabis.

The other half of respondents are split between those who think an officer could detect impairment (29%) and those who are unsure (24%). Those who think the officer could detect impairment say they do act differently after using, and have very clear indicators when they get high: their eyes get red, dilated, and/or a glassy, glazed over look; they have a noticeable cognitive impairment where they have less focus and poor short-term memory, as well as slower response time to questions or directions; and they may also have slurred speech or an inability to stop laughing. Some also report that they become noticeably more paranoid, jumpy, or jittery while under the influence.

Knowledge and Attitudes

Legalization status. Respondents were asked to describe the status of legalization of cannabis use in their state given the following options:

- Fully legal
- Legal for medicinal use, illegal but decriminalized for recreational use
- Legal for medicinal use, illegal for recreational use
- Illegal but decriminalized for all uses
- Fully illegal
- Not sure

As a reminder, refer to the Table 2 as to which states are reflected in these categories at the time of the first survey. For states that are fully legal, 92.1% respondents from Michigan and 93.1% of Oregon respondents correctly identified fully legal. Respondents from Ohio indicated their status as fully legal with an 81.6% prevalence; this would have been likely true for many respondents but not necessarily all given that legalization at the recreational level occurred midway through data collection. Ohio respondents also indicated that their state was legal for medical use, but illegal for recreational use (6.4%) or decriminalized for recreational use (8.4%).

For fully illegal states, only 35.1% of South Carolina respondents and 20.2% of Texas respondents correctly indicated the states' fully illegal status (see Table 6).

Table 6. Legalization Beliefs in Fully Illegal States

	Texas	South Carolina
Cannabis use is fully legal in the state	17.4%	16.2%
Legal for medical use but illegal for recreational use	14.3%	18.3%
Legal for medical use and illegal but decriminalized for recreational use	16.1%	29.7%
Illegal but decriminalized for all uses	8.2%	11.3%
Unsure	8.9%	5.2%

In fact, compared to the whole sample prevalence (3.4%), Texas and Louisiana (6.2%) had statistically larger instances of respondents unsure of the current cannabis legalization status in their location. Except for Ohio (previously mentioned), the states for which only medical cannabis is legal mostly indicated the correct legalization status for their state but did not differentiate well whether or not recreational use was decriminalized (see Table 7).

Table 7. Legalization Beliefs in States with Legal Medical Use and Illegal Recreational Use

	Florida	Louisiana	Oklahoma
Legal medical use and for illegal recreational use	29.5%	23.5%	38.6%
Legal medical use and illegal but decriminalized for recreational use	39.3%	37.9%	34.8%
Fully legal	26.2%	22.4%	23.2%
Fully illegal	1.9%	4.9%	0.9%
Unsure	2.6%	6.2%	2.5%

Both fully legal and medical only groups seem to understand the state of legalization at a high prevalence (with some ambiguity in the medical only group due to Ohio's change in status), whereas the distribution of responses to legal status from the non-legal state respondents is scattered (see Table 8).

Table 8. Respondent Knowledge of Cannabis Use by State Legalization Status

	Legalization Status*		
	Both Recreational and Medicinal (MI, OR)	**Medicinal Only (FL, LA, OH, OK)**	**Not Legal (SC, TX)**
Fully legal	93%↑	38%↓	17%↓
Legal for medicinal use, illegal but decriminalized for recreational use	4%↓	30%↑	22%
Legal for medicinal use, illegal for recreational use	2%↓	24%↑	16%
Illegal but decriminalized for all uses	1%↓	1%↓	10%↑
Fully illegal	0%↓	2%↓	28%↑
Not sure	0%↓	3%	7%↑

Which of the following describes the legal status of adult cannabis use in the state where you live?

Weight: Raked Weight; sample size = 2023; effective sample size = 1790 (88%)

**For this analysis, Ohio is still considered Medicinal only though their Recreational legal status was adopted midway through data collection.*

Statistical comparisons are made across group columns, where one subgroup is compared to other subgroups combined; green numbers indicate significantly higher values, red numbers indicate significantly lower values at the 95% confidence level.

Cannabis. Respondents were asked about their knowledge of the following cannabis related topics:

- THC strength of various products
- Appropriate amount to consume
- Source of cannabis—how/where it was grown/made
- Cannabis laws in your state regarding possession/use
- Cannabis laws in your state regarding driving

The ratings of knowledge ranged from 'not at all knowledgeable' to 'extremely knowledgeable' on a five-point Likert scale. All states showed the same general pattern as the sample at large, indicating the respondents considered themselves either very knowledgeable or extremely knowledgeable about each topic listed at a prevalence between 54.7% (source of cannabis) to 70.9% (appropriate amount to consume). When grouped by legalization status, the differences in knowledge of appropriate amount to consume became significant with legal states indicating a lower prevalence (66.4%), medical-only states indicating a higher prevalence (73.5%), and non-legal states in the middle (70.0%).

Respondents were asked whether there is a legal (per se) limit for the amount of THC allowed in the system/blood while driving in the state where they live, and 47.2% of respondents were unsure (only Ohio had a per se limit for cannabis at the time; South Carolina and Texas were excluded from this analysis because of their illegal status, see Table 9). For those who responded (n = 1419), 28.0% indicated there was a per se limit where they live, with Ohio respondents being the most sure (36.5%) and Oregon respondents being the least sure (19.4%). For those who indicated there is a limit (n = 398), 75% indicated that they did not know what amount constituted the legal limit for THC while driving, just that there was one. For the 24% who indicated they knew the specific amount of THC specified by the legal limit, answers varied widely and included "8%," "24g," "2 hours," "2 ounces," "I think it's about 50", and "It is not the amount but one's reflexes while driving." Only two individuals from Ohio correctly reported the state's per se limit of 2ng and two individuals from Oregon identified a per se limit of 5ng, which pertains to the neighboring state of Washington.

Table 9. Respondent Knowledge of THC Per Se Limit in Ohio and Other Cannabis-Legal States

	Ohio (per se limit of 2ng THC)		**Other States (no per se limits; SC & TX excluded)**	
	%	**Amount**	**%**	**Amount**
Yes	36.5% ↑	84 ↑	26.4%	398
No	13.0% ↓	30 ↓	27.1%	321
Not sure	50.5%	116	46.6%	553
Total		**231**		**1188**

In the state where you live, is there a legal limit for the amount of THC you can have in your system/blood when driving (e.g., something similar to blood-alcohol concentration for alcohol and driving)?

Weight: Raked Weight; sample size = 1413; total sample size = 2023; 610 missing; effective sample size = 1256 (89%)

Statistical comparisons are made across group columns, where one subgroup is compared to other subgroups combined; green numbers indicate significantly higher values, red numbers indicate significantly lower values at the 95% confidence level.

Only those in states where all THC use is illegal were respondents asked whether they believe it is legal to purchase and transport a closed container of cannabis back to their home, despite it being illegal in their home state. Respondents from Texas (29.2%) seemed surer of this than those from South Carolina (16.9%), while those in South Carolina seemed more unsure (24.3% compared to Texas, 15.3%). Overall, however, more than half of the respondents from both states believed the statement to be false (55.4% for the combined sample) and only a handful (n = 8) believed it 'depends on the circumstances.'

Users indicated that they would like to have guides for cannabis and driving, similar to that for alcohol, addressing how much they can take before driving and still be safe, how long they should wait, and how long cannabis stays in their system.

Attitudes. Each state's respondents, excluding South Carolina and Texas, were asked to what degree people close to them had changed their opinion on cannabis use since legalization, whether recreational or medical. The majority (79.0%) believed people close to them were either somewhat more or much more accepting of cannabis use since legalization. Very few (<2.0%, n = 21) indicated that opinions on cannabis use became either somewhat less or much less acceptable since legalization. About one in five (19.6%) believed opinions had not changed at all; this was more prevalent in Ohio (26.6%) and less prevalent in Oklahoma (14.8%).

Community Attitudes. All respondents were asked to identify how the community in their region feels about adult cannabis use, regardless of legalization. While most communities (57.3%) are accepting, either mostly or fully, this is less so in the states where cannabis is illegal, South Carolina (41.6%) and Texas (46.9%), and much more in Oregon (75.0%) where cannabis is fully legal. These trends are also reflected in the difference in prevalence of acceptance between legal states (where it is higher) and non-legal states (where it is lower). When asked why their community may have negative attitudes about adult cannabis use, 'they believe it is a gateway drug' was the most common answer at 53.3%. Ohio respondents identified factors at a much higher proportion than other states, including the aforementioned gateway drug concern (81.2%), 'they think it leads to increased crime' (73.7% compared to the larger sample prevalence of 39.9%), and 'they aren't knowledgeable about cannabis use' (57.4% compared to the larger sample prevalence of 33.6%). This is an important trend given that the status of legalization of recreational cannabis use in Ohio changed midway through data collection.

Law Enforcement Attitudes. The respondents' perceptions of law enforcement attitudes were also measured, with 39.4% of respondents saying they felt that law enforcement was accepting of adult cannabis use. Slightly less respondents (32.9%) felt that law enforcement included a mix of those who were accepting and those who were not, 18.5% felt law enforcement was against adult cannabis use, and 9.1% were unsure how law enforcement felt. Not surprisingly, perceived acceptance from law enforcement was higher in Oregon (54.5%), a fully legal state, and perceived disapproval from law enforcement was higher in South Carolina (32.8%) and Texas (32.1%). In examining why law enforcement might have negative attitudes toward adult cannabis use, respondents stated that 'they believe it will lead to more impaired driving' (49.2%) and 'there's a stigma attached to cannabis use' (48.6%) most often as factors. These beliefs were indicated in larger proportions in Michigan (impaired driving, 72.3%; stigma, 72.1%) and Ohio (impaired driving, 72.8%; stigma, 64.9%), and in smaller proportions in Texas (impaired driving, 32.8%; stigma, 37.2%). These patterns also bear out in the legalization subgroup analyses where legal states show that respondents believe stigma and impaired driving are more prevalent concerns for law enforcement, and non-legal states indicated those concerns at a lower proportion. Although this may seem counterintuitive, it suggests that users in states where cannabis use is legal may be more

attuned to the specific concerns of law enforcement, whereas consumers in a state where use is illegal are less aware of specific law enforcement concerns and perceive the illegality itself as the negative aspect of law enforcement's attitude toward adult cannabis use.

Health

Overall health. In rating their overall general health (not necessarily related to cannabis use), 26.9% indicated 'very good' health; this was statistically higher in Florida and Louisiana at 32.8% and 35.2%, respectively, and lower in Oregon at 18.6%. Respondents in Oregon, however, had a higher prevalence of 'good' health ratings than the sample as a whole, 53.9% compared to 46.2%. This trend was reflected in the state groups as well, with legal status states having a higher 'good' health percentage and medical-only states having a higher 'very good' health percentage. Only 5.0% (n = 101) of respondents indicated having either 'poor' or 'very poor' health.

Medical cannabis. In total, 88.1% of respondents indicated that they use cannabis to address/ease at least one medical condition; this is higher in Oklahoma, 93.3%, and lower in Texas, 81.9%. The most common conditions indicated were stress (51.8%), anxiety (50.5%), sleep problems (44.6%), and pain, both acute and chronic (42.5%). There were no notable differences when comparing condition treatment in the legalization status groups.

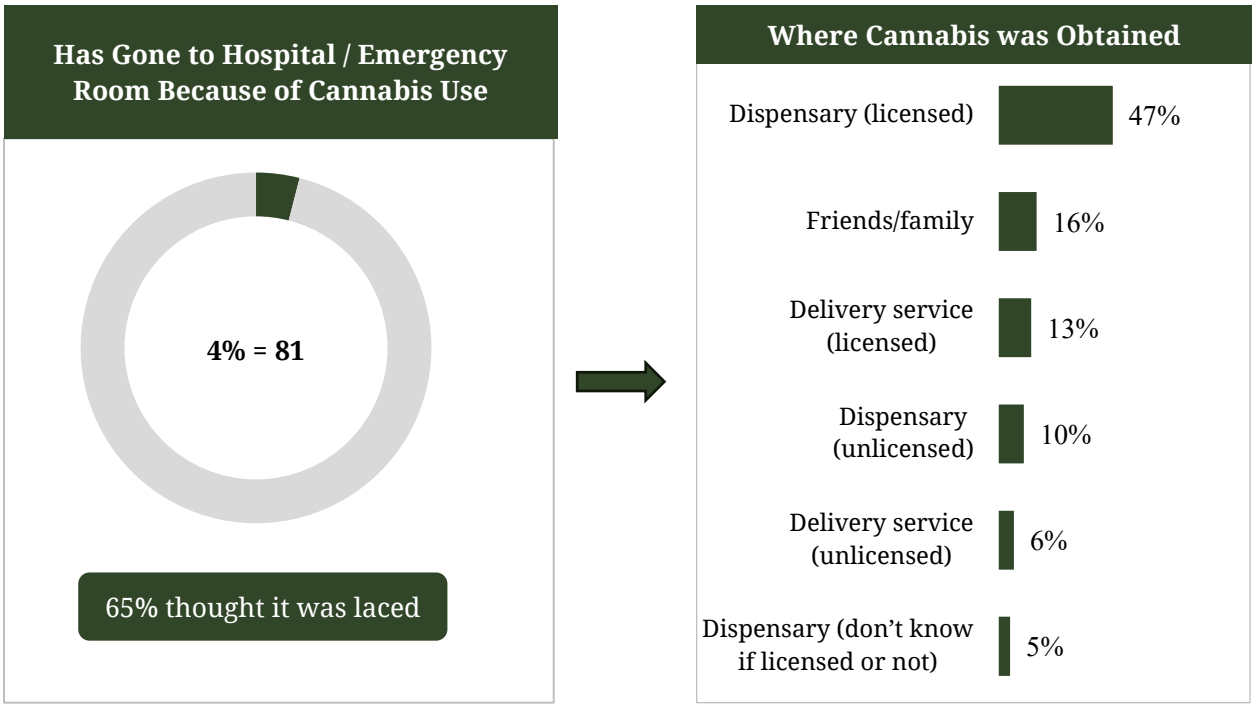
Effects of cannabis. A list of potential side effects of cannabis use was provided to respondents to identify which ones they had experienced:

- Hunger/the munchies
- Fatigue/sleepiness
- Brain fog
- Lack of motivation
- Paranoia
- Mood changes
- An altered sense of time
- Memory loss
- Persistent cough
- Weight gain
- Changes in visual or auditory perception
- Impaired body movement
- Nausea and/or vomiting
- Cannabis dependency
- Hallucinations/delusions
- Weight loss
- Other

- None; no unwanted side effects

Respondents indicated with a prevalence of 79.2% that they had experienced at least one unwanted side effect from cannabis use; this was statistically higher in Oregon at 87.6%. The most prevalent of these were hunger/munchies (35.7%), fatigue/sleepiness (29.7%), brain fog (23.1%), lack of motivation (21.9%), and paranoia (21.8%). Prevalence trends held relatively consistent across all states. Across legalization groups, lack of motivation and paranoia were more prevalent responses in legal states. A small proportion (4.0%; n = 81) of respondents in the sample indicated going to the hospital or emergency room because of cannabis use; of these, most (59.8%) reported obtaining the cannabis from a licensed dispensary or delivery service. More importantly, of the 67 respondents asked, 65.5% believed the cannabis that sent them to the hospital/ emergency room was 'laced' (see Figure 3).

Figure 3. Cannabis Related Hospital Visits



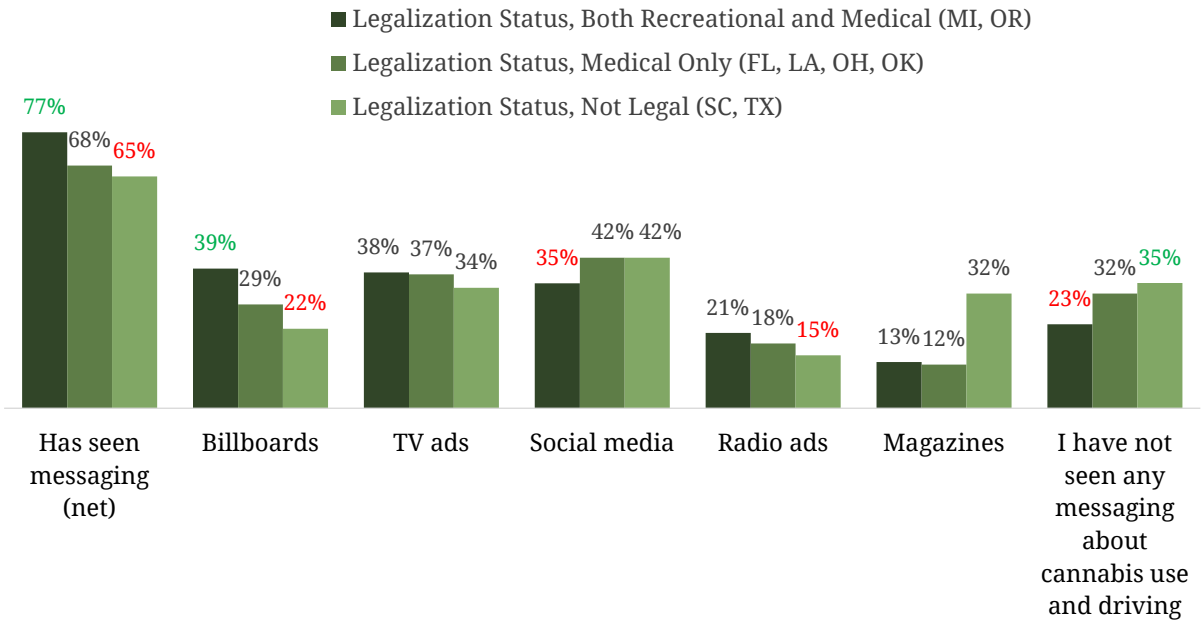
Other substances. The survey asked respondents to identify whether their cannabis use affected their use of other substances including alcohol, tobacco, prescription drugs, non-prescription drugs (illicit), or over-the-counter medications. Alcohol use most often stayed the same in 33.6% of the sample, was used less in 29.3%, and not currently used by 24.6%. Alcohol use only increased in 3.6% of the sample at large; however, this was significantly more in Texas at 7.9% and, therefore, the non-legal states combined at 10.6%. A similar trend can be seen with the effect of cannabis use on tobacco use, except those who use cannabis did not use less tobacco to the same degree, at only 16.2%.

Prescription and non-prescription drug use trended similarly, as well, but with more people either not currently using (55.2%) or having never used those substances (72.9%).

Messaging

Respondents were asked if they had seen any messaging related to cannabis use and driving (see Figure 4). Messaging on social media was most prevalent, with 40.3% of respondents indicating they had seen messaging used in that media. TV ads (36.6%) and billboards (29.8%) were also common, with Michigan respondents seeing billboards in higher proportion at 43.8%. Of sample respondents, 30.8% indicated not having seen any messaging about cannabis use and driving, which was significantly higher in Texas at 37.4%.

