CANNABIS PUBLIC POLICY CONSULTING

Estimating Cannabis Demand in New Mexico

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Prepared For:

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Terminology Dictionary

- *Direct estimation methods*
    - Direct estimation method is used in this report to refer to measurement of behavior in a fashion than makes fewer assumptions and that more "directly" assesses the behavior in question (in this case, amount of cannabis use). This approach usually translates to more accurate and reliable data because it makes fewer assumptions and fewer sources of data are used. In the current study, we directly ask participants evidence-based questions about their cannabis use and use secondary cannabis questions to validate the consistency and accuracy of their responses to the main cannabis questions used for our demand estimation.
    - Most peer-reviewed scientific publications in the substance use field use direct methods.
- *Indirect estimation methods*
    - Indirect estimation methods are used in this report to refer to demand assessment approaches that leverage multiple data sources, make educated assumptions about how that data might generalize in different contexts, and then calculate an estimated outcome. Most state cannabis demand studies use indirect estimation methods to estimate demand by indirectly calculating total weight of cannabis products sold based on sales data. However, most states track some cannabis products by number of units sold (not by weight), and there are inconsistencies in the actual weight of cannabis products sold by unit. Typically, only very rigorous indirect methods are published in the scientific literature, particularly in the context of cannabis or other substance use.
- *Reliability*
    - Generally, reliability refers to consistency of responses across similar measures within the same person. (For example, if a person is asked twice in a day how many days they used cannabis last month, the answer is reliable if it does not change).
- *Representativeness*
    - Social scientists assume that the more similar the characteristics of a sample (e.g., demographics, substance use patterns) are to the actual population, the more "representative" or generalizable the findings will be. The challenge is that no study will ever assess the entire population, which suggests that there is no such thing as the "actual population"—so we can only do our best to recruit the largest and most representative sample possible.

- *Validity*
    - Validity generally refers to the degree to which the question being asked is addressed by the methods used or the degree to which the results of a study can be generalized to other settings or the population.

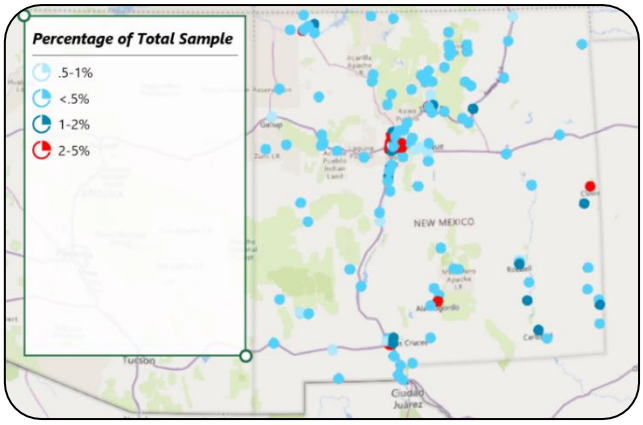
Executive Summary

Pursuant to HB2 (Section 40. Plant limit),[1] this report outlines the research methods and main findings of a comprehensive study of cannabis demand in New Mexico for the purpose of determining an estimate of the necessary supply of annual cannabis plants per licensee to meet cannabis demand for the prospective adult-use and medical cannabis markets.

To meet demand for medical and adult-use cannabis, our findings suggest the following:

- Between 2,007 and 3,756 plants per harvest cycle (PPHC) per producer are estimated to meet New Mexico cannabis demand for both medical and adult-use cannabis during Year 1 of adult-use enactment.
- Between 1,533 and 2,231 PPHC per producer is recommended to meet adult-use cannabis demand.
- Between 474 and 1,525 PPHC per producer is recommended to meet medical cannabis demand.
- The current study is the most scientifically rigorous state cannabis demand study to our knowledge. Below are key methodological components in support of this assertion:
    - Three separate approaches were leveraged to estimate cannabis demand to improve the reliability and validity of these findings, whereas most states use only one method.
    - We used two indirect estimation methods, which relied on translating data from other states with legal cannabis or from federal databases to estimate New Mexico demand, and one direct estimation method, which calculated demand based on individual survey responses on cannabis use data from a population sample of residents of New Mexico.
    - PPHC numbers that were derived using the two indirect methods, one which leveraged demand reports from other states and the other which used National Survey on Drug Use and Health (NSDUH) data, differed by only 2%, which increases confidence

