

August | 16

The Medical Cannabis Market in New Mexico

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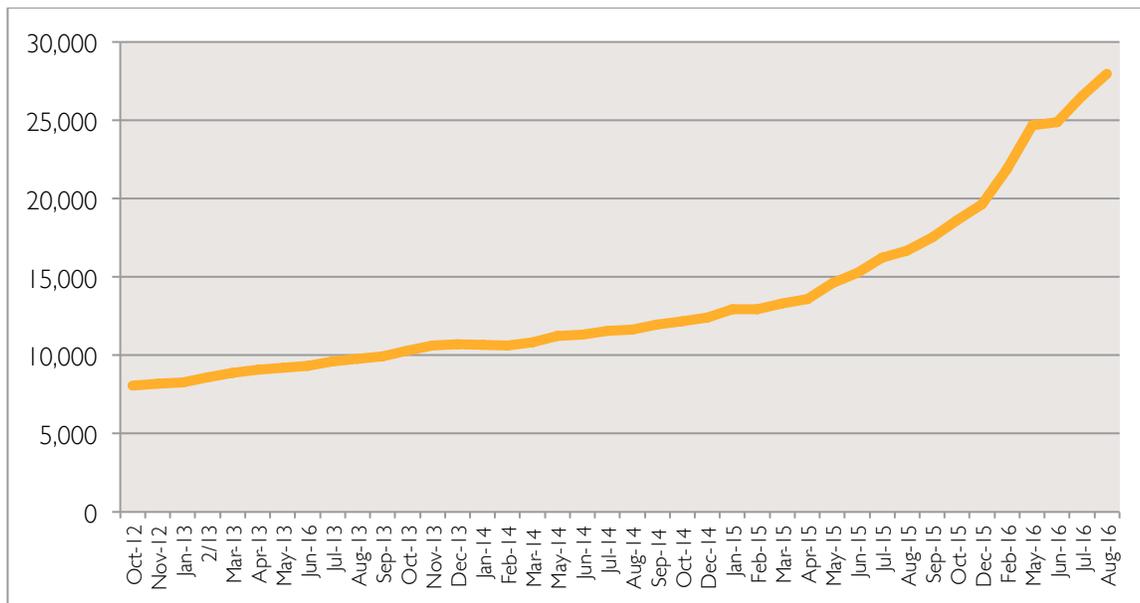
I. Executive Summary

New Mexico's nine-year-old medical cannabis market is undergoing a period of rapid growth that shows no sign of abating. Demand already exceeds supply, causing some dispensaries to operate on limited schedules or close without notice when they run out of product to sell. Patient enrollment in the state's Medical Cannabis Program (MCP) increased 81 percent between June 2015 and June 2016. As of this writing, in July 2016, the MCP, despite increased staffing, is failing to process 38 percent of medical cannabis applications within the requisite thirty days,¹ due to the exceptionally high volume of applications.

This report finds that, under current state regulations, the extent to which demand exceeds supply will continue to grow and that shortages will negatively impact patients, producers, and community health. At the core of the imbalance in New Mexico's medical cannabis market are state regulations that cap the number of plants a licensed producer may have in production. Most medical cannabis states do not limit plant count. Among the minority of states that do impose caps, New Mexico's 450-plant limit is the most restrictive.

New Mexico's pent-up demand for medical cannabis takes three principle forms: MCP-eligible New Mexicans who are not yet enrolled, current MCP cardholders who are not able to obtain enough cannabis from legal sources, and current and potential cardholders who would purchase more concentrates, edibles, and infused products were they more readily available. As of July 2016, New Mexico's demand for medical cannabis exceeded supply by 2.1 million grams (4,552 pounds). Surplus demand is forecast to top 6.2 million grams (13,603 pounds) by early 2018. A plant count increase of up to 600 percent over 2016 levels will be necessary to meet projected demand.

Figure 1: Medical Cannabis Program Enrollment



Source: New Mexico Department of Health Medical Cannabis Program

II. Introduction

O'Donnell Economics and Strategy was retained to estimate the current and future demand for medical cannabis in New Mexico and assess the ability of the state's currently licensed suppliers to meet that demand. This report presents the results of those analyses and discusses how state regulations impact the functioning of New Mexico's medical cannabis market and thus the ability of patients to obtain their medications legally.