Figure 4. Messaging Seen by State Legalization Status

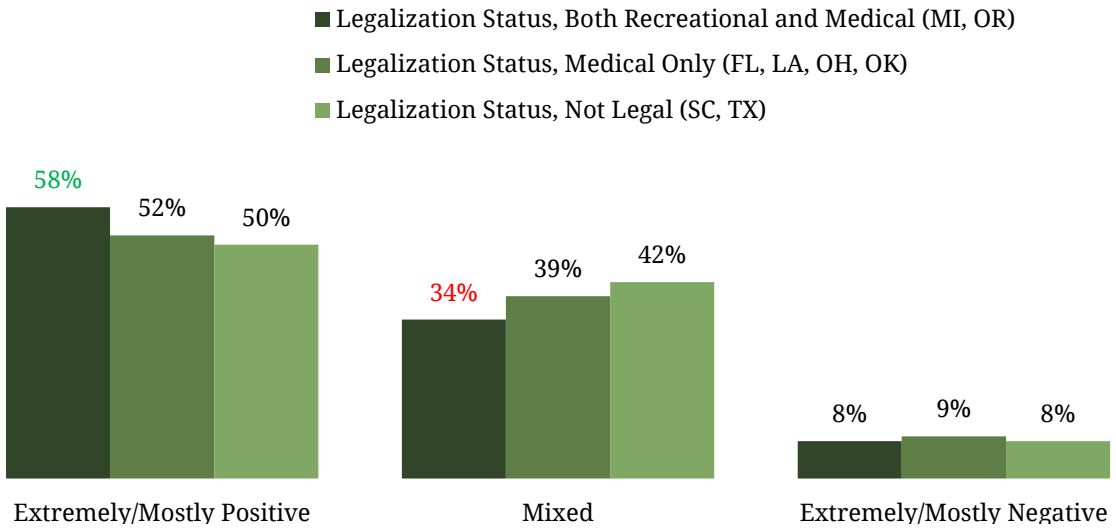


Where, if any place, have you seen messaging about cannabis use and driving? Please select all that apply.
N: Fully Legal = 509, Medical Only = 1009, Not Legal = 505
Statistical comparisons are made across group columns, where one subgroup is compared to other subgroups combined; green numbers indicate significantly higher values, red numbers indicate significantly lower values at the 95% confidence level.

Overall, the sample had positive reactions (including 'a little more positive than negative,' 'mostly positive,' and 'extremely positive') totaling 64.3% of responses (see Figure 5 for breakdown by state legalization status), 22.4% had mixed reactions, and 13.3% had negative reactions (including 'a little more negative than positive,' 'mostly negative,' and 'extremely negative). Michigan respondents reacted with a higher proportion of positive reactions (75.6%), while Oklahoma respondents had a lower

proportion of positive reactions (54.8%) owing to a larger proportion of mixed and negative reactions.

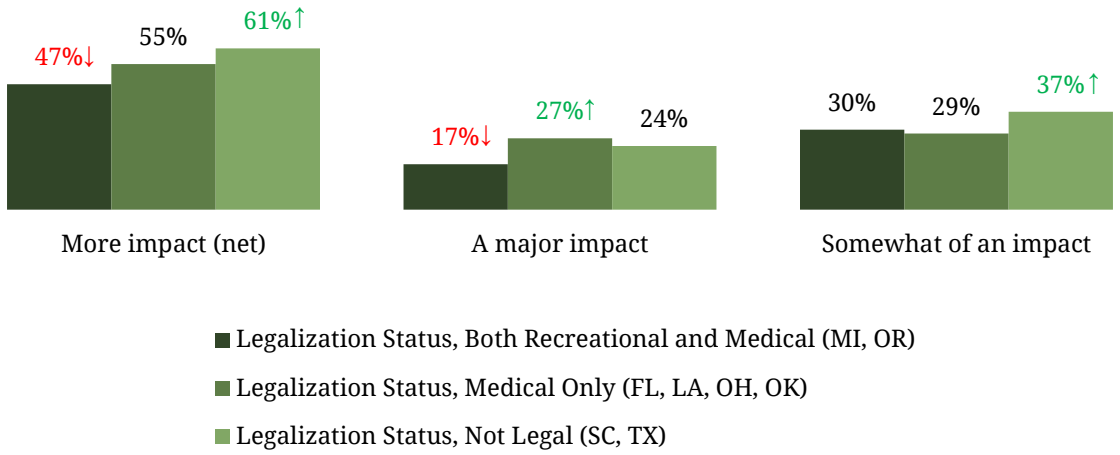
Figure 5. Reactions to Messaging About Cannabis Use and Driving by State Legalization Status



What is your reaction to the content of the messages you have seen about cannabis use and driving?
Base: Both = 509, Medical Only = 1009, Not Legal = 505
Statistical comparisons are made across group columns, where one subgroup is compared to other subgroups combined; green numbers indicate significantly higher values, red numbers indicate significantly lower values at the 95% confidence level.

In thinking about messages that were seen, respondents were asked to indicate how much of an impact the messages had on their beliefs/attitudes as well as their behavior (see Figures 6 and 7). A total of 28.3% of respondents (n = 1400) indicated that the messaging had no impact at all on their beliefs/attitudes, while 54.4% indicated it had more impact (combining 'somewhat' and 'major' impact responses) on their attitudes and beliefs. Significantly more respondents in Texas (68.9%) and significantly less in Oregon (42.7%) indicated that messaging had more impact. Likewise, on behavior, more respondents indicated an impact in Texas (59.2%) and fewer in Oregon (41.5%) compared to the sample at 48.8%.

Figure 6. Impact of Messaging on Attitudes by State Legalization Status

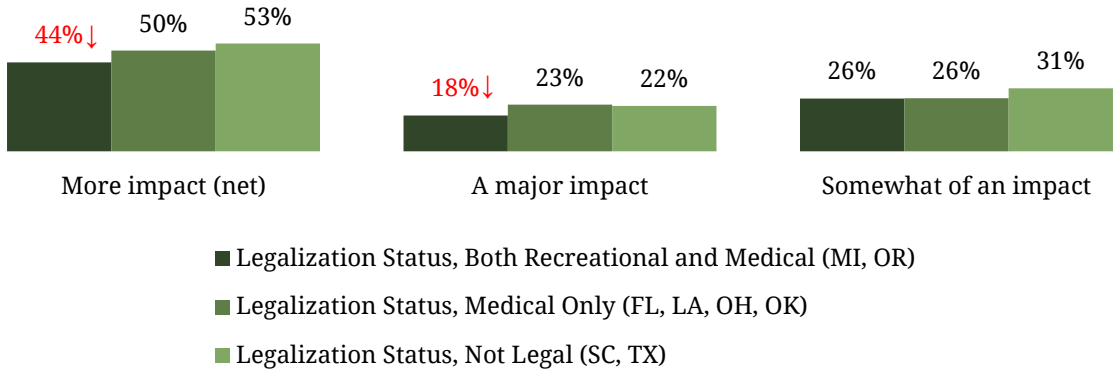


Thinking about the messaging you have seen about cannabis use and driving, how much of an impact did it have on your beliefs/attitudes?

N: Legal = 509, Medical Only = 1009, Not Legal = 505

Statistical comparisons are made across group columns, where one subgroup is compared to other subgroups combined; green numbers indicate significantly higher values, red numbers indicate significantly lower values at the 95% confidence level.

Figure 7. Impact of Messaging on Behavior by State Legalization Status



Thinking about the messaging you have seen about cannabis use and driving, how much of an impact did it have on your behavior?

N: Legal = 509, Medical Only = 1009, Not Legal = 505

Statistical comparisons are made across group columns, where one subgroup is compared to other subgroups combined; green numbers indicate significantly higher values, red numbers indicate significantly lower values at the 95% confidence level.

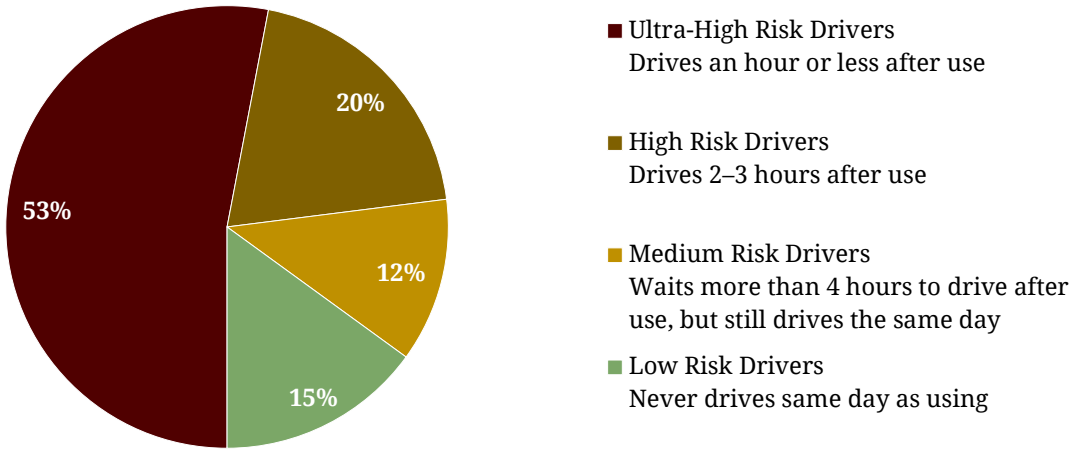
While the messaging seen by respondents (n = 1,518) is most often sponsored by law enforcement groups (36.1%) or safe driving advocacy groups (35.9%), respondents

indicated in higher proportions that they would trust messaging about cannabis use and safe driving from doctors/health care providers (42.3%), cannabis industry groups (38.6%), cannabis brands/companies (37.3%), and science/medical groups (36.1%). For safe driving in general, respondents trust safe driving advocacy groups (51.9%), law enforcement groups (43.4%), doctors/health care providers (40.3%), and science/medical groups (34.2%) with higher frequency. Oregon (49.8%) and Oklahoma (49.5%) had a higher prevalence of trust in law enforcement, while Florida respondents had a lower prevalence (36.9%) compared to the sample at large.

High-Risk Drivers

One major goal of the project is to determine how best to identify and, therefore, target high-risk cannabis consuming drivers with effective messaging. To do this, a combination of population prevalence of driving after consumption and guidance from the research team determined that those who consumed an hour or less before driving were considered 'ultra high risk,' those who consumed 2-to-3 hours were considered 'high risk,' and those who consumed 4 hours or more before driving but still within the same day (without sleep) were considered 'medium risk.' Individuals who consume but do not drive until the next day (8 hours, after sleep) are considered 'low risk.' Of course, the caveat here is that these risk designations are simply meant to identify the subset of individuals who are more likely to be impaired when driving than not; notice how none of the groups are 'no risk', and risk cannot be determined based upon time since use alone. What is presented is simply the data derived from these 2,023 participants and inferences beyond that should be made with care (see Figure 8).

Figure 8. Risk Driver Group Incidence



Q10. How long do you usually wait until you feel safe to drive after using each of the following [forms of cannabis]?

Base: Total=2023

Ultra-high-risk drivers make up 53.0% of the population sample of current users and are most prevalent in Florida and Texas. Ultra-high-risk and high-risk drivers combined, those that drive within 3 hours of using cannabis in any form, constitute 72.7% of all cannabis users in the study. Low-risk respondents were most prevalent in Michigan and Oregon, states where recreational cannabis is legal. Approximately 39.0% of ultra-high-risk and high-risk drivers are between the ages of 21 and 34, an age group that only comprises 15.7% of low-risk drivers. Nearly two-thirds of ultra-high-risk and high-risk drivers are male (61.3%), whereas medium-risk drivers are split fairly evenly between male and female, and low-risk drivers are statistically more represented by females (58.8%). Ethnicity and race prevalence are shown in Table 10; comparisons are analyzed across racial group (i.e., there is a lower percent of Hispanic respondents in the low-risk group, 13.0%, compared to their prevalence in the other groups) but percentages are calculated *within* risk groups (i.e., White respondents make up 49.0% of the ultra-high-risk group).

Table 10. Racial Demographics by Driver Risk Group

	Driver Risk Groups				
Are you…?	**Ultra High**	**High**	**Medium**	**Low**	**Sample Proportion**
White	49% ↓	59%	68% ↑	73% ↑	57%
African American	24% ↑	17%	12% ↓	9% ↓	19%
Hispanic	21% ↑	19%	14%	13% ↓	18%
Asian	3%	2%	3%	2%	3%
Other	2%	4%	2%	2%	3%
Net (n)	**1065**	**397**	**244**	**306**	**2012**

Weight: Raked Weight; sample size = 2012; total sample size = 2023; 11 missing; effective sample size = 1722 (86%); 95% confidence level

Statistical comparisons are made across group columns, where one subgroup is compared to other subgroups combined; green numbers indicate significantly higher values, red numbers indicate significantly lower values at the 95% confidence level.

Individual and household incomes are lower in the ultra-high-risk group. Ultra-high-risk and high-risk drivers have about a 50/50 split as to whether there are children under 18 living in the household; the prevalence of children under 18 is lower in other risk groups. Ultra-high-risk and high-risk drivers are more likely to rent than others, more likely to have lower education, and more likely to live in an urban area compared to the other risk groups.

Not surprisingly, ultra-high-risk and high-risk drivers who use cannabis are frequent users; they are more likely to use daily (69.3%) and more likely to use multiple times a day (53.0%). Of ultra-high-risk and high-risk drivers, 75.5% identify as recreational users and 66.0% identify as medicinal users, while 44.5% indicated both types of use. Combined with the fact that they are more likely to drive daily (62.8% vs.

44.1% of medium-risk and low-risk drivers), it was not surprising they are at highest risk for driving impaired. These users, who drive within 3 hours of consumption, have a higher prevalence of use across most products except edibles/capsules; use of these is pretty consistent across risk groups. Also expected is the result that respondents in the ultra-high-risk and high-risk categories believe they drive the same (48.4%) or better (37.3%) after using cannabis than those in the medium-risk group (the low-risk group was not assessed for this item). Riskier drivers are more likely to consider whether children are involved or what other substances they have used when determining how long to wait to drive after consuming cannabis. Medium-risk drivers, on the other hand, consider how accessible alternative transportation is and if there is a designated driver at a higher prevalence. High-risk drivers are far less likely (13.5%) to just stay home compared to medium-risk (22.4%) and low-risk (39.0%) drivers when choosing alternatives to not driving.

Ultra-high-risk drivers, even compared to high-risk drivers, are less likely to use factors like slow reaction time, consumption amount, or input from friends and family to determine whether they are impaired. They are far less likely to believe they would be detected as under the influence by a police officer; 20.8% compared to high-risk drivers, 33.7% to medium-risk, 42.6%, and 41.7% to low-risk drivers. With greater prevalence in every situation, ultra-high-risk drivers have experienced the dangerous consequences of cannabis use and driving (see Table 11).

Table 11. Vehicle Incidents by Driver Risk Group

	Driver Risk Groups				
	Ultra High	**High**	**Medium**	**Low**	**Net**
Pulled over for driving while under the influence of cannabis	18% ↑ 195 ↑	11% 44	7% ↓ 17 ↓	2% ↓ 6 ↓	13% 262
Driver in a crash while under the influence of cannabis	6% ↑ 68 ↑	6% 25	5% 11	1% ↓ 2 ↓	5% 107
Passenger in a crash whose driver was under the influence of cannabis	11% 114	11% 45	9% 23	4% ↓ 13 ↓	10% 195
Pulled over for suspected cannabis use	11% ↑ 120 ↑	8% 31	6% 16	2% ↓ 6 ↓	9% 17
Any of the above (net for responses 1–4)	28% ↑ 302 ↑	22% 88	13% ↓ 33 ↓	8% ↓ 24 ↓	22% 447
Crash (net for responses 2 & 3)	13% ↑ 144 ↑	13% 51	10% 24	5% ↓ 15 ↓	12% 234
Pulled Over (net for responses 1 & 4)	22% ↑ 239 ↑	15% 60	9% ↓ 21 ↓	3% ↓ 10 ↓	16% 331

Please indicate if you have experienced the following situations.

Weight: Raked Weight; sample size = 2023; effective sample size = 1783 (88%).

Net reflects full sample.

Statistical comparisons are made across group columns, where one subgroup is compared to other subgroups combined; green numbers indicate significantly higher values, red numbers indicate significantly lower values at the 95% confidence level.

Half (49.8%, n = 119) of ultra-high-risk drivers that were pulled over for (suspected) cannabis use or driving under the influence of cannabis were evaluated roadside; of those evaluated, 59.0% (n = 70) were let go immediately. The other risk groups were evaluated at slightly higher, though not significant, rates: high risk (51.6%), medium risk (67.6%), and low risk (60.1%). Ultra-high-risk drivers have statistically higher incidence of driving within one hour of alcohol use (66.3%), within 2 to 3 hours (74.3%), within 4 to 5 hours (78.4%), and within 6 hours or more (80.2%) as compared to lower risk groups.

While ultra-high-risk and high-risk groups were more likely to feel positive (60.5%) than negative (14.3%) about cannabis and driving messages, they still trended to more negative reactions than other risk groups, who were approximately 75% positive about messaging content. Despite positive reactions, the prevalence of that messaging having little or no impact on beliefs/attitudes (50.2%) or behavior (55.2%) in the ultra-high-risk group was much higher than other groups, with the exception of the low-risk group, which had an even greater prevalence in some cases of messaging having little or no impact. This is likely due to the fact that members of the low-risk group are already practicing safe cannabis use and driving habits and find the messaging superfluous. Respondents who drive within 3 hours of use are less likely than other groups to trust just about anyone providing messaging about safe cannabis use and driving, including

doctors/health care providers, cannabis industry groups, science/medical groups, safe driving advocacy groups, law enforcement groups, and labeling on products. They do, however have a higher instance than lower risk groups of trusting social media, influencers, and celebrities.

Ultra-high-risk and high-risk drivers consider themselves extremely knowledgeable (90.0% prevalence) on all aspects of cannabis including product strength, sources, and laws in their state regarding possession of cannabis and driving after using cannabis. They are more likely to believe their community (60.5%), as well as law enforcement (43.0%), are accepting of adult cannabis use. They are less likely to get their cannabis from a dispensary than other groups (still a majority source for high-risk drivers at 70.5%) and more likely to get it from friends and family (44.3%) or grow their own (10.5%).

One interesting finding related to unwanted symptoms identified by ultra-high-risk and high-risk drivers. Compared to other groups, mood changes, memory loss, persistent cough, and weight gain are more prevalent with these heavy users. This could be because of the types of products they are using or simply their frequency of use. This contrasts greatly from the overall population's most common unwanted symptoms of hunger, fatigue, brain fog, and lack of motivation. Cannabis use in these high-risk groups does not necessarily increase alcohol use or non-prescription drug use but does have some impact (both less and more use across the group) on tobacco, prescription drug, and over the counter drug use, especially compared to medium-risk and low-risk groups. They perceive themselves as having good or very good health (74.2%) and are more likely to use cannabis to address anxiety, stress, PTSD, grief, and depression compared to the sample at large.

Discussion

Self-awareness of Use and Impairment

Our findings reveal a complex picture of self-awareness and beliefs among cannabis users regarding their impairment. Many respondents drive on the same day they consume cannabis, with variations across states. This high rate of same-day driving, particularly within hours of use, suggests a potential underestimation of impairment risks. Notably, a significant portion (over 80%) of users believed their driving ability was either unchanged or improved after consuming cannabis, indicating a gap in understanding the true impact of cannabis on driving performance.