Figure 1. Geographic Distribution of Participants



[1] HB2, The Cannabis Regulation Act. (2021). Section 40. Plant limit. https://www.nmlegis.gov/Sessions/21%20Special/final/HB0002.pdf

in study findings.

- Demographics of the sample closely corresponded to census data (136 ZIP codes were represented in the current study; 10% of the sample were living in areas with < 500 residents, and 10% were living in areas with >40,000).
- We estimate that, in this survey, we recruited more than five times the number of past-month cannabis users in the largest existing federal cannabis study (NSDUH), providing a more precise estimation of demand.
- Individual survey respondents showed highly consistent responses across cannabis use questions, increasing confidence in the reliability and accuracy of their answers.
- The validity of the type of cannabis use questions employed in the survey are supported by at least 20 scientific publications, including some that were published by the lead investigator of this study and lead author of this report.[2, 3, 4, 5, 6, 7, 8]
- Further support for the accuracy of the self-report methods used in this study comes from the findings that the average price per gram of medical cannabis that residents were willing to pay in our survey was $10 and the actual medical cannabis price data provided by the New Mexico Department of Health (DOH) from 2020 was $10.05 (i.e., the self-reported price was 99.5% accurate to the actual price).

Additional Highlights on Legal Cannabis Market in New Mexico

- 88% of medical cannabis users in New Mexico report medical cannabis dispensaries being sufficiently stocked, which suggests the state is meeting current demand for medical cannabis. There were no racial or ethnic disparities in stocking of medical cannabis, although medical cannabis was more difficult to acquire in Native American tribal, pueblo, or sovereign lands.
- After adjusting for median household income, the price per gram of medical cannabis in New Mexico (2020: $10.05/gram) is approximately 6% lower relative to the rest of the United States.[9]

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[2] Morean, M. E., DeMartini, K. S., Foster, D., Patock-Peckham, J., Garrison, K. A., Corlett, P. R., Krystal, J. H., Krishan-Sarin, S., & O'Malley, S. S. (2018). The Self-Report Habit Index: Assessing habitual marijuana, alcohol, e-cigarette, and cigarette use. *Drug and Alcohol Dependence*, *186*, 207–214. https://doi.org/10.1016/j.drugalcdep.2018.01.014

[3] Center for Behavioral Health Statistics and Quality. (2020). *2019 National Survey on Drug Use and Health public use file codebook*. Substance Abuse and Mental Health Services Administration.

[4] Sofis, M. J., Borodovsky, J. T., Pike, C. K., Liu, L., Jacobson, N. C., & Budney, A. J. (2021). Sifting through the weeds: Relationships between cannabis use frequency measures and delay discounting. *Addictive Behaviors*, *112*, 106573. https://doi.org/10.1016/j.addbeh.2020.106573

[5] Cerdá, M., Mauro, C., Hamilton, A., Levy, N. S., Santaella-Tenorio, J., Hasin, D., Wall, M. M., Keyes, K. M., & Martins, S. S. (2020). Association between recreational marijuana legalization in the United States and changes in marijuana use and cannabis use disorder from 2008 to 2016. *JAMA Psychiatry*, *77*(2), 165–171. https://doi.org/10.1001/jamapsychiatry.2019.3254

[6] Martin, G. W., Wilkinson, D. A., & Kapur, B. M. (1988). Validation of self-reported cannabis use by urine analysis. *Addictive Behaviors*, *13*(2), 147–150. https://doi.org/10.1016/0306-4603(88)90004-4