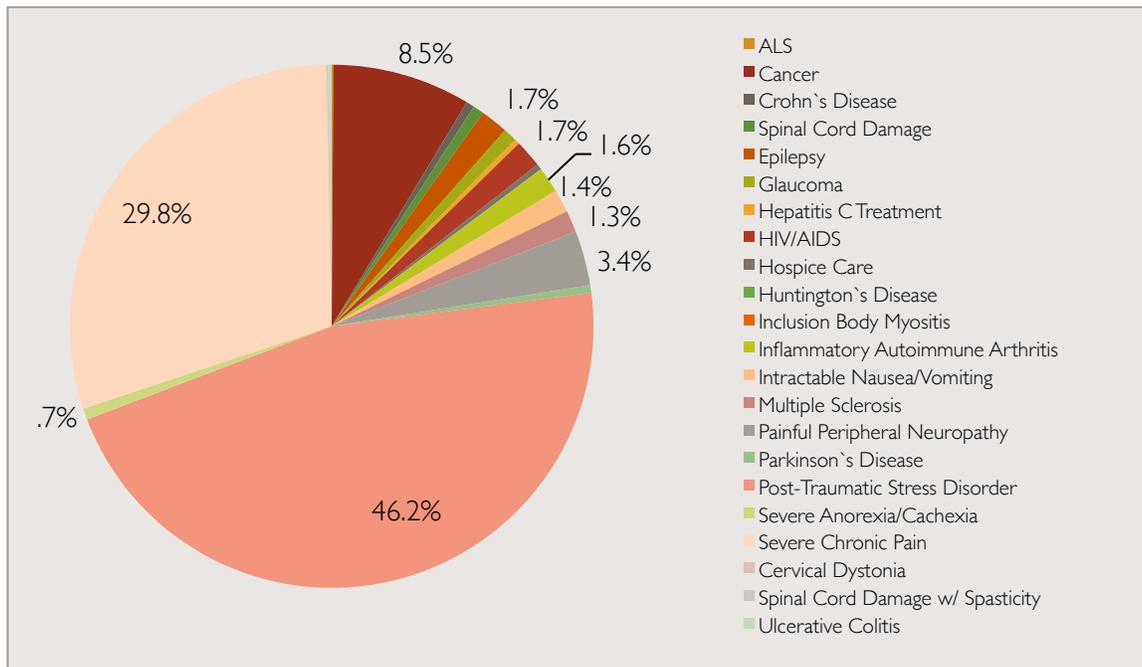
III. Background

New Mexico is one of 25 states that allow the use of cannabis by individuals with certain qualifying medical conditions. The Lynn and Erin Compassionate Use Act,² enacted in 2007, permits the use of cannabis by New Mexico residents with certain severe medical conditions and establishes the broad regulatory framework for the state’s Medical Cannabis Program (MCP). To qualify for the MCP, a patient must have their diagnosis and need for medical cannabis certified in writing by a health practitioner licensed to prescribe and administer controlled substances in New Mexico and they must register with the state MCP. The Act also legalizes the production, possession, distribution and dispensing of cannabis for use under the provisions of the Act, but leaves other key elements of the program, including the amount of cannabis patients are allowed to have on hand,ⁱ licensure of producers, and production facilities, and the development of the distribution system, to rulemaking by the New Mexico Department of Health (DOH).

A. Qualifying Conditions

Currently, there are 21 conditions that qualify patients for New Mexico’s MCP. The Erin and Lynn Compassionate Use Act lists eight “qualifying conditions”: cancer; glaucoma, multiple sclerosis, spinal cord damage with spasticity, epilepsy, HIV/AIDS, hospice care, and “any other medical condition, medical treatment or disease as approved by the department.” Thirteen additional qualifying conditions have been added pursuant to this provision and upon recommendation by an advisory board appointed by the DOH secretary. Seventy five percent of MCP patients qualify on the basis of two conditions: Post Traumatic Stress Disorder (PTSD) and chronic pain (see Figure 2). Cancer is third most common qualifying condition. Although only one qualifying condition is listed per patient, it is likely that the majority of MCP patients have two or more qualifying conditions.³