Despite these perceptions of driving safety, users reported considering a number of factors before deciding if they are safe to drive. The most commonly cited factor was their own feeling of impairment (e.g., brain fog), followed by the distance to be traveled and familiarity with the route. Interestingly, while some users (7.2%) reported not

considering any factors, others highlighted the involvement of children and weather conditions as important considerations. These findings suggest a mix of caution and overconfidence among cannabis users regarding their ability to drive safely post-consumption, and provide some insights as to what users prioritize in deciding whether to drive following cannabis use.

High-risk drivers, those who frequently drive within 2 to 3 hours after cannabis consumption, exhibit distinct characteristics. They display high confidence in their knowledge about cannabis and perceive greater community and law enforcement acceptance of adult cannabis use. High-risk drivers are also less likely to rely solely on dispensaries for their cannabis, often obtaining it from friends, family, or personal cultivation. This combination of high self-assessed knowledge and diverse sourcing methods suggests they might underestimate the risks associated with driving post-consumption, and may not be impacted by outreach efforts using dispensary-based messaging. Overall, these findings highlight the need for targeted interventions to address misconceptions about impairment and promote safer driving practices among cannabis users, particularly those identified as high-risk drivers.

Interactions with Law Enforcement

Findings reveal significant skepticism among cannabis users regarding law enforcement's ability to detect cannabis impairment. A majority of respondents did not believe that police officers could detect cannabis influence, with a considerable portion unsure about the effectiveness of such evaluations. This skepticism was consistent across all states. Among those who had actual interactions with police, experiences varied, with some reporting being pulled over or involved in crashes while under the influence of cannabis. These incidents were less frequent in states where recreational cannabis use is legal, suggesting that legal status might influence the prevalence of such encounters.

Roadside evaluations for cannabis impairment after being pulled over were common, with most evaluations relying on physical and behavioral assessments rather than biological tests. Many respondents were released immediately after being evaluated, even though in some cases the respondent reported feeling impaired at the time, although this varied by state. Additionally, a significant number of those pulled over felt targeted or discriminated against (e.g., based mostly upon race/ethnicity), highlighting concerns about perceived fairness and possible bias in law enforcement interactions. The perception of discrimination was particularly high in certain states (e.g., South Carolina at 50.8%), indicating a possible need for more consistent and equitable enforcement practices. The following quote from a respondent exemplifies this perception.

Every time I have been pulled over, I have felt profiled. Every time I have been pulled over, whether it be for a simple citation, I have been fully searched and so have the vehicles I have been in.

Ultra-high-risk drivers, who frequently drive within an hour after cannabis consumption, exhibited distinct behaviors and attitudes. They were less likely to use the common indicators of impairment noted above, and were more skeptical of detection by police. Despite experiencing more dangerous consequences, such as higher rates of being pulled over or involvement in a crash while under the influence of cannabis, these drivers were evaluated at the roadside when pulled over only half the time, while other risk groups were evaluated more often (51.6%–67.6%). This pattern of risky behavior underscores the need for targeted interventions and education to address misconceptions about impairment and promote safer driving practices, including more robust, evidence-based messaging to demonstrate to users that impairment detection is likely.

State Differences in Use, Driving, Knowledge

Among respondents, variations in cannabis consumption were evident across different states and legalization statuses. States with medical-only cannabis laws, like Oklahoma, showed a higher prevalence of daily and multiple-daily use, likely due to the necessity for regular dosing. Conversely, fully legal states, such as Michigan and Oregon, had higher incidences of recreational use, reflecting broader social acceptance and accessibility. In non-legal states, while respondent percentage use of most cannabis products mirrored that of fully legal or medical-only states, consumption of beverages containing THC and 'other forms of THC' (not including those listed like dried flower, edibles, vaping, dabbing, oils/tinctures, and topicals/transdermals) were significantly higher (17.4% and 31.1%, respectively). Respondents in non-legal states showed a balanced mix of recreational and medical use.

Driving behavior also varied significantly across states. In Louisiana and Florida, where cannabis is not fully legalized, there was a high rate of respondents driving on the same day as consuming cannabis, indicating a concerning trend of potential impaired driving. Interestingly, legal states demonstrated slightly more cautious driving behavior after cannabis consumption, possibly due to better public awareness and education on the risks of impaired driving. However, as noted earlier, a sizable portion of respondents across all states believed their driving ability was unaffected or even improved after using cannabis, highlighting a persistent gap in understanding the true effects of cannabis on driving.

Perceptions of community and law enforcement attitudes towards cannabis use also varied by state. In fully legal states, there was a sense of broader acceptance, with cannabis use more deeply integrated into social circles. In contrast, non-legal states

reported higher levels of perceived disapproval and stigma. Notably, concerns about cannabis being a gateway drug and leading to increased crime were particularly high in Ohio. This is a unique take considering the shifting legalization landscape of the state during the administration of the survey. It is possible that messaging about these negative factors was perceptible leading up to the vote, which turned Ohio into a fully legalized state. Additionally, there were notable knowledge gaps regarding state legal THC limits for driving, particularly in medical-only states; further evaluation of state-based knowledge may determine the need for improved public education on cannabis laws and safe consumption practices. These insights demonstrate the intricate relationship between state regulations, usage behaviors, and public perceptions, providing a detailed understanding of the diverse landscape of cannabis use and attitudes across the United States.

Health and Use of Other Substances

The survey of cannabis users illuminates several important aspects of their behaviors and health perceptions, especially in states with varying legal statuses for cannabis. A significant finding is the frequency of cannabis use, with a notable portion of respondents in medical-only states consuming it multiple times daily. This pattern underscores the use of cannabis for potentially managing health conditions, as evidenced by the high percentage of users reporting treatment of ailments such as stress, anxiety, and pain. The interaction with alcohol also presents critical insights, with over half of the respondents admitting to driving shortly after drinking, pointing to a need for public health interventions aimed at reducing impaired driving and promoting safer consumption practices, particularly when it comes to the co-use of substances.

Regarding health outcomes, most users perceive their health to be positively impacted by cannabis, with those in legal states more likely to rate their health as ‘good,’ and those in medical-only states more often rating it as ‘very good.’ This suggests that how users perceive and integrate cannabis into their health regimen may differ based on the legal context of their state. However, despite these positive health perceptions, a significant number of users also experience unwanted side effects from cannabis use, with high-risk and ultra-high-risk groups (often more frequent users) reporting more severe symptoms such as mood changes (up to 20% in high-risk group), memory loss (15.1% in ultra-high-risk group), and persistent cough (13.5% of ultra-high-risk group). These adverse effects, alongside users reporting hospital visits believed to be due to “laced” cannabis, underscore the need for robust quality control and regulation of cannabis products.

Furthermore, cannabis use appears to affect the consumption of other substances, notably leading to decreased use of alcohol and tobacco among many users. This substitution effect, where cannabis replaces other arguably more harmful substances, points to the possible harm reduction benefits of legalized cannabis. However, the

relationship between cannabis use and other substance use is complex, as evidenced by the varied impact on prescription drug use and the increase in unwanted health symptoms among heavy users. These findings call for nuanced public health messages that not only address the risks associated with impaired driving but also educate about the potential health impacts of frequent and heavy cannabis use. Tailored interventions should particularly focus on heavy users and those using cannabis for mental health reasons, ensuring that public safety messaging is relevant and effective across different user demographics.

Definition and Profile of High-Risk Drivers

Identifying drivers among cannabis users that have higher risk of driving after use is crucial for tailoring public safety messages that effectively address and mitigate risks associated with impaired driving. Defined in this study as those who consume cannabis within 3 hours before driving, these drivers constitute a significant majority of the study population, with 72.7% falling into the ultra-high-risk and high-risk categories. This subset of drivers is particularly concerning because their proximity of use to driving time greatly increases the likelihood of impairment, which can compromise their driving abilities and increase the risk of a crash. Targeting these individuals with specific messaging is essential, as they represent the group most at risk for cannabis-related driving incidents.

The challenge, however, lies in the reduced likelihood of behavior change among these drivers. The study reveals that ultra-high-risk and high-risk drivers, particularly prevalent in the sample of drivers from Florida and Texas, often underestimate the effects of their consumption on driving capability. Many believe that their driving is either unaffected or even enhanced after cannabis use. This perception persists despite evidence suggesting increased risks of crashes and driving offenses among this group. Furthermore, these drivers are characterized by frequent and heavy cannabis use, complicating efforts to change their perceptions and behaviors. They are less likely to be influenced by traditional safety campaigns and more likely to trust non-conventional sources like social media or influencers, which may not always provide accurate or health-oriented advice.

Effective communication strategies must therefore not only reach these high-risk drivers but also resonate with them in a way that challenges their existing beliefs and encourages safer behaviors. This involves understanding the demographic and psychological profile of these users—including their frequent dismissal of traditional authority figures and reliance on peer-driven platforms for information. However, this description is not an all-encompassing one and factors like mental health issues, substance use disorders, socioeconomic factors, etc., may also play a role in this use profile. Public safety campaigns need to leverage these insights to deliver compelling, credible messages through channels that these drivers trust and engage with.

Additionally, these strategies should address the common misconceptions about cannabis use and driving, providing clear, research-backed information on the risks involved and offering practical advice for safer consumption practices.

Messaging and How It Informs Phase 3

Respondents were asked for their reactions to the content of messages they have seen regarding cannabis use and driving through an open-ended question, probing why they felt positively, negatively, or had mixed feelings about the messaging. Those who responded positively understood the underlying intent of these messages—to enhance public safety. They appreciated being informed about the risks associated with driving under the influence of cannabis and the potential legal consequences. However, they also noted that while most advice was beneficial, some messaging could exaggerate the dangers, preferring that information should enable smart decision-making rather than instill fear. Conversely, respondents with negative reactions felt that the messaging often came from a place of bias against cannabis users, employing outdated stereotypes and sometimes lacking in factual accuracy. They argued that the effects of cannabis can vary greatly between individuals, making the typical comparisons with alcohol impairment and broad, generalized rules less applicable and effective.

Inquiring about how this messaging influenced their behavior, respondents shared that it heightened their awareness about the implications of driving after using cannabis. The messaging prompted them to critically assess the necessity of their trips if they had consumed cannabis and encouraged them not to drive if they felt impaired. This awareness extended to the legal consequences of driving under the influence, making many reconsider the wisdom of driving after cannabis use, particularly on days they knew they would need to drive. Through these messages, respondents became more conscious of the risks to both their own safety and that of others, recognizing that the dangers of impaired driving were not limited to alcohol.

The channels through which respondents encountered these messages included social media, TV ads, and billboards, with each medium playing a significant role in shaping public perceptions. The effectiveness and reception of these messages varied significantly by region, reflecting the influence of local cultural and legal contexts on the interpretation and impact of the messaging. Trust in the sources of these messages also varied, with a preference for information coming from medical and scientific authorities over law enforcement or safe driving advocacy groups, suggesting a potential shift in strategy might be more effective in reaching and persuading the public. This nuanced feedback on messaging and its influence offers valuable insights into the complexities of public communication strategies concerning cannabis use and driving. The following responses illustrate respondents' reactions.

It caused me to think more about where I am going and if it is that important if I am under the influence of cannabis. I think deeper to where I understand whether or not I should drive in that condition, and if I do, it makes me focus even more so that I won't make any mistakes.

It made me realize driving while stoned, even if it seems safer than drinking and driving, it's not because your reaction speed is so much slower than if you were sober and you have to have your quick reactions at any given moment on road. So, to keep yourself and others safe, no mind-altering substances before driving.

It makes me nervous and sad to think that people get injured because they choose to drive when they are impaired. The thought of people getting hurt because they or someone they're with drive while under the influence makes me feel very sad. It also makes me think about when I've driven hours after consuming cannabis.

Synthesis of SME and User Insights

Several consistencies emerged between the opinions of SMEs, gathered in Phase 1, and cannabis users, gathered in the Phase 2 survey. Cannabis users demonstrate—and SMEs acknowledge—significant gaps in public knowledge about the effects of cannabis, especially concerning its impact on driving. SMEs have suggested that there is a widespread lack of awareness about the variability of cannabis impairment and its potential dangers when combined with driving. Similarly, cannabis users expressed that many people might be unaware of the risks or believe that there are no dangers associated with driving under the influence. However, where SMEs might emphasize the need for broader educational initiatives, users often pointed out that the messaging they encounter can sometimes be overly alarmist or disconnected from their actual experiences, indicating a divergence in the perceived effectiveness and approach of current educational efforts.

On the topic of legalization, SMEs recognize the influence of local legal contexts on cannabis use and attitudes, often discussing how differing state laws affect everything from usage patterns to enforcement practices. Cannabis users' responses reflect these differences, with variations in how messaging is received and the behaviors surrounding cannabis use, such as the likelihood of driving after consumption. For example, users in states with full legalization may experience and report a more relaxed attitude towards cannabis, which aligns with SME observations that legalization can reduce stigma and alter public perceptions.

On the other hand, a notable divergence emerges in the discussion of messaging effectiveness. While SMEs might argue for the importance of consistent and factual messaging across various platforms, users frequently criticize the actual messages they

encounter as being biased or not reflective of their personal experiences with cannabis. Users express a desire for messaging that is less judgmental and more reflective of the nuanced effects of cannabis, suggesting a disconnect between the intentions of public health messages and their reception by the target audience. This gap highlights the need for developing messaging strategies that are not only informative but also resonate authentically with diverse user experiences, addressing the complex realities of cannabis consumption in a way that is both respectful and practical.

Phase 3: Reactions to Messaging About Cannabis Use and Driving

In the context of evolving cannabis legislation and usage patterns, it is imperative to refine how to communicate about driving safety among cannabis users. Traditional methods such as focus groups or reliance solely on expert insights often fail to capture the complex, varied perceptions of actual cannabis consumers, potentially leading to safety messages that are less effective or are irrelevant. The study described in this section seeks to bridge this gap by engaging directly with 800 cannabis users who were not part of the initial 2,000 participant surveyed (Phase 2). This new group's insights are vital, as they provide fresh perspectives that enhance the representativeness and depth of the data collected.

Direct user feedback is paramount for developing messages that resonate deeply with the target audience. This approach allows for the precise tailoring of communications to address specific behaviors and concerns of cannabis users. Recent research underscores the effectiveness of such tailored messages; for example, Dillard et al. (2018) demonstrate that personalized health communications significantly influence behavioral intentions. This evidences the critical need for specificity and customization in message design to improve public health outcomes.

Moreover, engaging a new subset of cannabis users ensures the messages developed are perceived as more credible and relevant, which is essential for their effectiveness. Studies like that of Evans et al. (2020) reveal that the perceived credibility and relevance of messages markedly enhance their persuasive power. By incorporating direct feedback from a broad spectrum of cannabis users, this study aims to craft messages that users find believable and pertinent, thereby increasing the likelihood that they will be acted upon.

Expanding the pool of participants also prevents biases that might emerge from repeatedly surveying the same cohort and ensures that a diverse array of experiences and views are considered. Ultimately, this study not only aligns with contemporary research methodologies but also significantly contributes to public safety. By generating scientifically grounded and user-verified safety messages, the research holds the potential to effectively alter risky driving behaviors associated with cannabis use. This

proactive and inclusive approach marks a pivotal step towards enhancing roadway safety in a landscape where cannabis use is increasingly normalized.

Method

Again, partnering with Quester, messaging and the accompanying questionnaire were developed. A combination of novel messages, one or two sentences about safe cannabis use and driving with an image, and communications from existing or previous public safety campaigns were developed with simplicity and effectiveness in mind based on the feedback of subject matter expert interviews (Phase 1) and surveyed cannabis users (Phase 2). The research team worked collaboratively to develop and refine the novel messaging concepts, based on input from the SME interviews and Phase 2 results. The team then selected images to pair with the messaging, and reviewed and finalized the content. Whereas the Phase 2 survey was heavily quantitative with some qualitative responses drawn from open-ended, interview-like questions, this Phase 3 survey relies heavily on respondents to provide descriptive feedback on the messages they experience. The overall goal of this study is to capture cannabis users' reactions to various messaging about cannabis use and driving. This will inform how to craft messages that will resonate with and positively impact cannabis users. The focus of the analysis is not on choosing a "winning" message; instead, the analysis and recommendations focus on message optimization.

Multiple-choice questions with open-ended items were created with probes moderated by Quester's proprietary artificial intelligence (AI) software. Quester programmed the questionnaire into content to be completed in approximately 25 minutes. A soft launch to 388 respondents was deployed to ensure understanding of questionnaire items, as well as improve targeted probing of open-ended questionnaire items. Of the initial respondents, 90 completed the questionnaire. The survey was then launched fully into the field to collect the target 800 participants.

Participants

Participants of this questionnaire/interview were recruited in a similar way as in the Phase 2 survey on cannabis use and behavior. While Quester continued to meet demographic representations by state, the more important quota factors to capture in this phase of the study were driving risk groups, as defined in Phase 2, and state groupings based on legal status. Therefore, nine subgroups became the target for sampling distributions: ultra-high-risk drivers (drive 1 hour or less after cannabis consumption), high-risk drivers (drive 2 to 3 hours after cannabis consumption), and medium-risk drivers (wait 3 hours or more after cannabis consumption but still same day) by states with fully legal cannabis (medical and recreational; Michigan, Ohio, and Oregon), medical-only legal cannabis (Florida, Louisiana, and Oklahoma), and illegal cannabis (South Carolina and Texas). Like with the Phase 2 survey, inclusion criteria to

complete the initial screener questionnaire included residence in the state of interest, at least 21 years of age, and able to read English. Only respondents that were current consumers of cannabis (in any form, containing THC) were selected; this was defined by being a self-stated current user, consuming cannabis in any form within the past 3 months, and consuming cannabis in any form at least once every three months. Finally, participants had to have a driver's license and access to a car, drive at least one day per week, and meet the aforementioned criteria of driving after cannabis use. Likewise, exclusion criteria included employment in the cannabis, marketing/market research, or advertising/public relations industries. Selected participants were prompted to complete the full questionnaire immediately following the screener questionnaire, using quota sampling as described above. Once the goal number of participants in each use category was reached, further participants in that category were also excluded.

Messages

The following figure represents the messages shown to survey takers as well as the nicknames (in "quotes") given to the messages in order to identify them throughout analysis and discussion (Figure 9). Respondents did not see these nicknames as part of the message presentation. Some messages were novel, developed with the responses from the Phase 2 survey and SME input in mind: "Wind Down," "Judge," "Studies Show," and "Let's Be Blunt." Other messages were adapted from already publicly available safe cannabis use and driving campaigns: "THC Effects," "Feel Different Drive Different," "Little High Still Too High," and "Driving High is Driving Impaired." These messages kept the same slogan and spirit of the original campaign but were paired with new images selected by the research team for their impact.

Figure 9. Messages Shown to Survey Respondents

"Judge"

You can judge how much cannabis you use. But you may not be the best judge of whether you're okay to drive.

Don't use and drive.

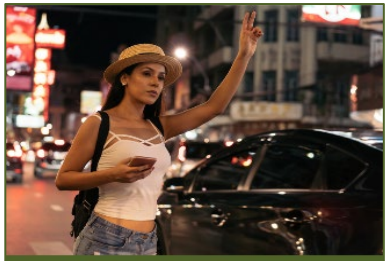
"Let's Be Blunt"

Let's be blunt.