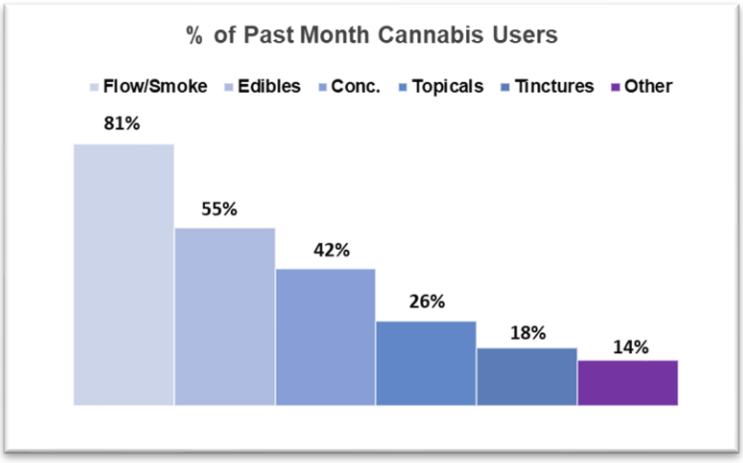
[7] Caulkins, J. P., Pardo, B., & Kilmer, B. (2020). Intensity of cannabis use: Findings from three online surveys. *The International Journal on Drug Policy*, *79*, 102740. https://doi.org/10.1016/j.drugpo.2020.102740

[8] Stephens, R. S., Babor, T. F., Kadden, R., Miller, M., & Marijuana Treatment Project Research Group (2002). The Marijuana Treatment Project: Rationale, design and participant characteristics. *Addiction (Abingdon, England)*, *97 Suppl 1*, 109–124. https://doi.org/10.1046/j.1360-0443.97.s01.6.x

[9] The median of two analyses were used to derive this estimate. The first value was based on median household income data (Median Household Income By State

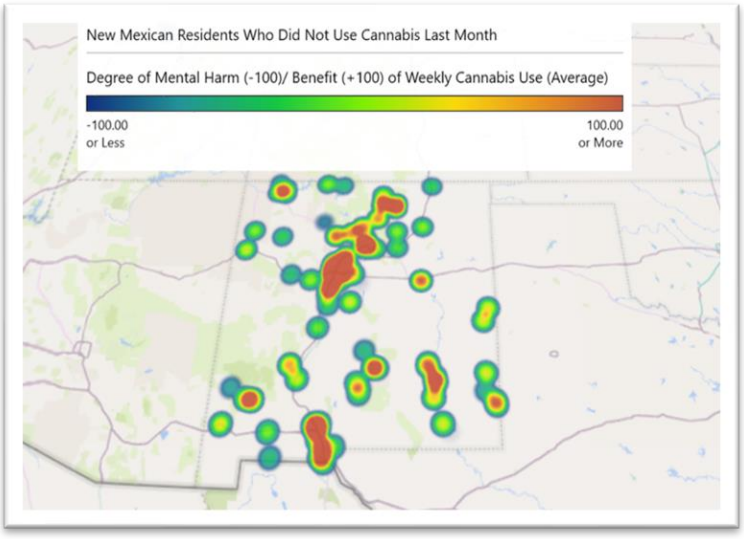
This suggests that New Mexico's medical cannabis prices are more accessible relative to other states and further highlights that the state is likely providing a sufficient supply of cannabis.

Figure 2. Percentage of Past-Month Cannabis Users by Product or Method



- The most common method of cannabis use was smoking (81%), followed by edibles (55%), concentrates (42%), topicals (26%), tinctures (18%), and other methods (14%).
- In line with population data from the United States, the most commonly reported product or method of cannabis use was flower/smokable cannabis, followed by edibles, concentrates, topicals, tinctures, and other methods (e.g., wax, shatter; see figure 2).
- Perceptions regarding the relative harm or benefit of cannabis use differed by rural and urban areas; those in rural areas had a more negative perception of cannabis, while those in urban areas had a more positive perception of cannabis. Past-month cannabis users perceived regular cannabis use to be beneficial for mental (average = +70.5) and physical health (average = 57.5), and to a greater extent than non-past-