Figure 2: New Mexico Medical Cannabis Program: Percent of Patients by Qualifying Condition



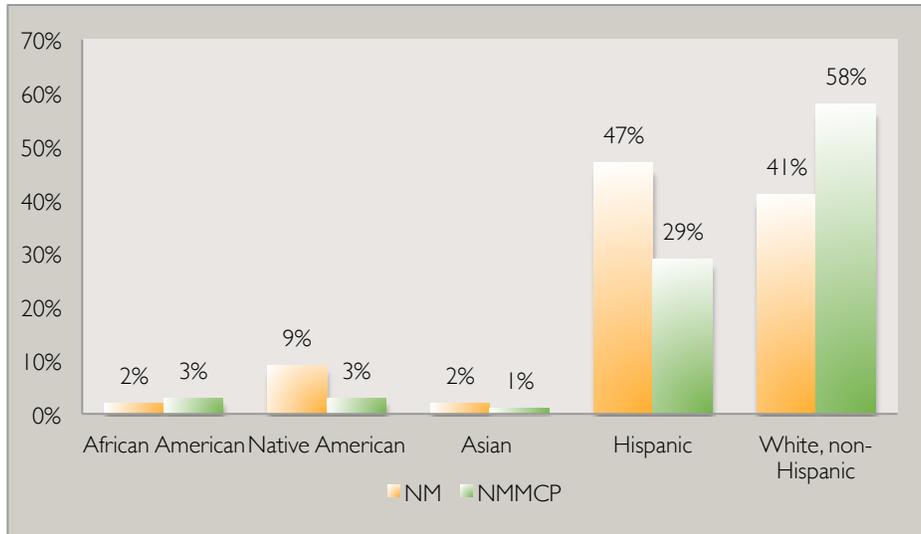
Source: New Mexico Medical Cannabis Program

ⁱ As used in the Lynn and Erin Compassionate Use Act: “adequate supply” means “an amount of cannabis, in any form approved by the department, possessed by a qualified patient or collectively possessed by a qualified patient and the qualified patient’s primary caregiver that is

B. Patient Demographics

The New Mexico Department of Health collects demographic information from MCP applicants but does not compile or report this data publically.⁴ The patient characteristics presented in Figure 3 were collected in a phone and mail survey of MCP patients conducted by the Department of Health in 2013.⁵ Survey results indicate that the racial and ethnic composition of the MCP patient population differs significantly from that of the state overall. Native Americans constitute 9 percent of New Mexico's population and 3 percent of patients served by the MCP. Similarly, Hispanics are 47 percent of the state's population and 29 percent of MCP patients.

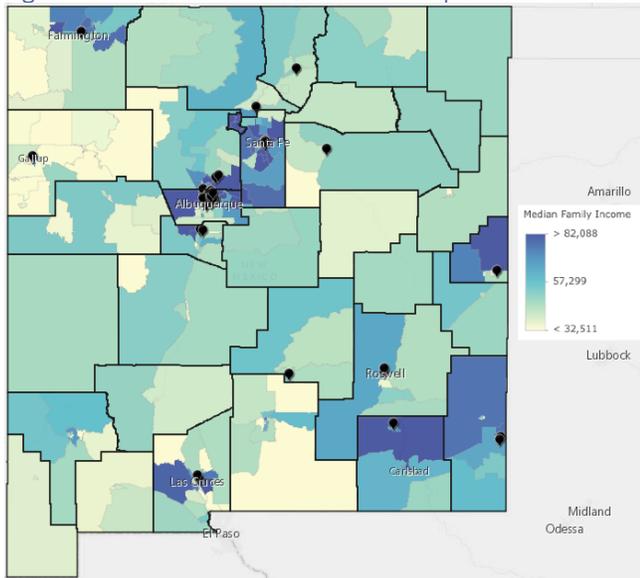
Figure 3: Racial and Ethnic Profile of MCP Cardholders and the General New Mexico Population