Keep *everyone* safe when you're behind the wheel.

Don't use cannabis and drive.

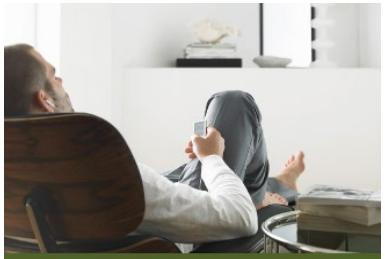
"Driving High Is Driving Impaired"



Driving high is driving impaired.

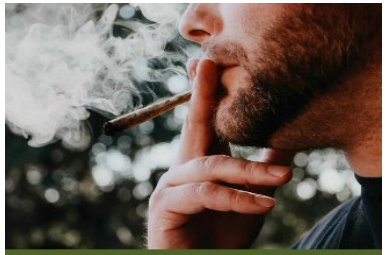
Find a safe ride home.

"Wind Down"



You might use cannabis to wind down. But if you do, please don't drive.

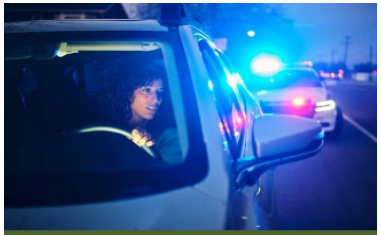
"THC Effects"



THC slows reaction time, distorts perception, and increases the risk of a car crash.

Don't Drive High.

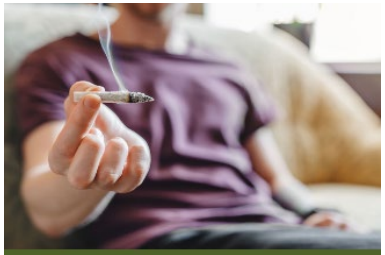
"Feel Different Drive Different"



If you feel different, you drive different.

Drive High. Get a DUI.

"Little High Still Too High"



A little high is still too high to drive.

"Studies Show"

Studies show even low doses of cannabis can be impairing.

Stay safe – don't drive.

Procedure

Survey data was collected from April 23, 2024, to May 27, 2024. Once screened for inclusion and exclusion criteria (as described above) participants were given the opportunity to consent to their data being collected with anonymity and confidentiality. Survey items consisted of multiple-choice, select-all-that-apply, open-ended, and entered-information items as determined by previous survey research studies, SME feedback, and research team survey development discussions, including input from Quester and the AAA Foundation for Traffic Safety. An outline of prompts and data collection type can be seen in Appendix C. Unique to this study, participants were asked to provide information about what type of message would catch their attention in either a positive or negative way (open ended). Then respondents rated all eight messages on likability and preference between liked messages.

A deep-dive interrogation was performed on three of the eight messages (selected randomly) by individual participants; respondents rated these three messages on a number of measures such as appeal and relevance. Additional taglines beyond the curated messages were also provided for evaluation. Participants were free to discontinue the survey at any time; Quester determined at what point abandoned surveys were not viable for overall data collection and adjusted recruitment to fill quotas.

All study procedures were approved by the IRB at the University of California–San Diego.

Results

The following results indicate the responses of 846 online survey takers. Noteworthy findings will be described below. Results within each section and subsection below will be presented by risk of driving after using cannabis and state legalization subgroups. Comparisons are reported in percentages of the sample, with each subgroup's percentages being compared to all other groups in an analysis using a z-test method, which is similar to a t-test comparison but for larger populations to take account for normal distribution. Significant differences are reported at a 95% confidence interval. Likeability and preference judgements were converted into scores for comparison. Analysis of qualitative data relied heavily on Quester's linguistics team to extract meaningful inferences from the various open-ended question responses provided by participants. Quester's linguistic analysis process involves linguistic analysts reviewing consumer stories using two pieces of proprietary software. The first review highlights the key recurring themes in the data and the representative language. The second measures the frequency of key themes and isolates the language so that it can be evaluated for both prevalence as well as meaning in context. The linguistic team uses

this information for comparative analysis among groups and to identify the broader narratives occurring in the data.

Demographics

Age. Of 846 total respondents (including ultra-high-risk, high-risk, and medium-risk drivers), most are either in the 35 to 44 years (32.6%) or 25 to 34 years (31.5%) age category. Of the remaining categories, 6.5% are 21 to 24 years of age, 12.7% are 45 to 54, 11.2% are 55 to 64, and 5.5% are 65 and over. The percentage of respondents aged 35 to 44 increases to 38.0% for ultra-high-risk drivers. Percentages among those 55 years and older increase in respondents using cannabis for medical purposes only, driving the average age of use up significantly to 45.9 years; the average age in the population and among all other subgroups hovers around 40 years.

Gender. In the total sample, males make up 63.2% of user/drivers. This percentage increases significantly to 72.5% with ultra-high-risk drivers and down 55.9% with medium-risk drivers.

Race/Ethnicity. Trends in this survey mirror those of the Phase 2 survey, 46.7% of respondents are White, which increases to 64.0% in fully legal states and drops to 32.0% in non-legal states, and 41.0% among ultra-high-risk drivers compared to their contrast groups.

Income. There are no significant differences in income among subgroups and, in the sample at large, there is roughly an equal distribution of income among those making $49,999 or less (31.3%), those making $50,000 to $99,999 (35.9%), and those making $100,000 or more (29.7%) in household income.

Marital Status. Among the population of medium-risk to ultra-high-risk drivers, 52.7% of respondents are either married or living with a partner. This drops to 46.0% among ultra-high-risk drivers.

Living environment. Sample households reflect those in the Phase 2 survey with an average number of persons in the household at 2.9. This is consistent across all subgroups, including driving risk and state legalization groups. The same is true for whether there are children under 18 in the household; the prevalence consistently ranges from 45.0% to 51.0%, except for respondents in non-legal states who have children under 18 in the household at 54.9%.

Ultra-high-risk drivers are more likely to live in an urban area, reporting such at 37.9%, compared to the contrasting risk groups (28.6% combined) and the larger sample (31.8%). Of all respondents, 38.9% rent their homes, while 57.9% own and 3.0% live with family/someone else. The prevalence of this last housing situation increased to 5.8%

among respondents in legal states and decreases to nearly zero (0.5%, n = 1) in the non-legal states. Living distributions are otherwise consistent across subgroups.

Education. Full sample education assessment produces 28.6% of respondents with a high school graduate (or equivalent) education, 37.0% with some college or associate's degree, 22.3% with a bachelor's degree, and 12.8% with a graduate or professional degree. Bachelor's degree prevalence decreases with the ultra-high-risk group significantly to 16.5% and increases significantly in the medium-risk group to 27.6%.

Employment. In total, 82.2% of respondents are employed, either full- or part-time, 8.9% are retired, 1.3% are students, 2.7% are full-time parents/homemakers, and 5.0% are unemployed. These trends are consistent across all subgroups, except where full-time employment drops to 70.1% in the medium-risk group compared to the contrast groups and full sample.

Cannabis use

Recent use. Among all respondents, 49.7% indicated that they had used cannabis the same day as completing the survey and another 41.3% within the prior week. Same-day use jumps significantly to 63.9% among ultra-high-risk drivers and down to 35.1% among medium-risk drivers.

Frequency of use. When asked how often they consume cannabis (in any form), respondents indicate daily use (at least once in a day) at 62.1%, use four to six times weekly at 17.8%, three or fewer times weekly at 12.7%, and less than weekly at 7.1%. Not surprisingly, daily and weekly multi-use increases in the ultra-high-risk group (75.5% and 90.6%, respectively).

Product use. Use of dried flower in the survey population was 70.6%, which goes up among respondents in medical-only states (79.5%) and among ultra-high-risk drivers (84.9%), but down among non-legal states (61.5%) and medium-risk drivers (56.1%). Dabbing concentrates is higher among ultra-high-risk drivers, 33.7% (compared to contrasting risk groups at 24.0%), while edible consumption was higher in medium-risk groups, 74.6% (compared to 64.0% of contrast risk groups), and vaping concentrates is more prevalent in non-legal states, 62.5% (compared to contrasting legalization state groups, 53.1%).

Cannabis source. As expected, cannabis procured from a dispensary, regardless of licensure, is more prevalent (90.3%) in respondents from fully legal states than it is from respondents where cannabis is illegal (71.3%). In the sample population, dispensary is

the most common way to obtain cannabis (80.0%), followed by friends/family (45.0%), delivery service (22.0%), and growing it oneself (8.0%).

Driving Behavior

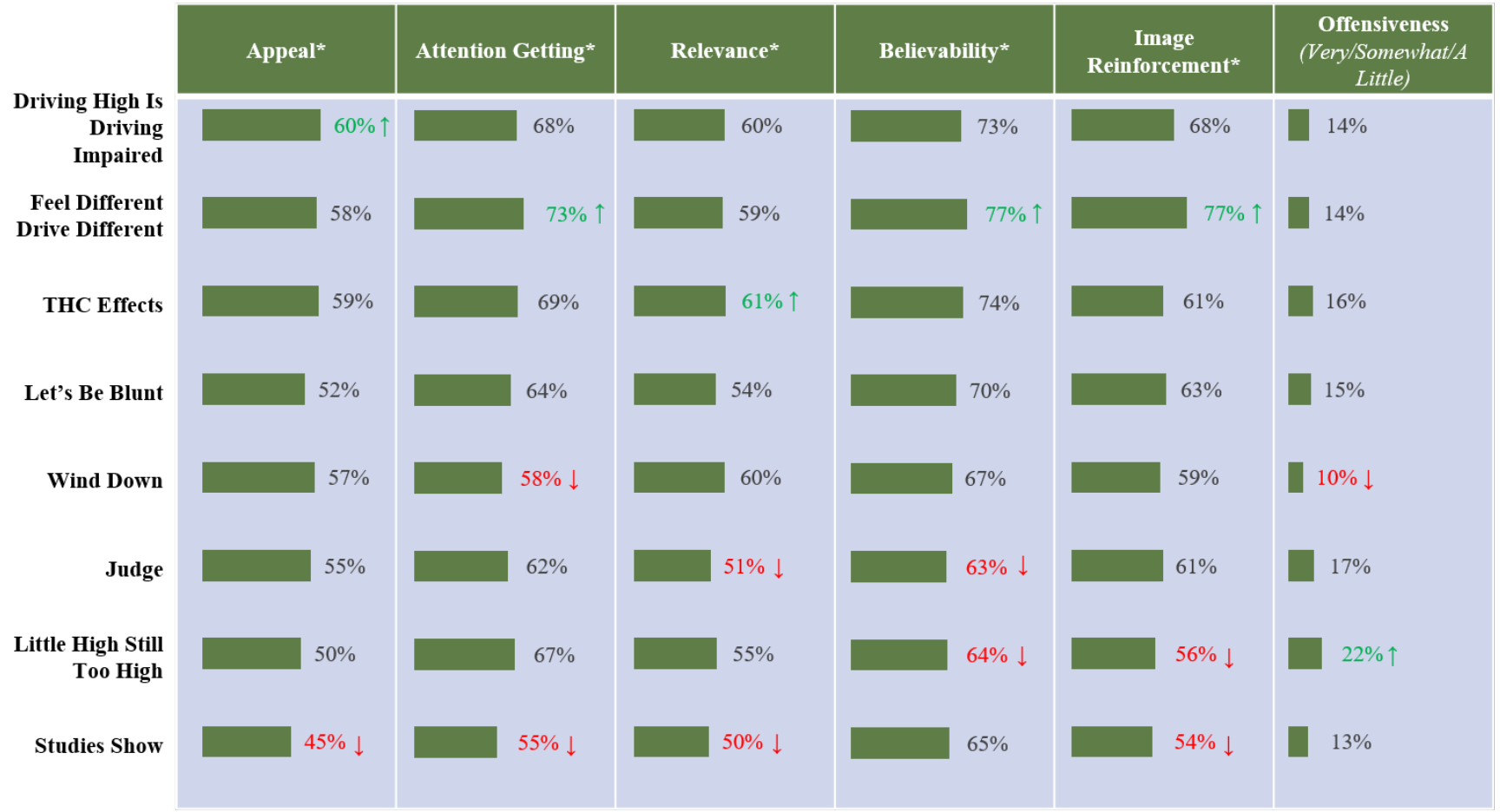
Driving frequency. Most respondents (62.2%) drive every day (any driving, regardless of whether after using cannabis), 27.2% drive four to six times a week, 9.1% drive two to three times a week, and only 1.4 % (n = 12) drive once a week. Daily driving was higher in the ultra-high-risk group (70.9%) and lower in the medium-risk group (52.6%), where prevalence for driving two to six times a week was 46.2%.

Message Reactions Overall

It should be reiterated that the cannabis users included in this phase are also the heavier users (62.0% use it daily and nearly all weekly). In addition, nearly all of these respondents were both recreational and medical cannabis users.

Each of the eight messages was rated for appeal, attention getting, relevance, believability, and image reinforcement on a seven-point Likert scale (see questionnaire in Appendix C for response options; see Figure 10 for Ratings). Offensiveness was also measured on a scale with fewer options; 'not offensive at all,' 'a little offensive,' 'somewhat offensive,' and 'very offensive.' For each metric (except offensiveness), the overall sample statistic reflects the proportion of respondents who rated the message as very or extremely high. In total, 60.1% of respondents found "Driving High is Driving Impaired" highly appealing, while "Studies Show" had the lowest prevalence of appeal with only 45.3% responding. "Feel Different Drive Different" had statistically high prevalence, compared to other messages, on attention getting, believability, and image reinforcement. "Studies Show," on the other hand, not only had statistically low appeal but also had a lower proportion of positive responses in attention getting, relevance, and image reinforcement. Offensiveness was determined by the proportion of people who rated a message with anything but "not offensive at all." The lowest of these was "Wind Down" at 9.6%, while over double (22.2%) found "Little High Still Too High" offensive to some degree. These ratings led to three natural divisions in the messaging; those that had a high prevalence of positive ratings, those that had a medium prevalence of positive ratings with only a few categories receiving statistically lower responses, and "Studies Show" on its own a category of lower prevalence across multiple characteristics.

Figure 10. Ratings of Message Qualities

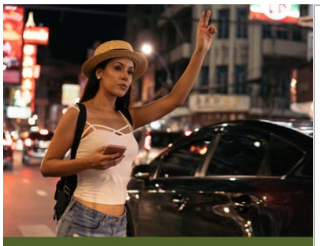


** = Ranked 7 or 6 on a 7-point scale*

N = 303–337

Statistical comparisons are made across within columns, where one message is compared to others combined on each factor; green numbers indicate significantly higher values, red numbers indicate significantly lower values at the 95% confidence level.

Respondents provided opinions of each message by typing responses to open-ended questions and follow-up prompts employed using AI. Language analysts at Quester reviewed responses and generated summative feedback about what did and did not resonate with respondents on each message (shown in the panels below).



Driving high is driving impaired.

Find a safe ride home.

What Works

- Communicates a message many can agree on – it's much better to be safe than sorry
- Does a good job of getting users to think about cannabis & driving in ways they hadn't previously

What Doesn't Work

- It doesn't connect with those who doubt the overall message that they are impaired after they use cannabis
- The person in the image "looks like a party girl," not a cannabis user
- To some, it reads like a campaign against drinking and driving

If you feel different, you drive different.

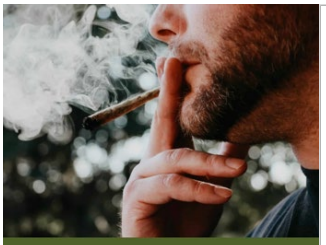
Drive High. Get a DUI.

What Works

- It's straight, to the point, and easily understood – it drives home the point of legal consequences
- A good reminder to be careful, especially among those that fear going to jail

What Doesn't Work

- It reads more like a drunk driving message than a cannabis-related one
- Some see it as "scare tactics" that don't apply to them, so they tune it out



THC slows reaction time, distorts perception, and increases the risk of a car crash.

Don't Drive High.

What Works

- Users appreciate that it is based on science and facts
- It's not judgmental and is a good reminder of what could happen if you drive after using cannabis

What Doesn't Work

- Some feel the message is too wordy and has "too much information"
- The message and image are perceived as passive by some, who don't see it as applying to them

What Works

- It's a positive, non-judgy message that makes sense; a good reminder for users to think twice before driving

What Doesn't Work

- It does not speak enough to the driving danger and is not hard-hitting or thought-provoking enough to impact behavior
- The image creates some confusion, especially since the user doesn't appear to be planning to drive or to travel

What Works

- Both the message and the image do a good job of communicating the seriousness of the situation; it clearly gets across that other people can get hurt

What Doesn't Work

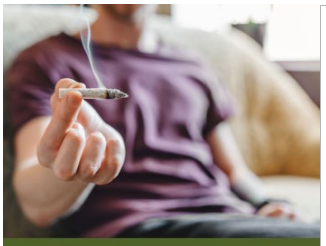
- It does not resonate with those who feel they are "fine" behind the wheel after using cannabis

What Works

- It communicates the dangers of driving under the influence and is relatable to some (especially those with a similar experience)

What Doesn't Work

- It's polarizing, as others feel it is too preachy and judgy
- The image is confusing – users are not sure exactly what's going on and feel it's an "intervention" for a serious problem
- It reads like a campaign against alcohol abuse – taking a stand against others who have a problem and need serious help



What Works

- It's simple, to the point, and realistic – with nothing detracting from the message

What Doesn't Work

- The message is a little vague – what exactly is "a little high"?
- The image is relaxing instead of hard-hitting, and it doesn't connect with driving
- Some flat out reject the message as being not true

What Works

- The message is clear and to the point
- Because it's "backed by science," it is perceived as being less judgy; they don't feel like they are being told what to do

What Doesn't Work

- "Studies" is too vague ("What studies? Done by whom?")
- Some don't trust a simulator ("It's like playing a video game.")

Respondents were also asked to rate how likely the messages might impact their behavior related to cannabis use and driving, including increasing wait time between consuming cannabis and driving, taking alternate transportation, staying home (or wherever they are), and reducing cannabis use. Response options for each of the behavior modifications were 'very likely,' 'somewhat likely,' 'somewhat unlikely,' and very unlikely.' "Feel Different Drive Different" had the largest proportion of respondents on increasing wait time and taking alternate transportation among all respondents with 61.8% and 57.9%, respectively, indicating that the message was very likely to impact that behavior. "Driving High is Driving Impaired" (47.3%) and "Wind Down" (45.8%), both had statistically lower impact on the decision to increase wait time. All messages showed little behavioral impact on reducing cannabis use, eliciting only 20% to 29% 'very likely' responses.