Figure 3. Rural vs. Urban Differences in Perceived Benefit and Harm of Cannabis Use



2021 (worldpopulationreview.com)) and from a report by the Oxford Treatment Center (The Average Cost of Marijuana by State - Oxford Treatment Center). We took the average price of "medium quality" cannabis for all states that legalized medical cannabis in the 5 years following New Mexico's legalization of cannabis and that remain medical-only states. This resulted in an estimate of 4% lower price for New Mexico relative to the other medical cannabis states. The second analysis took the average national price of "high quality" cannabis using data from Statista (High quality cannabis prices by U.S. state 2020 | Statista). All U.S. states were included in this analysis, and in contrast to the first estimate, the percentage difference in median household income level between New Mexico and the other states was taken after identifying the raw percentage difference between New Mexico and the other states in price (i.e., 11%). This second analysis resulted in a value of 9%. The median of the first and second analyses was 6.5, so we rounded down to 6% to present a more conservative value.

month cannabis users perceive cannabis use to be beneficial for mental (average = +.20) and physical health (average = 3.0).

- Younger individuals and those with a medical ID card reported using more grams of cannabis.

Methods

Statutory Language Guiding Methods

"SECTION 40. PLANT LIMIT.[10] -- No later than September 1, 2021, and each September 1 thereafter, the division shall by rule limit, by plant count, canopy or square footage, the number of cannabis plants that a licensee that is not an integrated cannabis microbusiness or a cannabis producer microbusiness may produce. ***The rule shall set the number of allowed cannabis plants per licensee to meet an average national market demand for cannabis products in states where adult and medical cannabis are authorized during the preceding year using a consumer base of no less than twenty percent of the adult population of New Mexico."***

Part 1. Average Market Demand for Cannabis from Adult-Use and Medical-Use States

To determine the estimated "*number of allowed cannabis plants per licensee to meet an average national market demand for cannabis products in states where adult and medical cannabis are authorized*," we collected data from Vermont (VT), Colorado (CO), and Washington (WA), which demonstrate considerable diversity in the characteristics of their cannabis industry and in their geography, which together likely improved the generality and accuracy of our findings. Two methods of data collection were used to calculate cannabis demand in the form of plants from other legal cannabis states with mature markets.

Method #1 – Cross-Validation with Independent, Selected State-Specific Demand Reports

The first method entailed leveraging pre-calculated estimates of the total numbers of grams or pounds of cannabis produced in each state during a recent year provided in independently commissioned demand studies for Washington,[11] Vermont,[12] and Colorado.[13]

- If the final outcome was provided in grams, we converted grams to pounds (453 grams = 1 pound), and pounds to plants (1 pound = 1.33 plants[14]).

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[10] HB2, The Cannabis Regulation Act. (2021). Section 40. Plant limit. https://www.nmlegis.gov/Sessions/21%20Special/final/HB0002.pdf
[11] Kilmer, B., Davenport, S., Smart, R., Caulkins, J. P., & Midgette, G. (2019). *After the grand opening: Assessing cannabis supply and demand in Washington State*. RAND Corporation. https://www.rand.org/pubs/research_reports/RR3138.html
[12] Marijuana Policy Project. Microsoft Word - VT economic report (AL FINAL REVIEW 8-4-20).docx (mjbizdaily.com)
[13] Light, M. K., Orens, A., Lewandowski, B., & Pickton, T. (The Marijuana Policy Group). (2014). *Market size and demand for marijuana in Colorado*. Colorado Department of Revenue.
https://www.colorado.gov/pacific/sites/default/files/Market%20Size%20and%20Demand%20Study%2C%20July%209%2C%202014%5B1%5D_1.pdf
[14]Freedman and Koski. https://www.scribd.com/document/433582824/A-Snapshot-of-Demand-for-Adult-use-Cannabis-in-Illinois

- If the amounts of adult-use relative to medical cannabis were not explicitly noted in the reports available (i.e., Washington), we estimated the relative demand (medical vs. adult use) using the proportion of medical vs. adult use noted in a national survey from states with both medical and adult-use laws[15].