Finally, additional taglines were evaluated for their likelihood to reduce driving after consumption (i.e., either not driving or delaying driving after use). These were developed and tested briefly as the ability to test all of them more thoroughly, as with the

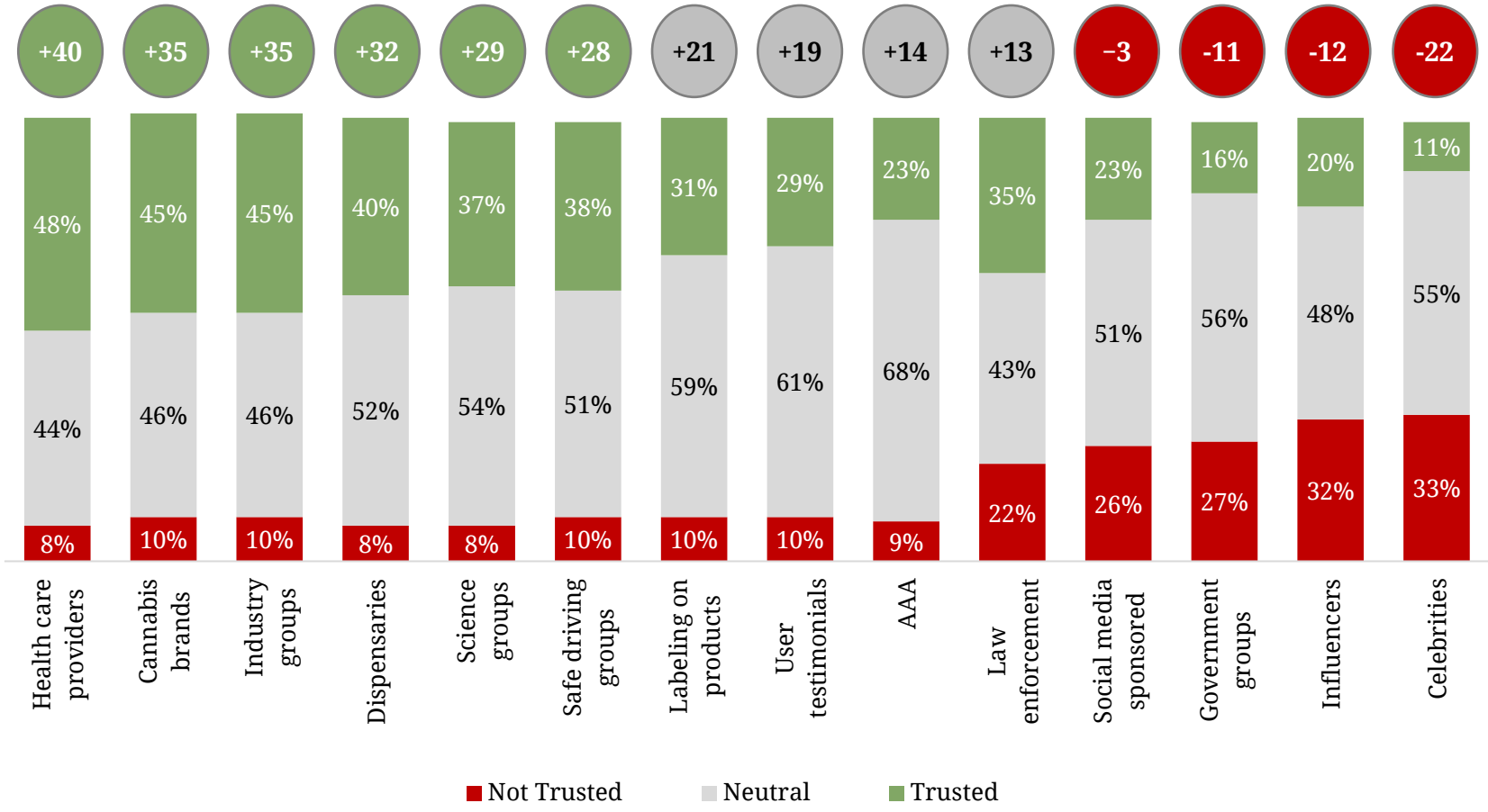
text/image messages, would have inflated the survey completion estimates and resulted in more lost data and dropout. The following taglines were presented to respondents:

- Don’t use cannabis and drive
- Drive responsibly
- Marijuana DUI can cost you upward of $13,500
- Driving high isn’t worth the risk
- A DUI doesn’t just mean booze
- Know the facts about cannabis-impaired driving
- Even a little weed can impair driving
- Even a little cannabis can impair driving
- Driving high is illegal
- Cannabis and driving is a hazardous combination

“Drive Responsibly” resonated with 68.2% of respondents saying the tagline was ‘very likely’ to reduce their driving after use, while both of the “Even a Little…” taglines were at the bottom of the list but still had a ‘very likely’ response from 55.8% of respondents, each on average.

Respondents were asked which sources they trust to receive messages about driving and cannabis use from. In this assessment, they were asked to choose as many sources that they would trust and, separately, which sources they would not trust. The resulting prevalence scores were used to calculate a net trust score across the population for each entity; the results are shown in Figure 11 and are discussed by subgroup in the subsequent sections.

Figure 11. Trust Ratings for Messaging Sponsors



Net Trust Score *(in circle above) is the percent of those who said they would trust a source, subtracted by the percent who said they would not trust that source.*

Message Reactions by Driving Risk Group

In looking at the driving risk groups (ultra-high, high, and medium), ultra-high-risk drivers had a statistically lower proportion of respondents (41.2%–49.8% vs. 50.3%–72.3%) identify messages as either extremely or very appealing; this is across all messages, except "Studies Show." However, 72.3% of high-risk drivers found the message "THC Effects" extremely/very appealing. Low prevalence of ultra-high-risk driver engagement continued in evaluating whether messages were attention-getting. High-risk drivers agreed (completely or a lot) that "Feel Different Drive Different" was attention-getting at 81.3%. There were few differences between groups about the relevance of the messages though, and again, high-risk drivers found "THC Effects" to be extremely or very relevant at a significant proportion (72.7%). Again, ultra-high-risk drivers found all messages (except "Studies Show") to be completely or very believable in a lower proportion than high-risk and medium-risk drivers. High-risk drivers, especially, were rating most messages as completely or very believable with high prevalence (71.9% to 82.0%). There is little difference between driver risk groups on how well the imagery reinforces the message.

These driver risk group comparisons were also made when evaluating the likelihood (prevalence of indicating 'very likely') in a message having impact on behavior. Unsurprisingly, ultra-high-risk drivers were far less likely to increase their wait time than high-risk and medium-risk drivers based on the messaging presented; for example, only 37.8% of ultra-high-risk drivers indicated they would be very likely to increase wait time compared to 71.2% of high-risk and medium-risk drivers for the message "Let's Be Blunt." This trend is mirrored in the likelihood of messages to impact respondents' choosing to take alternate transportation after consumption or even stay put. None of the driver risk groups is very likely to reduce cannabis use due to any message, especially compared to the other impacted behaviors. This finding reflects what is seen in the sample as a whole. In evaluating the additional taglines, high-risk and medium-risk drivers respond, again, in slightly higher proportion to being 'very likely' to reduce driving after use than the ultra-high-risk drivers.

Driver risk groups evaluated which sources from which they would trust messaging about cannabis use and driving. Among medium-risk drivers, healthcare providers (57.7%), science groups (48.1%), cannabis industry groups (45.8%), and safe driving groups (45.1%) were among the top trusted sources and more prevalent than other driving risk groups. High-risk drivers put their trust in cannabis brands. Ultra-high-risk drivers had statistically lower prevalence for trusting most sources compared to the other groups, while they were more *untrusting* of health care providers, safe driving groups, and law enforcement.

Message Reactions by State Legalization Groups

Finally, comparisons of message characteristics and behavior impact were also analyzed through the lens of the state legalization status groups. Surprisingly, there is little difference in the state group comparisons across the board. Respondents in states where cannabis is not legal at all found “Driving High is Driving Impaired,” “Feel Different Drive Different,” and “Let’s Be Blunt” to have a higher degree of attention getting and relevance. Otherwise, group prevalence patterns echoed trends seen in the larger sample possibly due to the nature of the cannabis users themselves; if you are a heavy user-then-driver in any state, the legalization status of that state is not likely to change your attitudes and beliefs about cannabis use and driving behavior. Additional tagline comparison showed that for many of the messages, non-legal states had a higher prevalence of being ‘very likely’ to reduce driving after use.

In a comparison of legalization status groups, who was trusted to provide messaging on cannabis use and driving was also not significantly different; only non-legal respondents had more trust in celebrities and less trust in dispensaries than their legal (fully or medical-only) state counterparts. Fully legal states found health care providers and celebrities untrustworthy in higher proportion than other states groups. Finally, this survey took the opportunity to ask respondents from states that did not have recreationally legal cannabis if they cross into another state to purchase cannabis and how far they travel when they do. On all, 58.1% of respondents from non-legal states and 34.4% of respondents from medical-only states have traveled to another state to purchase products. Of those that have (n = 261), 29.9% traveled 100 miles or less, 19.5% traveled 100 to 200 miles, 17.9% traveled 201 to 500 miles, 18.4% traveled 501 to 1000 miles, and 14.2% traveled 1000 miles or more; there is no significant difference in these percentages across the two groups. The median distance traveled is 217 miles.

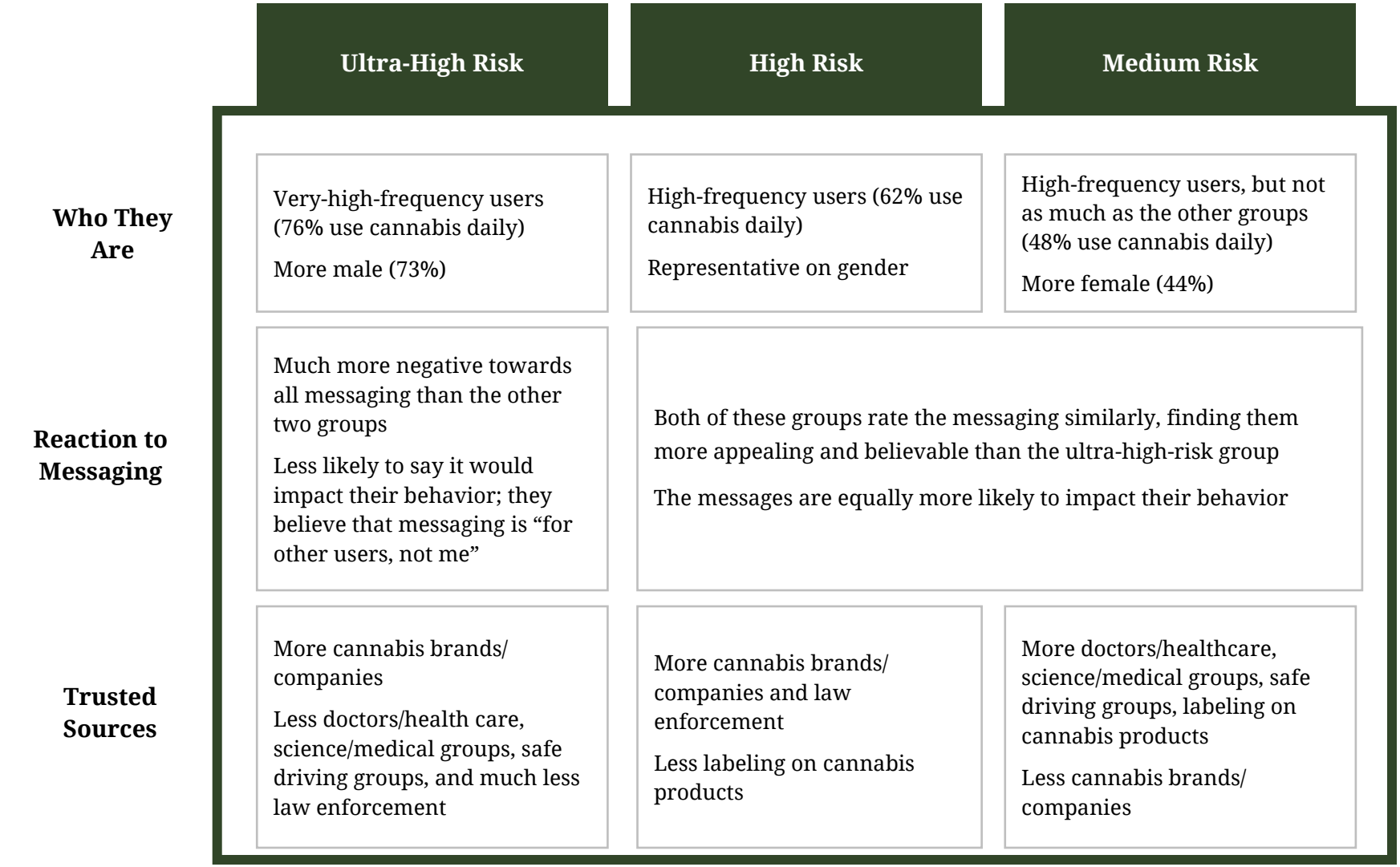
Discussion

The study on messaging strategies for cannabis use and driving reveals important findings on how to effectively influence user behavior and perceptions. Effective communication can have a significant positive impact on both attitudes and behaviors if crafted correctly. Messaging that makes users aware of the risks and potential dangers involved, both to themselves and others, encourages them to think twice about driving after using cannabis. However, the approach in delivering these messages is crucial. Users generally appreciate being informed of risks but are likely to disregard messages perceived as condescending or prescriptive. Many react negatively to feeling looked down upon or being overtly told what to do.

In terms of messaging tone, the findings indicate a prevalent preference for positive, non-critical communication that clearly informs users of the risks without resorting to exaggeration or fearmongering. Most users understand that the primary

intent of these messages is to ensure safety and make informed decisions about driving post-consumption. Messages that are preachy or degrading are less effective and can alienate the target audience. Additionally, it is important to avoid stereotypical depictions of cannabis users as “stoners” in safety messaging, as this does not reflect the diversity among users and tends to reduce the message’s respect and credibility. Regarding the sources of these messages, doctors, scientists, the cannabis industry, and safe driving advocates are the most trusted among the users surveyed. Dispensaries are also seen reliable sources to many in states where cannabis is fully legal or medical-only, while government bodies, social media-sponsored groups, and celebrities or influencers are generally viewed with skepticism. This preference underscores the importance of choosing credible and respected sources for delivering safety messages to ensure they are received as legitimate and taken seriously.

Figure 12. Overall Conclusions from Risk Groups



Study Conclusions and Future Directions

A previous guide to messaging and cannabis, *Cannabis Consumers and Safe Driving: Responsible Use Messaging*, was published in July 2022 and sponsored by the Governors Highway Safety Association (GHSA), Responsibility.org, and the National Alliance to Stop Impaired Driving (NASID). The GHSA guide outlined some promising practices and recommendations for effective messaging about responsible cannabis use and driving behavior. The current study report serves to both contrast and support some of the findings in the 2022 GHSA messaging guide. The results of this report outline a data-driven, consumer-based perspective on cannabis consumption, driving behaviors, and the influence of messaging in potentially changing attitudes and road safety decisions, in addition and in contrast to those provided by law enforcement, highway safety organizations, or local governments (such as departments of transportation). The current study also expands beyond the development of messaging done by state and national transportation departments to evaluate at the feature level the reactions, appeal, influence, and overall resonance of cannabis and safe driving messages with the consumers themselves, a practice that is not often achievable by organizations due to constraints on time, personnel, and funding. Findings from the current study also add to those provided in the GHSA report, including emphasis on factual messaging, messaging that does not use stereotypes or ridicule, and highlighting the dangers of cannabis-impaired driving as well as its illegality.

Challenges from this study also provide opportunities for further investigation. While a breadth of information was gathered from 8 states, we might stand to learn more from surveying additional regions. Likewise, the current survey constrictions in evaluating responses only from those 21 years and older limits the ability to gain insight from younger cannabis users and drivers. Finally, the current study has limited itself to the testing of static messaging, while we know that dynamic campaigns (e.g. video ads on TV or animated banner ads on social media) can also be an effective tool for conveying safety information through a variety of media.

Overall, this report illustrates a rich and detailed understanding of the cannabis consuming public's habits, attitudes, and reactions. The purpose is to provide data and recommendations for reaching the public about safe cannabis use and driving decisions to improve overall roadway safety and address the public health concern of cannabis-impaired driving.

General Recommendations

This study obtained input from 19 Subject Matter Experts, and almost 3,000 cannabis users in eight states using two AI-supported surveys of adults 21 and older. The respondents provided information on their cannabis use, purchasing behaviors,

knowledge, perceptions, and driving behaviors. Based on the results of these interviews and surveys, below we provide a summary of the findings to provide guidance for policy makers, law enforcement, researchers, and public health and social marketing educators.

FOR POLICY MAKERS: The findings of this project may help inform policy, as states grapple with issues of legality, per se laws, and unregulated sales.

- States where cannabis is fully illegal did not have a significantly different prevalence of use than fully legal states; legalization does not appear to affect use prevalence.
- States where cannabis is fully illegal had slightly worse driving safety behavior, with participants more likely to drive within an hour of use compared to legal states. Legalization may be associated with greater public awareness of potential safety risks of use.
- Users need education on driving after concomitant use of alcohol, especially drivers in fully illegal states.

FOR LAW ENFORCEMENT: Respondents identified a number of areas of need, including where law enforcement could improve their interaction with the public and be helpful.

- Help users self-identify impairment to determine their ability to drive safely; specifically, respondents suggested guides for usage and driving should be crafted as they are for alcohol, where possible.
- Implement cannabis laws equally across racial and ethnic groups to reduce the perception of discrimination.
- Train law enforcement officers to feel more confident in assessing drivers who might be at risk for driving under the influence.
- Better communicate evidence-based information regarding the likelihood of cannabis-impaired drivers being detected.

FOR RESEARCHERS: This study identified potential areas of research to better understand cannabis, its impact on safe driving, and methods for detecting impairment

- Develop methodology to determine if messages actually result in behavior change.
- Explore systemic and participant-centered approaches to address ultra-high-risk groups, including reasons for changes in driving after use.
- Develop tools for users to self-identify impairment that will adversely affect driving.
- Improve law enforcement's ability to detect cannabis-related impairment.

FOR THE PUBLIC: In addition to the messaging recommendations listed above, this project identified several guidelines for cannabis public education:

Address common myths in a manner that is respectful of users and acknowledges the source of some of the misconceptions

- Although people under the influence of cannabis may drive differently than when under the influence of alcohol, it can still be significantly impairing and is not necessarily "better" than alcohol.
- While it is legal to drive after using cannabis in cannabis-legal states, it is not legal to drive when impaired due to cannabis.
- Tolerance may reduce driving risk, but it does not when individuals look to become high.
- Although impairment detection due to cannabis is not as straightforward as with alcohol, police are still able to identify cannabis impairment.

Public Education: general guidelines

- Promote effective communication (i.e. avoid stereotypes); many different sectors of society may use cannabis and may be turned off by messaging that does not fit their self-identity.
- Provide accurate and factual information; users may not listen to messaging that promotes generalities that have not been substantiated by research.
- Tailor messages to specific groups (e.g., risk groups based on driving patterns), since they may have different motivations for the choices they make.
- Avoid authoritative language, consumers don not like being told what to do (i.e., being talked down to).
- Avoid hyperbole (exaggerations are not well-received by users).
- Clarify for the public the legality of cannabis in their specific state, including laws about transporting to and from out of state.
- Visuals accompanying cannabis and driving messaging should be appealing, clear, respectful, and consistent with the text being conveyed.