Method #2 – Cross-Validation with Federal Demand Data for the Selected States

The second method for estimating demand leveraged 2019 data from the NSDUH. Specifically, we:

(i) Calculated the proportion of past-month cannabis users in each state who reported purchasing 1–5 grams, 5–10 grams, and 10 or more grams respectively the last time they bought cannabis from a legal dispensary or store[16].

(ii) We then multiplied the estimated percentage of individuals in each state that reported purchasing within each of these ranges of cannabis (e.g., 10% for those reporting 1–5 grams) and simplified the grams to represent 3 grams for the 1–5-gram category, 7.5 grams for the 5–10-gram category, and 15 grams for the 10+-gram category.

(iii) These calculations allowed us to multiply the percentage of individuals who reported using within each range of grams by the representative value in grams for each category (e.g., 10% x 3 grams x 10,000 cannabis users = 3,000 grams).

(iv) Given that national data suggests cannabis users in states with legal medical and adult-use laws purchase cannabis from dispensaries 6.22 times per month, we then multiplied the previous value by 6.22[17] to get a monthly total and multiplied that amount by 12 (months) to arrive at an annual total demand per capita value.

Our NSDUH data modeling found that there were similar consumption patterns across all three states, with a monthly demand of around 30 grams of cannabis per user for each state. Estimates of the number of total annual cannabis plants in demand based on our modeling when averaging across the three states (VT, CO, and WA) are noted in Table 1. When comparing the number of plants between the demand reports commissioned by other states and our estimates using NSDUH data, ***the average percentage difference between the two methods was 2% across the three states, which suggests a high level of reliability.***

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[15] Cannabis In America For 2021 & Beyond: A New Normal in Consumption & Demand - New Frontier Data

[16] Due to restrictions from the NSDUH Restricted Use Dataset that prevent potential identification of individual participants when examining state-specific data, we could not necessarily guarantee that all data in terms of the number of grams bought with the last cannabis purchase was from past month cannabis users. However, we knew that all reported using cannabis at least in the past year, and the aggregate NSDUH data suggests that at least two thirds of these participants were past month users. Further, when summing the percent of participants who reported a value for the number of grams bought during the last purchase measures, the end value appeared lower than the total percentage of past month users which suggests that the vast majority of these individuals were past month users.

[17] Brown, M. (2020, May 28). *The money behind marijuana*. LendEDU.com. https://lendedu.com/blog/money-behind-marijuana

Table 1. Average Estimated Total Aggregate Year-End Plant Count Across VT, CO, & WA

	State-Specific Reports Approach	NSDUH Approach
Total Plants	261,695	268,173
AU Plants	201,325	203,443
Med Plants	60,370	64,730

AU = Adult-use; Med = Medical

Part 1A. Converting National Data to New Mexico Demand

To translate these demand estimates (which inform the necessary supply) from the other states to New Mexico in a fashion that accounts for population differences of adults 21+ and the proportion of past-month cannabis users, we calculated the relative difference in the number of past-month cannabis users who were 21+ from each state relative to New Mexico's population. As seen in Table 2, relative to New Mexico, fewer individuals 21+ who used cannabis in the past month reside in Vermont (approximately 41% of the number in New Mexico), but 3.7 and 4.7 times more live in Colorado and Washington, respectively. Thus, all plant counts were multiplied by .41 for Vermont, 3.7 for Colorado, and 4.7 for Washington to arrive at an estimated total number of plants (demand) converted to New Mexico.