Channels for communication

- Collaborating with the cannabis industry for messaging and dissemination is important; one should include key stakeholders relevant to the consumers one is trying to reach.
- Using social media should be thoughtful and targeted (different platforms have different types of viewers).
- Incorporate testimonials from cannabis users.
- Physician/health care providers are a trusted source of messaging, followed by industry and cannabis brands/companies. Physician education would be needed for health care providers to be equipped to provide cannabis and driving safety messages.

Project Summary Table

Project Goals

Address public misperceptions about cannabis and driving to produce messaging to reduce driving after cannabis use

Method

Phase 1: SME Interviews	Phase 2: Driving Behavior Survey	Phase 3: Messaging Survey
Input from 19 subject matter experts (SMEs) on strategies to reach cannabis users with safe driving messages	Surveying 2,000 cannabis users from 8 states with varied cannabis laws regarding their driving behavior	Surveying 800 cannabis users from the same 8 states for reactions to messaging about cannabis use and driving

Results

SMEs recommended:	Survey results indicated:	Survey feedback indicated:
• Addressing misconceptions or myths • Promoting effective communication • Addressing gaps in knowledge • Collaborating with the cannabis industry for messaging and dissemination • Using social media to share messaging • Incorporating testimonials from cannabis users	• 84.8% said they drive the same day they consume cannabis • Only about 1 in 5 (19%) thought their driving was worse after use (same [47%], a little or much better [34%]) • Almost half of respondents didn't believe police could detect the influence of cannabis • Results showed some confusion in state residents' understanding of their state laws • Low-risk, medium-risk, high-risk, and ultra-high-risk groups were identified based on their history of driving after using cannabis	• Evaluated by medium-, high-, and ultra-high-risk respondents • The 3 messages ranked highest for increasing wait time or finding alternative transportation were: *"Driving high is driving Impaired- Find a safe ride home"* *"If you feel different, you drive different"- Drive High. Get a DUI,* *"THC slows down reaction time, distorts perception, and increases the risk of a car crash- Don't Drive High"* • Messages showed little impact on intentions to reduce cannabis use • Trusted information sources by group: Ultra-high risk and high risk- cannabis brands and companies Medium risk- physicians, medical groups, safe driving groups, product labels

Takeaways

- Most cannabis users surveyed demonstrated high-risk driving patterns
- There was generally a low level of knowledge about cannabis laws
- Cannabis users were most responsive to messages that were: *factual*, *respectful*, and *avoided stereotyping*

Guidance

For Policy Makers:	• Legalization does not appear to affect use prevalence • Fully illegal states had slightly worse driving safety behavior; legalization may be associated with greater public awareness of potential risk • Users need education on driving after using both alcohol and cannabis (especially in illegal states)
For Law Enforcement:	• Help users self-identify impairment and driving ability • Implement laws equally across racial and ethnic groups to reduce perceptions of discrimination • Train officers to be more confident in assessing drivers who may be at risk • Better communicate evidence-based information on the likelihood of detection
For Researchers:	• Develop methodology to determine if messages actually result in behavior change • Explore systemic and participant-centered approaches to address ultra-high-risk groups • Develop tools for users to self-identify impairment that will affect driving • Improve law enforcement ability to detect cannabis-related impairment

Acknowledgements

The University of California–San Diego (UCSD) would like to thank the staff and students of Transportation Research and Education for Driving Safety (TREDS) and Center for Medicinal Cannabis Research (CMCR). Special thanks to Angela Wong (UCSD) and Ahmed Elashmawy (Wayne State University) for help with literature review and survey development. Thank you to Renée Dell'Acqua (UCSD TREDS) for previous work on the topic and support for the project's development. Appreciation to the entire Quester team and specifically to Alice Gold (SVP–Client Strategy), Andrea Joss (SVP–Insights & Strategy), Ilene Lanin-Kettering (SVP–Consumer Science & Strategy), and Tom Shaughnessy (Senior Director–Insights & Strategy).

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Appendix A: Subject Matter Expert Interview Guide

I. INTRODUCTION

Can you please provide a background of your work?

What type of work have you done that focuses on cannabis, especially as it relates to cannabis and driving?

What is the current state of legalization in your state?

II. CANNABIS & DRIVING

Thank you for the information and insight you've provided thus far. So now, let's transition into the primary focus of today's interview, which is about exploring your understanding of cannabis and driving.

Let's start off with general questions. Given your area of expertise,...

What gaps in public knowledge have you observed?

What are the myths people believe?

What are the barriers to being heard?

What do you notice about the population of users in your area?

High-risk users?

What do you want the population to know?

What are the changes that have occurred since legalization?

What are the campaigns you've seen in your region?

How are they developed? Measured for effectiveness?

III. CANNABIS LEGISLATION

Thank you for sharing your thoughts and perceptions on cannabis and driving. Now, we'd like to get your perspective on cannabis legislation.

How does the current state of cannabis legislation affect your neighboring states and vice versa?

What do you believe are the consequences (or complications) of differing state and federal cannabis policies and regulations?

If you had the opportunity to make amendments to the current legislation, what would they be and why?

What other changes do you hope to see in the future when it comes to cannabis policies and legislation?

IV. AREAS OF INTEREST (PHASE 2)

During the upcoming phases of our study, we'll be surveying cannabis users.

Knowing that we will have access to the knowledge, insight, and perspective of cannabis users across the country, what do you hope we could include in our survey related to your industry or line of work?

FOLLOW-UP: What would you be interested in learning from cannabis users whether related to your line of work or not?

Generally speaking, what type of cannabis-related research would you like to see?

Appendix B: Cannabis Use and Driving Survey

Study: UCSD Cannabis and Driving
Subject: Quester Conversation Guide
Date: 11/06/23
Estimated LOI: 28 minutes

Objectives:

- Understand demographics, cannabis usage, attitudes, and driving behavior

Sample

N=3750 Respondents

- States in various stages of cannabis legalization = Florida, Louisiana, Michigan, Ohio, Oklahoma, Oregon, South Carolina, Texas (n250 per state, except Michigan who will have 2000 completes)
    - Geographic variation within each state will be representative
- Have to have a driver's license, access to a car, and drives at least one day per week
- Age = 21+
- Current User of cannabis that contains THC (in any form): self-stated current user (S7) + last consumed within the past 3 months (S8) + consumes at least once every three months (S9)

This Discussion Guide includes instructions for the programming team. Below is a legend to define some of the programming language:

Programming Instruct/Language	Definition
Type: Radio Button	A single select close-end.
Type: Checkbox	A multi-select close-end.
Type: Instructional	Instructional text to set context for Respondents.
Probe: Yes	Indicates the open-end will be probed using the AI Moderator.
Probe: No	Indicates the open-end will not be probed.
PN	Programming note
AN	Analyst note for probing or analytics on the back-end

Mobile Optimized: Yes

---- SCREENER CRITERIA----

H1Consent
Type: Radio Button
In order to participate in this survey, we ask you to consent to the collection of your personal data (for example, your age or gender). Collected data is used exclusively for research purposes and is never reported on an individual level but analyzed with all other participants in the aggregate. Our full privacy policy and how we will be using your information is located here.

Do you consent to having your personal data used for this survey?

Opt. #	Option Text
1	Yes
2	No

S1aZipCode
Type: Digits

What is your residential zip code?

S1bState
Type: Single Select Dropdown
In which state do you live?

Opt. #	Option Text
1	Alabama
2	Alaska
3	Arizona
4	Arkansas
5	California
6	Colorado
7	Connecticut
8	Delaware
9	District of Columbia
10	Florida
11	Georgia
12	Hawaii
13	Idaho
14	Illinois
15	Indiana
16	Iowa
17	Kansas
18	Kentucky
19	Louisiana
20	Maine
21	Maryland
22	Massachusetts
23	Michigan
24	Minnesota

25	Mississippi
26	Missouri
27	Montana
28	Nebraska
29	Nevada
30	New Hampshire
31	New Jersey
32	New Mexico
33	New York
34	North Carolina
35	North Dakota
36	Ohio
37	Oklahoma
38	Oregon
39	Pennsylvania
40	Rhode Island
41	South Carolina
42	South Dakota
43	Tennessee
44	Texas
45	Utah
46	Vermont
47	Virginia
48	Washington
49	West Virginia
50	Wisconsin
51	Wyoming
52	Outside of the US

S0Industry

Type: Checkbox

Do you or does anyone in your household work in any of the following types of businesses or occupations? Please select all that apply.

Randomize

Opt. #	Option Text
1	Advertising/Public Relations
2	Financial Services
3	Food/Beverage
4	Marketing/Marketing Research
5	Real Estate/Construction
6	Sales/Sales Promotion
7	Cannabis Industry
8	None of the above

S2aAge

Type: Digits
What is your age?

_____

S3Gender
Type: Radio Button
What is your gender?

Opt. #	Option Text
1	Male
2	Female
3	Genderqueer or non-binary
4	Agender
5	Not specified above
6	Prefer not to answer

S4aHispanic
Type: Radio Button
Are you of Spanish, Hispanic, or Latino background or origin? This includes Mexican, Mexican American, Puerto Rican, Cuban, and all other Spanish, Hispanic, or Latino origins.

Opt. #	Option Text
1	Yes
2	No
3	Prefer not to answer

S4bRace
Type: Checkbox
Are you…? Select all that apply.

Opt. #	Option Text
1	White/Caucasian
2	Black/African American
3	American Indian/Native American
4	Asian
5	Pacific Islander
6	Some other race
7	Prefer not to answer

S5aPersonalIncome
Type: Radio Button
What is your personal income (not including others in your household) before taxes?

Opt. #	Option Text
1	Less than $25,000
2	$25,000 to $49,999
3	$50,000 to $74,999

4	$75,000 to $99,999
5	$100,000 to $124,999
6	$125,000 to $149,999
7	$150,000 to $249,999
8	$250,000 or more

S5bHHIncome
Type: Radio Button
And what is your total annual household income (including others in your household) before taxes?

Opt. #	Option Text
1	Less than $25,000
2	$25,000 to $49,999
3	$50,000 to $74,999
4	$75,000 to $99,999
5	$100,000 to $124,999
6	$125,000 to $149,999
7	$150,000 to $249,999
8	$250,000 or more

---- CUSTOM SCREENER CRITERIA----

S7Usage
Type: Radio Button
Which of the following statements best describes you?

Please note:

- When we say cannabis, we mean in all forms – flower, concentrates, edibles, topicals, etc.
- THC (tetrahydrocannabinol) is the substance in cannabis products that is responsible for the 'high' or 'stoned' feeling when using cannabis. Pure CBD products do not contain THC.
- Everything we talk about is completely anonymous and confidential.

Opt. #	Option Text
1	I currently use or consume **cannabis that contains THC** (in any form)
2	I do not currently use or consume **cannabis that contains THC** (in any form), but I have in the past
3	I have never used or consumed **cannabis that contains THC** (in any form)

S8LastConsumed
Type: Radio Button
When was the last time you used or consumed **cannabis that contains THC**, in any form?

Opt. #	Option Text
1	Today
2	Within the past week
3	Within the past month
4	Within the past 2-3 months

5	Within the past 4-6 months
6	Within the past 7-12 months
7	More than 12 months ago

S9UseFrequency

Type: Radio Button

Approximately how often do you use or consume cannabis that contains THC, in any form?

Opt. #	Option Text
1	Multiple times a day
2	Once a day
3	4-6 times a week
4	1-3 times a week
5	1-2 times a month
6	Once every 2 to 3 months
7	Once every 4 to 6 months
8	Less than every 6 months

S10DriversLicense

Type: Radio Button

Which of the following best describes you?

Opt. #	Option Text
1	I have a driver's license and regular access to a car
2	I have a driver's license but do not have regular access to a car
3	I do not have a driver's license

S11HowOftenDrives

Type: Radio Button

In a typical week, how many of those days do you drive a car?

Opt. #	Option Text
1	Everyday
2	4 – 6 days per week
3	2 – 3 days per week
4	One day per week
5	Less often than once a week

----BEGIN SURVEY----

introA
Type: Instructional
Thank you for helping me get to know you a little better. My name is Alex, and I'm looking forward to talking with you today.

Now, please take a moment to review the helpful hints for taking this interview below and then continue.

SOME HELPFUL INSTRUCTIONS FOR TAKING THIS INTERVIEW:

- Please keep in mind that this is an interview, rather than a survey, so your answers will guide our conversation.
- It would be extremely helpful to me to get your open and honest feedback ... there are no right or wrong answers.
- Our conversation will go the most smoothly if you include at least 15 to 20 words in each of your more conversational responses. That's about two lines of text ... but the more you tell me, the better.
- Once your answers have been submitted, they cannot be changed.
- Please do not use your browser back button, browser refresh button or the return/enter key throughout the interview, as this will terminate the interview.

---- Intro and Activation-----

Intro0
Type: Instructional
Thanks for sharing! I'd like to talk with you about cannabis in all forms – flower, concentrates, edibles, topicals, etc. We're going to cover a lot of ground within this topic, and I want you to know you can tell me anything ... there are no right or wrong answers, everything we talk about is completely anonymous and confidential. I just really want to understand what your experience with cannabis is like.

Please note that in this interview, when we say cannabis, we mean **cannabis with THC**.

So, let's get started! Please click below to continue.

OE1
Type: Quester OE
Probe: No
Talk to me about your cannabis use. How would you describe yourself as a user?

Q2WordBank
Type: Check Box
Which of the following, if any, describe you as a cannabis user? Please select all that apply.

Randomize

Opt. #	Option Text
1	Casual
2	Committed
3	To relax in social situations

4	Experimental
5	Experienced
6	Cautious
7	I treat specific symptoms
8	Helps my mind
9	Helps my body
10	Frequent
11	Long-time
12	Reluctant (no other effective options available)
98	Other (specify)
99	None of the above

Q3ProductsUse

Type: Check Box

Which of the following cannabis products do you use regularly? Please select all that apply.

Randomize

Opt. #	Option Text
1	Dried flower (i.e., smoking, vaporized flower)
2	Oils/tinctures
3	Edibles or capsules
4	Vaping concentrates
5	Dabbing concentrates
6	Topical/transdermal (i.e., creams, lotions, salves, patches)
7	Beverages
8	Other forms of THC (Delta 8, Delta 10, THC-V)
98	Other (specify)

Q4StateStatus

Type: Radio Button

Which of the following describes the legal status of adult cannabis use in the state where you live?

Opt. #	Option Text
1	Fully legal
2	Legal for medicinal use, illegal but decriminalized for recreational use
3	Legal for medicinal use, illegal for recreational use
4	Illegal but decriminalized for all uses
5	Fully illegal
99	Not sure

—— Driving and Impairment——

Intro1

Type: Instructional

Thanks! Next, I'd like to talk with you about cannabis use and driving. Again, I want you to know you can tell me anything … there are no right or wrong answers, everything we talk about is completely anonymous and confidential. I just really want to understand your experience.

Q10WaitTimes

Type: Grid Radio Button

How long do you usually wait until you feel safe to drive after using each of the following?

Options

Opt. #	Option Text
1	Less than 30 minutes
2	30 minutes
3	1 hour
4	2 hours
5	3 hours
6	4 hours
7	5 hours
8	6 hours
9	7 hours
10	8 hours or more (same day/before sleep)
97	8 hours or more (after sleep)
98	I wait until the next day (never on the same day)

Headers- Randomize

Opt. #	Option Text
1	Cannabis flower
2	Cannabis edibles
3	Cannabis vaping or dabbing concentrate
4	Other type(s) of cannabis

Q11aDriveAfterConsuming1

Type: Radio Button

Thinking about the times you needed to go somewhere and you consumed cannabis **an hour or less** before then, how often do you drive?

Opt. #	Option Text
1	Most of the time (more than 50%)
2	Some of the time (10%- 49%)
3	Every once in a while (less than 10%)
4	Never

Q11bDriveAfterConsuming2-3

Type: Radio Button

Thinking about the times you needed to go somewhere and you consumed cannabis **2-3 hours** before then, how often do you drive?

Opt. #	Option Text
1	Most of the time (more than 50%)
2	Some of the time (10%- 49%)
3	Every once in a while (less than 10%)
4	Never

Q11cDriveAfterConsuming4-5

Type: Radio Button

Thinking about the times you needed to go somewhere and you consumed cannabis **4-5 hours** before then, how often do you drive?

Opt. #	Option Text
1	Most of the time (more than 50%)
2	Some of the time (10%- 49%)
3	Every once in a while (less than 10%)
4	Never

Q11dDriveAfterConsuming6more

Type: Radio Button

Thinking about the times you needed to go somewhere and you consumed cannabis **6 or more hours** before then (but on the same day), how often do you drive?

Opt. #	Option Text
1	Most of the time (more than 50%)
2	Some of the time (10%- 49%)
3	Every once in a while (less than 10%)
4	Never

OE11

Type: Quester OE

Probe: Yes

Talk to me about why you never drive the same day after consuming cannabis.

AN: Probe areas include being responsible, fear of getting caught, confidence, end destination/length of travel

OE12

Type: Quester OE

Probe: Yes

Talk to me about how you approach driving after using cannabis.

AN: Probe areas include length of time, pays additional attention

Q13DriveAfterConsuming

Type: Radio Button

How would you rate your driving when you drive after recently using cannabis?

Opt. #	Option Text
5	Much better
4	A little better
3	The same
2	A little worse
1	Much worse
99	Not sure

OE13

Type: Quester OE
Probe: No
Why do you say that?

Q14aWaitTimeFactors
Type: Check Box
Which of the following do you consider when determining how long you need to wait to drive after consuming cannabis? Please select all that apply.

Randomize

Opt. #	Option Text
1	What other substances I've used
2	Weather
3	If there are children involved
4	If I am alone
5	How far I'm going
6	Whether I feel impaired or not
7	Where I am driving is known for a lot of traffic stops and I might get caught
8	How accessible alternative transportation is
9	If there is a "designated driver"
10	Whether I think I might get pulled over
11	I'm familiar with where I am going
98	Other (specify)
99	None

Q14bProductsUseBefore Driving
Type: Check Box
Are there any particular cannabis product(s) that you prefer to use when you know you will be driving later, because you think it might be less impairing? Please select all that apply.

Randomize

Opt. #	Option Text
1	Dried flower (i.e., smoking, vaporized flower)
2	Oils/tinctures
3	Edibles or capsules
4	Vaping concentrates
5	Dabbing concentrates
6	Topical/transdermal (i.e., creams, lotions, salves, patches)
7	Beverages
8	Other forms of THC (Delta 8, Delta 10, THC-V)
98	Other (specify)
99	None; product type doesn't matter

Q15Transportation
Type: Check Box
What transportation alternatives are you most likely to choose when you decide that you should not drive, but really need to be somewhere. Please select all that apply.

Randomize

Opt. #	Option Text
1	Public transportation
2	Ride sharing (e.g., Uber, Lyft) or taxi
3	Friends/designated driver
4	Bicycle
5	Motorized scooter / bike
6	None – I stay home
7	None – I walk
8	None – I just drive
98	Other (specify)

OE15
Type: Quester OE
Probe: No
When you use cannabis and need to be somewhere, how do you determine if you are okay to drive?

Q16aImpairedSelf
Type: Check Box
Asking it another way…

When you use cannabis, how do you determine if you are too impaired to drive? Please select all that apply.