Table 2. Demographic Proportions and Conversions to New Mexico

	Past-Month Use (NSDUH 2019)	2019 Population 21+	Per Capita 21+ Cannabis Users	Conversion to New Mexico Ratio
VT	28%	480,000	132,099	.41
CO	27%	4,250,000	1,155,472	3.7
WA	26%	5,640,000	1,491,551	4.7

Figure 4, below, shows the converted plant count estimates for each state after being translated to New Mexico based on the proportion of individuals in each state who are 21+ and use cannabis at least monthly. As can be seen by the gray bars, the total annual plant count estimated for New Mexico ranges between 238,000 and 308,000 total plants per year.

Figure 4. Total Aggregate Year-End Plant Count Estimates for NM Based on Other States' Consumption Patterns—Cross-Validated by Independent, Selected State-Specific Demand Reports

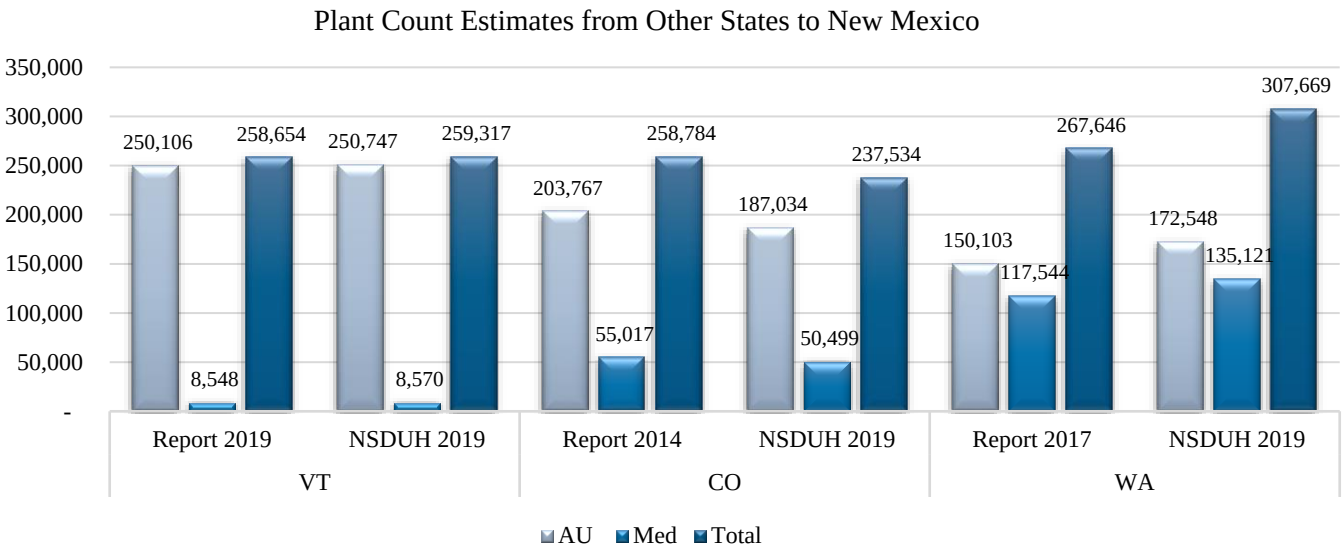

Table 3, below, shows the actual numbers represented in figure 4.

Table 3. Total Plant Count Estimates for NM Based on Other States' Consumption Patterns—Cross-Validated by Independent, Selected State-Specific Demand Reports

	VT		CO		WA	
	Report 2019	**NSDUH 2019**	**Report 2014**	**NSDUH 2019**	**Report 2017**	**NSDUH 2019**
AU	250,106	250,747	203,767	187,034	150,103	172,548
Med	8,548	8,570	55,017	50,499	117,544	135,121
Total	258,654	259,317	258,784	237,534	267,646	307,669

To complete the national-level estimates of demand based on other states' data, the total aggregate year-end plant count needs to be divided by four to account for an estimated four harvest cycles. This calculation provides a final demand unit of **plants per harvest cycle (PPHC)**[18] that more accurately reflects the available plants *required at any given time* to meet production each year. This unit is reflective of a license plant cap amount.