Randomize

Opt. #	Option Text
1	Slurred speech
2	Trouble with balance
3	Slow reaction time
4	Trouble with recall
5	Self-test via a phone app
6	Friends/family
7	By the amount I consumed
8	Drowsiness
9	Unusual mood or affect
10	Heightened emotions
11	Brain fog / not thinking clearly
98	Other (specify)

Q16bImpairedOther
Type: Check Box
When you use cannabis with others, how do you determine if others are too impaired to drive? Please select all that apply.

Randomize

Opt. #	Option Text
1	Slurred speech
2	Trouble with balance
3	Slow reaction time
4	Trouble with recall

5	Self-test via a phone app
6	Friends/family
7	By the amount I consumed
8	Drowsiness
9	Unusual mood or affect
10	Heightened emotions
11	Brain fog / not thinking clearly
98	Other (specify)

Q16cHypothetical
Type: Radio Button
Hypothetically, if you were to be evaluated by a police officer, do you believe he/she would be able to detect if you were under the influence of cannabis?

Opt. #	Option Text
1	Yes
2	No
99	Not sure

OE16
Type: Quester OE
Probe: No
Why do you say that?

Q17aInteractionsWithPolice
Type: Grid Radio Button
Please indicate if you have experienced the following situations.

Options

Opt. #	Option Text
1	Yes
2	No

Headers - Randomize

Opt. #	Option Text
1	Have you ever been pulled over for driving while under the influence of cannabis?
2	Have you ever been a driver in a crash while under the influence of cannabis?
3	Have you ever been a passenger in a crash whose driver was under the influence of cannabis?
4	Have you ever been pulled over for suspected cannabis use?

Q17bWhetherEvaluated
Type: Radio Button
When you were pulled over by police for (suspected) cannabis use, were you evaluated at the road side?

Opt. #	Option Text
1	Yes
2	No

99	Not sure

Q17cWhoEvaluated

Type: Check Box

When you were evaluated, who did the evaluation? Please select all that apply.

Opt. #	Option Text
1	The officers who pulled me over
2	Someone else (specify)
99	Not sure

Q17c1HowEvaluated

Type: Check Box

When you were evaluated, what types of test(s) were you given? Please select all that apply.

Randomize

Opt. #	Option Text
1	Saliva test (oral fluid teat)
2	Blood test
3	Urine test
4	Behavioral test (e.g., walk and turn, one-leg stand)
5	Physical assessment (e.g., appearance of eyes, speech)
97	Other (specify)
98	Not sure/don't recall
99	None

Q17dEvaluationOutcome

Type: Radio Button

What was the outcome of the evaluation?

Opt. #	Option Text
1	I was let go immediately
2	I was detained for a bit and then let go
3	I was issued a citation
4	I was arrested
98	Other (specify)
99	Don't recall

Q17eSelfAssessment

Type: Radio Button

When you were pulled over by police for (suspected) cannabis use, how impaired were you at the time?

Opt. #	Option Text
5	Extremely impaired
4	Very impaired
3	Somewhat impaired
2	Not very impaired
1	Not impaired at all
99	Not sure

OE17
Type: Quester OE
Probe: No
Talk to me about what the officer(s) said to you while you were pulled over and some of the comments they made to you.

Q18FeelingsAboutGettingPulledOver
Type: Radio Button
During the time(s) you have been pulled over by police for (suspected) cannabis use, have you ever felt targeted or discriminated against?

Opt. #	Option Text
1	Yes
2	No

OE18
Type: Quester OE
Probe: No
Talk to me about the reasons you felt targeted or discriminated against in this instance.

—— Messaging——

Q21aMessagingSeen
Type: Check Box
Where, if any place, have you seen messaging about **cannabis use and driving**? Please select all that apply.

Randomize

Opt. #	Option Text
1	TV ads
2	Radio ads
3	Billboards
4	Magazines
5	Social media
98	Other (specify)
99	I have not seen any messaging about cannabis use and driving

Q21bMessagingOpinion
Type: Radio Button
What is your reaction to the content of the messages you have seen about **cannabis use and driving**?

Opt. #	Option Text
7	Extremely positive

6	Mostly positive
5	A little more positive than negative
4	Mixed
3	A little more negative than positive
2	Mostly negative
1	Extremely negative

OE21
Type: Quester OE
Probe: Yes
Tell me about why you are [insert answer from Q21b] about the content of the messages you have seen about cannabis use and driving.

Q22aMessagingImpactBeliefs
Type: Radio Button
Thinking about the messaging you have seen about cannabis use and driving, how much of an impact did it have on your **beliefs/attitudes**?

Opt. #	Option Text
4	A major impact
3	Somewhat of an impact
2	A little impact
1	No impact at all

Q22bMessagingImpactBehavior
Type: Radio Button
Thinking about the messaging you have seen about cannabis use and driving, how much of an impact did it have on your **behavior**?

Opt. #	Option Text
4	A major impact
3	Somewhat of an impact
2	A little impact
1	No impact at all

OE22
Type: Quester OE
Probe: No
What impact did the messaging about cannabis use and driving have on your **behavior**?

Q23MessagingSponsor
Type: Check Box
Who sponsored the messaging about **cannabis use and driving** that you have seen? Please select all that apply.

Randomize

Opt. #	Option Text
1	Law enforcement groups
2	Government groups

3	Safe driving advocacy groups
4	Science / medical groups
5	Social media-sponsored
6	Cannabis industry groups/associations
7	Dispensaries
8	Cannabis brands/companies
98	Other (specify)
99	Not sure

OE23
Type: Quester OE
Probe: No
If you were to see any new messaging about **cannabis use and driving**, how do you think the cannabis user should be represented?

OE24
Type: Quester OE
Probe: No
As a cannabis user, how would you not want to be represented in messaging about **cannabis use and driving**?

Q24TrustedSourcesSafeCannabisUse
Type: Check Box
From which of the following sources would you trust messaging about **cannabis use and driving**? Please select all that apply.

Randomize

Opt. #	Option Text
1	Law enforcement groups
2	Government groups
3	Safe driving advocacy groups
4	Science / medical groups
5	Social media-sponsored
6	Cannabis industry groups/associations
7	Dispensaries
8	Cannabis brands/companies
9	AAA
10	Doctors / health care providers
11	Celebrities
12	User testimonials
13	Social media influencers
14	Labeling on products
98	Other (specify)
99	None

Q25TrustedSourcesSafeDriving
Type: Check Box
From which of the following sources would you trust messaging about **safe driving in general**? Please select all that apply.

Randomize

Opt. #	Option Text
1	Law enforcement groups
2	Government groups
3	Safe driving advocacy groups
4	Science / medical groups
5	Social media- sponsored
6	AAA
7	Doctors / health care providers
8	Celebrities
9	Social media influencers
98	Other (specify)
99	None

—— Cannabis Attitudes and Perceptions ——

Q31KnowledgeLevel

Type: Grid Radio Button

When it comes to using cannabis with THC, how knowledgeable would you say you are about each of the following?

Options

Opt. #	Option Text
5	Extremely knowledgeable
4	Very knowledgeable
3	Somewhat knowledgeable
2	Not very knowledgeable
1	Not at all knowledgeable

Headers- Randomize

Opt. #	Option Text
1	THC strength of various products
2	Appropriate amount to consume
3	Source of cannabis - how/where it was grown/made
4	Cannabis laws in your state regarding possession/use
5	Cannabis laws in your state regarding driving

OE31

Type: Quester OE

Probe: No

What are the cannabis laws in your state regarding driving? Please provide as much detail as you can.

Type: Radio Button

In your opinion, do you think people close to you have changed their opinions on cannabis use since it was legalized for [recreational/medical] use?

Opt. #	Option Text	Notes
5	Much more acceptable	
4	Somewhat more acceptable	
3	No change	

2	Somewhat less acceptable	
1	Much less acceptable	

Q33aCommunityPerceptions

Type: Radio Button

Thinking about the **community in which you live**, which of the following describes how **your community feels about adult cannabis use**?

Opt. #	Option Text
1	They are fully accepting
2	They are mostly accepting
3	There's a mix of those okay with it and those who are not
4	There's more a negative opinion than a positive one
5	Most are strongly against it
99	Not sure

Q33bWhyNegativeCommunityPerceptions

Type: Check Box

Which of the following describe why **those in your community are negative** about adult cannabis use? Please select all that apply.

Randomize

Opt. #	Option Text
1	There's a stigma attached to cannabis use
2	They don't understand why people use cannabis
3	They aren't knowledgeable about cannabis use
4	They believe it is a gateway drug
5	They think it leads to increased crime
6	They think it has unwanted or unknown side effects
7	They believe it will lead to more impaired driving
8	They are concerned about people taking it but it being laced with other things
9	Because it is illegal
10	Because it is not legal for recreational purposes
98	Other (specify)
99	Not sure

Q34aLocalLawEnforcementPerceptions

Type: Radio Button

Thinking about **the law enforcement in the community in which you live**, which of the following describes **how they feel about adult cannabis use**?

Opt. #	Option Text
1	They are fully accepting
2	They are mostly accepting
3	There's a mix of those okay with it and those who are not
4	There's more a negative opinion than a positive one
5	Most are strongly against it
99	Not sure how they feel

Q34bWhyNegativeLocalLawEnforcementPerceptions

Type: Check Box

Which of the following describes why **the law enforcement in your community are negative** about adult cannabis use? Please select all that apply.

Randomize

Opt. #	Option Text
1	There's a stigma attached to cannabis use
2	They don't understand why people use cannabis
3	They aren't knowledgeable about cannabis use
4	They believe it is a gateway drug
5	They think it leads to increased crime
6	They think it has unwanted or unknown side effects
7	They believe it will lead to more impaired driving
8	They are concerned about people taking it but it being laced with other things
9	Because it is illegal in my state
10	Because it is not legal for recreational purposes in my state
98	Other (specify)
99	Not sure

—— Cannabis Use ——

Q41MedRec

Type: Check Box

Please select **all the reasons** you currently use cannabis from the list below.

Randomize

Opt. #	Option Text
1	Medicinal purposes
2	Recreational purposes
3	Religious or spiritual purposes
98	Other (please specify)

Q43WhoElse Uses

Type: Check Box

Who else in your social circle uses cannabis? Please select all that apply.

Randomize

Opt. #	Option Text
1	Spouse / partner
2	Family members
3	Friends
4	Co-workers/colleagues
98	Other (specify)
99	Not sure

Q44WhereObtains

Type: Check Box

From what source(s) do you normally obtain cannabis? Please select all that apply.

Opt. #	Option Text
1	Dispensary- licensed
2	Dispensary- unlicensed
3	Dispensary – don't know if licensed or not
4	Delivery service- licensed
5	Delivery service- unlicensed
6	Delivery service – don't know if licensed or not
7	Friends/family
8	I grow my own
98	Other (please specify)

OE44

Type: Quester OE

Probe: No

Tell me more about your experience buying at a licensed dispensary; where do you go? How far do you travel to get there? What is it about that place that makes you go there?

Q45SideEffects

Type: Check Box

Which **unwanted side effects** have you ever experienced from using cannabis? Please select all that apply.

Randomize

Opt. #	Option Text
1	Fatigue/sleepiness
2	Memory loss
3	Lack of motivation
4	Weight gain
5	Weight loss
6	Brain fog
7	Changes in visual or auditory perception
8	An altered sense of time
9	Mood changes
10	Impaired body movement
11	Hallucinations/delusions
12	Paranoia
13	Nausea and/or vomiting
14	Cannabis dependency
15	Persistent cough
16	Hunger / the munchies
98	Other (please specify)
99	None; no unwanted side effects

Q46aEverEmergency

Type: Radio Button

Have you ever gone to a hospital or emergency room because of cannabis use?

Opt. #	Option Text
1	Yes

2	No

Q46bWhereGot

Type: Radio Button

Where did you get the cannabis that made you go to the hospital/emergency room?

Opt. #	Option Text
1	Dispensary- licensed
2	Dispensary- unlicensed
3	Dispensary – don't know if licensed or not
4	Delivery service- licensed
5	Delivery service- unlicensed
6	Delivery service – don't know if licensed or not
7	Friends/family
8	I grow my own
98	Other sources (please specify)

Q46cLaced

Type: Radio Button

Do you think the cannabis that made you go to the hospital/emergency room was "laced"?

Opt. #	Option Text
1	Yes
2	No

Q47InfluenceOnOtherUsage

Type: Grid Radio Button

How has your cannabis use affected your use of the following?

Options

Opt. #	Option Text
1	Use more
2	Use the same
3	Use less
4	Don't currently use
5	Never used

Headers- Randomize

Opt. #	Option Text
1	Alcohol
2	Tobacco
3	Prescription drugs that might impair driving (e.g., makes you drowsy)
4	Non-prescription drugs (e.g., cocaine, mushrooms, opiates like heroin and fentanyl)
5	Over the counter medications that might impair driving (e.g., Tylenol PM, Benadryl)

Q48UseWithCannabisBeforeDriving

Type: Grid Radio Button

How often do you use the following substances with cannabis before driving?

Options

Opt. #	Option Text	Notes
1	I use these frequently (>50% of the time I use cannabis before driving)	
2	I use these sometimes (10-49% of the time I use cannabis before driving)	
3	I use these rarely (<10%)	
4	I never use these substances with cannabis before driving	

Headers- Randomize

Opt. #	Option Text
1	Prescription drugs that might impair driving (e.g., makes you drowsy)
2	Non-prescription drugs (e.g., cocaine, mushrooms, opiates like heroin and fentanyl)
3	Over the counter medications that might impair driving (e.g., Tylenol PM, Benadryl)

Q49aDriveAfterDrinking1

Type: Radio Button

Thinking about the times you needed to go somewhere and you drank alcohol **an hour or less** before then, how often do you drive?

Opt. #	Option Text
1	Most of the time (more than 50%)
2	Some of the time (10%- 49%)
3	Every once in a while (less than 10%)
4	Never

Q49bDriveAfterDrinking2-3

Type: Radio Button

Thinking about the times you needed to go somewhere and you drank alcohol **2-3 hours** before then, how often do you drive?

Opt. #	Option Text
1	Most of the time (more than 50%)
2	Some of the time (10%- 49%)
3	Every once in a while (less than 10%)
4	Never

Q49cDriveAfterDrinking4-5

Type: Radio Button

Thinking about the times you needed to go somewhere and you drank alcohol **4-5 hours** before then, how often do you drive?

Opt. #	Option Text
1	Most of the time (more than 50%)
2	Some of the time (10%- 49%)
3	Every once in a while (less than 10%)
4	Never

Q49dDriveAfterDrinking6more

Type: Radio Button

Thinking about the times you needed to go somewhere and you drank alcohol **6 or more hours** before then (but on the same day), how often do you drive?

Opt. #	Option Text
1	Most of the time (more than 50%)
2	Some of the time (10%- 49%)
3	Every once in a while (less than 10%)
4	Never

—— Physical and Mental Health Status and History ——

Q51PerecivedHealthStatus

Type: Radio Button

How would you rate your overall health?

Opt. #	Option Text
5	Very good
4	Good
3	Average
2	Poor
1	Very poor

Q52ConditionsCannabis

Type: Check Box

For which, if any, of the following conditions are you using cannabis to address/ease? Please select all that apply.

Randomize

Opt. #	Option Text
1	Pain - acute
2	Pain - chronic
3	Sleep problems
4	Anxiety
5	Stress
6	PTSD
7	Decreased appetite
8	Grief
9	Depression
10	Another diagnosed mental health condition
98	Other (specify)
99	None

——ADDITIONAL DEMOGRAPHICS——

D0IntroDemo

Type: Instructional

I have some quick questions and then we'll be all wrapped up.

D1Marital

Type: Radio Button

What is your marital status?

Opt. #	Option Text
1	Single, never married
2	Living with partner
3	Married
4	Widowed
5	Divorced/Separated
6	Prefer not to answer

D2HHSize

Type: Radio Button

How many people are living or staying at your current address? (Include yourself and any other adults or children who are living or staying at this address for at least two months)

Opt. #	Option Text
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8 or more
9	Prefer not to answer

D2aHHComposition

Type: Checkbox

And just to be sure I understand, thinking of those who are living or staying at your current address, are any of them … ?

Opt. #	Option Text
1	Under age 6
2	7 to 12 years old
3	13 to 17 years old
4	My adult children age 18+
5	My parents or in-laws
6	Spouse or partner
7	My grandchildren
8	Grandparents
9	Other family member (aunts, uncles, cousins)
10	Roommate(s)
99	Prefer not to answer

D2bNumberKids

Type: Radio Button
How many of those living in your household are children under the age of 18?

Opt. #	Option Text
1	0
2	1
3	2
4	3
5	4
6	5
7	6 or more
8	Prefer not to answer

D3Education
Type: Radio Button
What is the highest degree or level of school you have completed?

Opt. #	Option Text
Category Header	Education through Grade 12
1	Less than 9th grade
2	9th to 12th grade, no diploma
Category Header	High School Graduate or Equivalent
3	Regular High School Diploma
4	GED or alternative credential
Category Header	Some College or College Degree
5	Occupational trade program
6	Some college credit, but no degree
7	Associate's degree (for example: AA, AS)
8	Bachelor's degree (for example: BA, BS)
Category Header	Graduate or Professional Degree
9	Master's degree (for example: MA, MS, MEng, MEd, MBA)
10	Professional degree (for example: MD, DDS, DVM, LLB, JD)
11	Doctorate degree (for example: PhD, EdD)

D4Employment
Type: Radio Button
Which of the following best describes your current employment status?

Opt. #	Option Text
1	Employed – full-time
2	Employed – part-time
3	Self-Employed – full-time
4	Self-Employed – part-time

5	Retired
6	Student – full-time
7	Student – part-time
8	Military
9	Full-time parent, homemaker
10	Not currently employed
11	Prefer not to answer

D5Urbanicity

Type: Radio Button

Which of the following best describes the area where you now live?

Opt. #	Option Text
1	Rural
2	Suburban
3	Urban

D6RentOwn

Type: Radio Button

Do you rent or own your primary place of residence?

Opt. #	Option Text
1	Rent
2	Own
3	Live with family or someone else rent-free

Q99aSurveySat

Type: Radio Button

Thanks for your help today! To wrap up today, how satisfied were you with this survey?

Opt. #	Option Text
7	Very satisfied
6	Satisfied
5	Somewhat satisfied
4	Neither satisfied nor dissatisfied
3	Somewhat dissatisfied
2	Dissatisfied
1	Very dissatisfied

Appendix C: Messaging Survey

Study: UCSD Messaging Test
Subject: Quester Conversation Guide
Date: 04/12/24
Estimated LOI: 20 minutes

Objective:

- Test various communication strategies

Sample

N=800 Respondents

- States in various stages of cannabis legalization = Florida, Louisiana, Michigan, Ohio, Oklahoma, Oregon, South Carolina, Texas
- Have to have a driver's license, access to a car, and drives at least one day per week
- Age = 21+
- Current User of cannabis that contains THC (in any form): self-stated current user (S7) + last consumed within the past 3 months (S8) + consumes at least once every three months (S9)
- Is at least a Medium Risk driver (drives same day as using cannabis)

Quotas

- 1/3 of the completes will be among each of these Driver Groups:
    - Ultra-High Risk Drivers (drive 1 hour or less after use)
    - High Risk Drivers (drive 1.5-3.0 hours after use)
    - Medium Risk Drivers (wait more than 3 hours to drive after use - but still same day (ultra high/high/medium risk)
- 1/3 of the completes will also be among the state groupings based on legal status:
    - Both Recreational and Medicinal (MI, OR, OH)
    - Medicinal Only (FL, LA, OK)
    - Not legal (SC, TX)
- In the end, we will have ~100 "deep dive" evaluations of each message within each of these groups

**NOTE: Ohio moved to "fully legal" status for this test.*

H1Consent
Type: Radio Button
In order to participate in this survey, we ask you to consent to the collection of your personal data (for example, your age or gender). Collected data is used exclusively for research purposes and is never reported on an individual level but analyzed with all other participants in the aggregate. Our full privacy policy and how we will be using your information is located here.