When averaging across all 3 states' demand values based on the state-specific reports and the NSDUH values, these indirect analyses resulted in an estimated 50,596 adult-use PPHC, 15,637 medical PPHC, and 66,233 combined PPHC (medical + adult-use) converted to New Mexico's proportion of individuals 21 and older who used cannabis in the past month.

[18] https://www.nmhealth.org/publication/view/rules/5184/

When taking the number of currently licensed New Mexico medical cannabis producers into account (assumes 33 licenses for both adult-use and medical)[19], these estimates are:

- **1,533 PPHC** per producer for adult use
- **474 PPHC** per producer for medical use
- **A total of 2,007 PPHC** per producer across adult use and medical use

Part 2. Empirically Deriving New Mexico Cannabis Demand: An Individual Survey Approach

Using a series of survey recruitment panels organized through the company Qualtrics, we recruited 1,167 total residents of New Mexico from 5/10/2021 to 5/25/2021 (>20% of whom used cannabis in the past month). Among a series of questions, we asked participants who indicated past-month cannabis use to report the **number of grams they used on average each week during the past month.** Such self-report questions have been found to be reliable in previous scientific studies. The approximate results for monthly use are below.

- 14% of past-month cannabis users reported using about 2 grams per month.
- 23% reported using 6 grams per month.
- 22% reported using 16 grams per month.
- 19% reported using 32 grams per month.
- The remaining 21% reported using 52 or more grams per month.[20]

In a similar fashion to our estimation method using the NSDUH data to determine state-level demand, we:

(i) Multiplied the average monthly number of grams of cannabis per capita in New Mexico reported in the survey results (i.e., 26 grams) by the number of individuals who are 21+ in New Mexico and are past-month cannabis users (316,259 individuals). This results in 73 million grams in annual totals (see Table 3 below).

(ii) We then determined the proportion of medical vs. adult-use cannabis based on the

[19] This denominator was provided as the number of medical producers currently licensed from New Mexico Department of Health.
[20] Analyses using NSDUH data (SAMHDA (samhsa.gov) suggest that two-thirds of cannabis users use an average of 12 grams per month, one-quarter use 30 grams per month, and approximately one-tenth use an average of 60 grams per month. Notably, these estimates include states with and without legal cannabis laws, which suggests the true values may be larger, because cannabis use is more prevalent in states with legal cannabis laws. This result also suggests that the amount of cannabis consumed in New Mexico based on this study may be moderately less than other states with legal cannabis laws and other states in general.

proportion of past-month cannabis users who indicated having an authorized medical card (i.e., 41%).

(iii) We then translated grams to pounds (453 grams = 1 pound), pounds to plants (1 pound = 1.33 plants), PPHC (plants/4) and by number of growers (plants/33 producers).

These analyses resulted in an estimate of:

- **2,231 PPHC** per adult-use producer in New Mexico
- **1,525 PPHC** per medical-use producer in New Mexico
- **A total of 3,756 PPHC** per producer across adult use and medical use in New Mexico

Table 4. Modeling NM-Specific Demand Based on NM Qualtrics Survey Data

Category	Value
Total Grams	168,859,812
AU Grams	100,302,728
Med Grams	68,557,084
Total Pounds	372,759
AU Pounds	221,419
Med Pounds	151,340
AU Plants TOTAL in a Year	294,487
Med Plants TOTAL in a Year	201,282
Total Plants TOTAL in a Year	495,769
Plants per Harvest Cycle (TOTAL)	123,942
AU Plants per Harvest Cycle	73,622
AU Plants per Harvest Cycle per Producer	**2,231**
Med Plants per Harvest Cycle	50,321
Med Plants per Harvest Cycle per Producer	1,525

The suggested PPHC per producer range to meet adult-use cannabis demand is 1,533–2,231 PPHC.

The suggested PPHC per producer range to meet medical-use cannabis demand is 474–1,525.

The suggested PPHC per producer range to meet adult-use and medical-use demand combined is 2,007–3,756.