Do you consent to having your personal data used for this survey?

Opt. #	Option Text
1	Yes
2	No

---- SCREENING----

S1aZipCode
Type: Digits

What is your residential zip code?

S1bState
Type: Single Select Dropdown
In which state do you live?

Opt. #	Option Text
1	Alabama
2	Alaska
3	Arizona
4	Arkansas
5	California
6	Colorado
7	Connecticut
8	Delaware
9	District of Columbia
10	Florida
11	Georgia
12	Hawaii
13	Idaho
14	Illinois
15	Indiana
16	Iowa
17	Kansas
18	Kentucky
19	Louisiana
20	Maine
21	Maryland
22	Massachusetts
23	Michigan
24	Minnesota
25	Mississippi

26	Missouri
27	Montana
28	Nebraska
29	Nevada
30	New Hampshire
31	New Jersey
32	New Mexico
33	New York
34	North Carolina
35	North Dakota
36	Ohio
37	Oklahoma
38	Oregon
39	Pennsylvania
40	Rhode Island
41	South Carolina
42	South Dakota
43	Tennessee
44	Texas
45	Utah
46	Vermont
47	Virginia
48	Washington
49	West Virginia
50	Wisconsin
51	Wyoming
52	Outside of the US

HVStateGroup
Type: Hidden Variable
Quota assignment

Opt. #	Option Text
1	Fully legal (MI, OR, OH)
2	Medicinal only (FL, LA, OK)
3	Not legal (SC, TX)

S0Industry
Type: Checkbox
Do you or does anyone in your household work in any of the following types of businesses or occupations? Please select all that apply.

Randomize

Opt. #	Option Text
1	Advertising/Public Relations
2	Financial Services
3	Food/Beverage
4	Marketing/Marketing Research
5	Real Estate/Construction

6	Sales/Sales Promotion
7	Cannabis Industry
8	None of the above

S2aAge
Type: Digits
What is your age?

_____

S3Gender
Type: Radio Button
What is your gender?

Opt. #	Option Text
1	Male
2	Female
3	Genderqueer or non-binary
4	Agender
5	Not specified above
6	Prefer not to answer

S4aHispanic
Type: Radio Button
Are you of Spanish, Hispanic, or Latino background or origin? This includes Mexican, Mexican American, Puerto Rican, Cuban, and all other Spanish, Hispanic, or Latino origins.

Opt. #	Option Text
1	Yes
2	No
3	Prefer not to answer

S4bRace
Type: Checkbox
Are you…? Select all that apply.

Opt. #	Option Text
1	White/Caucasian
2	Black/African American
3	American Indian/Native American
4	Asian
5	Pacific Islander
6	Some other race
7	Prefer not to answer

S5aPersonalIncome
Type: Radio Button
What is your personal income (not including others in your household) before taxes?

Opt. #	Option Text

1	Less than $25,000
2	$25,000 to $49,999
3	$50,000 to $74,999
4	$75,000 to $99,999
5	$100,000 to $124,999
6	$125,000 to $149,999
7	$150,000 to $249,999
8	$250,000 or more

S5bHHIncome
Type: Radio Button
And what is your total annual household income (including others in your household) before taxes?

Opt. #	Option Text
1	Less than $25,000
2	$25,000 to $49,999
3	$50,000 to $74,999
4	$75,000 to $99,999
5	$100,000 to $124,999
6	$125,000 to $149,999
7	$150,000 to $249,999
8	$250,000 or more

S7Usage
Type: Radio Button
Which of the following statements best describes you?

Please note:

- When we say cannabis, we mean in all forms – flower, concentrates, edibles, topicals, etc.
- THC (tetrahydrocannabinol) is the substance in cannabis products that is responsible for the 'high' or 'stoned' feeling when using cannabis. Pure CBD products do not contain THC.
- Everything we talk about is completely anonymous and confidential.

Opt. #	Option Text
1	I currently use or consume **cannabis that contains THC** (in any form)
2	I do not currently use or consume **cannabis that contains THC** (in any form), but I have in the past
3	I have never used or consumed **cannabis that contains THC** (in any form)

S8LastConsumed
Type: Radio Button
When was the last time you used or consumed **cannabis that contains THC**, in any form?

Opt. #	Option Text
1	Today
2	Within the past week

3	Within the past month
4	Within the past 2-3 months
5	Within the past 4-6 months
6	Within the past 7-12 months
7	More than 12 months ago

S9UseFrequency
Type: Radio Button
Approximately how often do you use or consume **cannabis that contains THC**, in any form?

Opt. #	Option Text
1	Multiple times a day
2	Once a day
3	4-6 times a week
4	1-3 times a week
5	1-2 times a month
6	Once every 2 to 3 months
7	Once every 4 to 6 months
8	Less than every 6 months

S10DriversLicense
Type: Radio Button
Which of the following best describes you?

Opt. #	Option Text
1	I have a driver's license and regular access to a car
2	I have a driver's license but do not have regular access to a car
3	I do not have a driver's license

S11HowOftenDrives
Type: Radio Button
In a typical week, how many of those days do you drive a car?

Opt. #	Option Text
1	Everyday
2	4 – 6 days per week
3	2 – 3 days per week
4	One day per week
5	Less often than once a week

S12ProductsUse
Type: Check Box
Which of the following cannabis products do you use regularly? Please select all that apply.

Randomize

Opt. #	Option Text
1	Dried flower (i.e., smoking, vaporized flower)
2	Oils/tinctures
3	Edibles or capsules

4	Vaping concentrates
5	Dabbing concentrates
6	Topical/transdermal (i.e., creams, lotions, salves, patches)
7	Beverages
8	Other forms of THC (Delta 8, Delta 10, THC-V)
98	Other (specify)

Type: Instructional
Thanks! Next, I'd like to talk with you about cannabis use and driving. Again, I want you to know you can tell me anything … there are no right or wrong answers, everything we talk about is completely anonymous and confidential. I just really want to understand your experience.

S13WaitTimes
Type: Grid Radio Button
How long do you usually wait until you feel safe to drive after using each of the following?

Opt. #	Option Text
1	Less than 30 minutes
2	30 minutes
3	1 hour
4	2 hours
5	3 hours
6	4 hours
7	5 hours
8	6 hours
9	7 hours
10	8 hours or more (same day/before sleep)
11	8 hours or more (after sleep)
12	I wait until the next day (never on the same day)

Headers - Randomize

Opt. #	Option Text
1	Cannabis flower
2	Cannabis edibles
3	Cannabis vaping or dabbing concentrate
4	Other type(s) of cannabis aside from flower, edibles, or concentrates

---- SURVEY START ----

Type: Instructional
Thank you for helping me get to know you a little better. My name is Alex, and I'm looking forward to talking with you today.

Now, please take a moment to review the helpful hints for taking this interview below and then continue.

SOME HELPFUL INSTRUCTIONS FOR TAKING THIS INTERVIEW:

- Please keep in mind that this is an interview, rather than a survey, so your answers will guide our conversation.

- It would be extremely helpful to me to get your open and honest feedback ... there are no right or wrong answers.
- Our conversation will go the most smoothly if you include at least 15 to 20 words in each of your more conversational responses. That's about two lines of text ... but the more you tell me, the better.
- Once your answers have been submitted, they cannot be changed.
- Please do not use your browser back button, browser refresh button or the return/enter key throughout the interview, as this will terminate the interview.

Type: Instructional
Thanks for sharing! I'd like to talk with you about cannabis in all forms – flower, concentrates, edibles, topicals, etc. We're going to cover a lot of ground within this topic, and I want you to know you can tell me anything … there are no right or wrong answers, everything we talk about is completely anonymous and confidential. I just really want to understand what your experience with cannabis is like.

Please note that in this interview, when we say cannabis, we mean **cannabis with THC**.

Type: Quester OE
Talk to me about your cannabis use. How would you describe yourself as a user?

Q41MedRec
Type: Check Box
Please select **all the reasons** you currently use cannabis from the list below.

Randomize

Opt. #	Option Text
1	Medicinal purposes
2	Recreational purposes
3	Religious or spiritual purposes
98	Other (please specify)

Q44WhereObtains
Type: Check Box
From what source(s) do you normally obtain cannabis? Please select all that apply.

Opt. #	Option Text
1	Dispensary - licensed
2	Dispensary - unlicensed
3	Dispensary – don't know if licensed or not
4	Delivery service - licensed
5	Delivery service - unlicensed
6	Delivery service – don't know if licensed or not
7	Friends/family
8	I grow my own
98	Other (please specify)

Q44bAnotherState
Type: Radio Button
Have you ever gone to a different state than where you live to purchase cannabis products?

Opt. #	Option Text
1	Yes
2	No

Q44cAnotherStateDistance
Type: Digits
How far did you travel to purchase cannabis in a different state? Please enter a number below in miles.

—— Messaging ——

Type: Instructional
Next, I'd like to talk with you about messaging about cannabis and driving. This could include billboards, advertisements on TV, posts on social media… any messaging about cannabis and driving.

OE45
Type: Quester OE
If you were to see messaging about cannabis and driving, what would catch your attention in a **positive** way?

OE46
Type: Quester OE
If you were to see messaging about cannabis and driving, what would catch your attention in a **negative** way?

Type: Instruction
In the next exercise, we will show you some ideas that are being considering for messaging about cannabis and driving.

Be sure to click open the image to read the full description.

Select the "□" or swipe right if it's a message that you like, or select the "X" or swipe left if it is a message you do not like.

If you swipe right on two messages, you will be asked to choose the one you like more.

Ready? Let's go!

Idea Number	Idea Name
1	Wind Down
2	Judge
3	Studies Show
4	Let's Be Blunt
5	THC Effects
6	Feel Different Drive Different
7	Little High Still Too High
8	Driving High is Driving Impaired

—— Messaging Deep Dive ——

Show before questions for first message assigned to
MessageExposure1
Type: Instruction
Next, we would like you to evaluate one of the messages that you saw earlier in further detail.

Show before questions for second message assigned to
MessageExposure2
Type: Instruction
Thanks! Next, we would like you to evaluate a different message that you saw earlier in further detail.

Show before questions for third message assigned to
MessageExposure3
Type: Instruction
Great! Next, we would like you to evaluate one last message that you saw earlier in further detail.

OE11
Type: Quester OE
Probe: Yes
Tell me all about your reaction when you first saw this message.

Show image of message below question text

OE21
Type: Quester OE
Probe: No
Tell me about anything you found to be confusing or difficult to understand about the message.

Show image of message below question text

Q1a_AttentionGetting
Type: Radio Button
To what extent do you agree or disagree that this message **gets your attention**?

Show image of message below question text

Opt. #	Option Text
1	Agree completely
2	Agree a lot
3	Agree a little
4	Neither agree nor disagree
5	Disagree a little
6	Disagree a lot
7	Disagree completely

Q1b_Appeal
Type: Radio Button
How **appealing** is this message to you?

Show image of message below question text

Opt. #	Option Text
1	Extremely appealing
2	Very appealing
3	Somewhat appealing
4	Neither appealing nor unappealing
5	Somewhat unappealing
6	Very unappealing
7	Extremely unappealing

Q1c_Relevance
Type: Radio Button
How **relevant** is this message to you, personally, in your life?

Show image of message below question text

Opt. #	Option Text

1	Extremely relevant
2	Very relevant
3	Somewhat relevant
4	Neither relevant nor irrelevant
5	Somewhat irrelevant
6	Very irrelevant
7	Extremely irrelevant

Q1d_Believability
Type: Radio Button
How **believable** do you find this message to be?

Show image of message below question text

Opt. #	Option Text
1	Completely believable
2	Very believable
3	Somewhat believable
4	Neither believable nor unbelievable
5	Somewhat unbelievable
6	Very unbelievable
7	Completely unbelievable

Q1e_LikelihoodToImpactBehavior
Type: Grid Radio Button
Think about the times when you have driven after using cannabis. Now that you have seen this message, **how likely would you be to do the following instead**?

Show image of message below question text

Headers - Randomize

Opt. #	Option Text
1	Increase your wait time before driving after using cannabis
2	Take alternative transportation after using cannabis
3	Stay home or in same location after using cannabis
4	Reduce your cannabis use

Opt. #	Option Text
1	Very likely
2	Somewhat likely
3	Somewhat unlikely
4	Very unlikely

Q1x_OtherBehaviorImpact
Type: Text Box
Tell me about any other ways this message would likely impact your behavior.

Show image of message below question text

OE31
Type: Quester OE
Why do you say this message is **likely to impact** your driving choices after using cannabis?

Show image of message below question text

OE41
Type: Quester OE
Probe: Yes
Why do you say this message is **unlikely to impact** your driving choices after using cannabis?

Show image of message below question text

Q1f_ImageFit
Type: Radio Button
How well does the **image reinforce** the message?

Show image of message below question text

Opt. #	Option Text
1	Extremely well
2	Very well
3	Somewhat well
4	Neither well nor poorly
5	Somewhat poorly
6	Very poorly
7	Extremely poorly

Q1g_Offensiveness
Type: Radio Button
Lastly, how **offensive** did you find this message to be?

Show image of message below question text

Opt. #	Option Text
1	Not offensive at all
2	A little offensive
3	Somewhat offensive
4	Very offensive

Repeat section for Messages 2-8

---- Additional Questions ----

Intro5
Type: Instructional
Thanks for your feedback! Next, I'd like to ask you a couple more questions about messaging about cannabis and driving… we're almost done!

Q51AltMessagingImpactOnBehavior
Type: Grid Radio Button
For each of the messages shown below, please tell me how likely it would be to reduce your driving after using cannabis (i.e., either not driving after use or delaying driving after use).

Headers - Randomize

Opt. #	Option Text
1	Don't use cannabis and drive
2	Drive responsibly
3	A marijuana DUI can cost you upward of $13,500
4	Driving high isn't worth the risk
5	A DUI doesn't just mean booze
6	Know the facts about cannabis-impaired driving
7	Even a little weed can impair driving
8	Even a little cannabis can impair driving
9	Driving high is illegal
10	Cannabis and driving is a hazardous combination

Opt. #	Option Text
1	Very likely
2	Somewhat likely
3	Somewhat unlikely
4	Very unlikely

Q52aTrustedSources
Type: Check Box
From which of the following sources would you trust messaging about **cannabis use and driving**? Please select all that apply.

Randomize

Opt. #	Option Text
1	Law enforcement groups
2	Government groups
3	Safe driving advocacy groups
4	Science / medical groups
5	Social media -sponsored
6	Social media influencers
7	Cannabis industry groups/associations
8	Dispensaries
9	Cannabis brands/companies
10	AAA
11	Doctors / health care providers
12	Celebrities

13	User testimonials
14	Labeling on cannabis products
15	Other (specify)
99	None

Q52bTrustedSourcesNOT
Type: Check Box
On the flip side, from which of the following sources would you not trust messaging about **cannabis use and driving**? Please select all that apply.

Randomize –

Opt. #	Option Text
1	Law enforcement groups
2	Government groups
3	Safe driving advocacy groups
4	Science / medical groups
5	Social media -sponsored
6	Cannabis industry groups/associations
7	Dispensaries
8	Cannabis brands/companies
9	AAA
10	Doctors / health care providers
11	Celebrities
12	User testimonials
13	Social media influencers
14	Labeling on cannabis products
15	Other (specify)
99	None

----ADDITIONAL DEMOGRAPHICS----

D0IntroDemo
Type: Instructional
I just have a few more quick questions and then we'll be all wrapped up.

D1Marital
Type: Radio Button
What is your marital status?

Opt. #	Option Text
1	Single, never married
2	Living with partner
3	Married
4	Widowed
5	Divorced/Separated
6	Prefer not to answer

D2HHSize
Type: Radio Button
How many people are living or staying at your current address? (Include yourself and any other adults or children who are living or staying at this address for at least two months)

Opt. #	Option Text
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8 or more
9	Prefer not to answer

D2aHHComposition
Type: Checkbox
And just to be sure I understand, thinking of those who are living or staying at your current address, are any of them … ?

Opt. #	Option Text
1	Under age 6
2	7 to 12 years old
3	13 to 17 years old
4	My adult children age 18+
5	My parents or in-laws
6	Spouse or partner
7	My grandchildren
8	Grandparents
9	Other family member (aunts, uncles, cousins)
10	Roommate(s)
99	Prefer not to answer

HVKids
Type: Hidden Variable
Not shown to respondents

Opt. #	Option Text
1	Kids <18 in HH
2	No Kids <18 in HH
3	Prefer not to answer

D2bNumberKids
Type: Radio Button
How many of those living in your household are children under the age of 18?

Opt. #	Option Text
1	0
2	1
3	2
4	3
5	4
6	5

7	6 or more
8	Prefer not to answer

D3Education
Type: Radio Button
What is the highest degree or level of school you have completed?

Opt. #	Option Text
Category Header	Education through Grade 12
1	Less than 9th grade
2	9th to 12th grade, no diploma
Category Header	High School Graduate or Equivalent
3	Regular High School Diploma
4	GED or alternative credential
Category Header	Some College or College Degree
5	Occupational trade program
6	Some college credit, but no degree
7	Associate's degree (for example: AA, AS)
8	Bachelor's degree (for example: BA, BS)
Category Header	Graduate or Professional Degree
9	Master's degree (for example: MA, MS, MEng, MEd, MBA)
10	Professional degree (for example: MD, DDS, DVM, LLB, JD)
11	Doctorate degree (for example: PhD, EdD)

D4Employment
Type: Radio Button
Which of the following best describes your current employment status?

Opt. #	Option Text
1	Employed – full-time
2	Employed – part-time
3	Self-Employed – full-time
4	Self-Employed – part-time
5	Retired
6	Student – full-time
7	Student – part-time
8	Military
9	Full-time parent, homemaker
10	Not currently employed
11	Prefer not to answer

D5Urbanicity
Type: Radio Button
Which of the following best describes the area where you now live?

Opt. #	Option Text
1	Rural
2	Suburban
3	Urban

D6RentOwn
Type: Radio Button
Do you rent or own your primary place of residence?

Opt. #	Option Text
1	Rent
2	Own
3	Live with family or someone else rent-free

Q99aSurveySat
Type: Radio Button
Thanks for your help today! To wrap up today, how satisfied were you with this survey?

Opt. #	Option Text
7	Very satisfied
6	Satisfied
5	Somewhat satisfied
4	Neither satisfied nor dissatisfied
3	Somewhat dissatisfied
2	Dissatisfied
1	Very dissatisfied