Source: 2013 New Mexico Department of Health Medical Cannabis Program Survey

The under-representation of minorities in the MCP patient population does not mean that Hispanic and Native American New Mexicans have less need for medical cannabis. Racial minorities, Native Americans in particular, are more likely than White Non-Hispanic (“Anglo”) residents to suffer from severe and debilitating medical conditions, including chronic pain⁶ and PTSD.⁷ Differing attitudes toward medical cannabis also fail to explain differences in MCP participation. In fact, recent survey data suggest that New Mexico's Hispanic residents are at least as supportive of medical cannabis as the state's Anglo population.⁸

Figure 4: New Mexico Medical Cannabis Dispensaries and Median Family Income



Source: US Census Americans Community Survey and New Mexico Medical Cannabis Program

Lower incomes and lack of geographic access likely contribute to racial and ethnic disparities in MCP participation. Native American and Hispanic state residents have lower average incomes than Anglos.⁹ Medical cannabis is not covered by most public or private health insuranceⁱⁱ and, at roughly \$11/gram,¹⁰ it is unaffordable for many lower income patients. As illustrated in Figure 4, dispensaries tend to be clustered in areas with higher median incomes.

ⁱⁱ The only exception is New Mexico's Worker Compensation program (See: New Mexico Workers Compensation Administration Fee Schedule and Billing Instructions, Medical Cannabis)

Table 1: Medical Cannabis Program: Patient Penetration by County, 2016

Medical Cannabis Program Patient Penetration by County, 2016				
Counties with dispensaries	Dispensaries	NMMCP Patients (June, 2016) ¹	Population (July, 2015) ²	Patients/1,000 population
Bernalillo	19	9952	676,685	14.7
Chaves	2	644	65,764	9.8
Curry	1	372	50,398	7.4
Dona Ana	2	1555	214,295	7.3
Eddy	1	596	57,578	10.4
Lea	2	476	71,180	6.7
Lincoln	1	462	19,420	23.8
McKinley	1	248	76,708	3.2
Rio Arriba	1	776	39,465	19.7
San Juan	1	786	118,737	6.6
San Miguel	1	570	27,967	20.4
Sandoval	2	1878	139,394	13.5
Santa Fe	4	3321	148,686	22.3
Taos	1	885	32,907	26.9
Valencia	2	937	75,737	12.4
Total	41	23,458	1,814,921	12.9
Counties without dispensaries				
Catron		45	3,456	13.0
Cibola		288	27,329	10.5
Colfax		160	12,414	12.9
De Baca		27	1,828	14.8
Grant		244	28,609	8.5
Guadalupe		53	4,371	12.1
Harding		3	698	4.3
Hidalgo		18	4,423	4.1
Los Alamos		159	17,785	8.9
Luna		101	24,518	4.1
Mora		103	4,596	22.4
Otero		537	64,362	8.3
Quay		83	8,455	9.8
Roosevelt		105	11,476	9.1
Sierra		331	11,282	29.3
Socorro		190	17,256	11.0
Torrance		272	15,485	17.6
Union		23	4,201	5.5
Total	0	2,742	262,544	10.4
Total	41	26,200	2,077,465	12.6

Sources:¹ New Mexico Department of Health Medical Cannabis Program ²Geospatial and Population Studies Program, University of New Mexico. http://bber.unm.edu/bber_research_demPop.html.

Participation in the MCP varies significantly by county. Penetration rates (MCP patients per 1,000 county residents) range from 29.3 in Sierra County to 3.2 in McKinley County. New Mexico's vast geographic area and sparse population create logistic barriers to access for patients outside the urban areas, particularly patients with limited income and/or access to transportation.

IV. The Market for Medical Cannabis in New Mexico

The market for medical cannabis in New Mexico is not as large or diversified as those of states like Oregon and Washington, but it has grown steadily over the last nine years. Recently, New Mexico's medical cannabis market has entered a period of unprecedented expansion, with demand greatly outpacing supply.

A. Supply

In New Mexico, regulated medical cannabis is produced by Licensed Non-profit Producers (LNPPs) and patients who hold Personal Production Licenses (PPLs).

1. Licensed Non-profit Producers

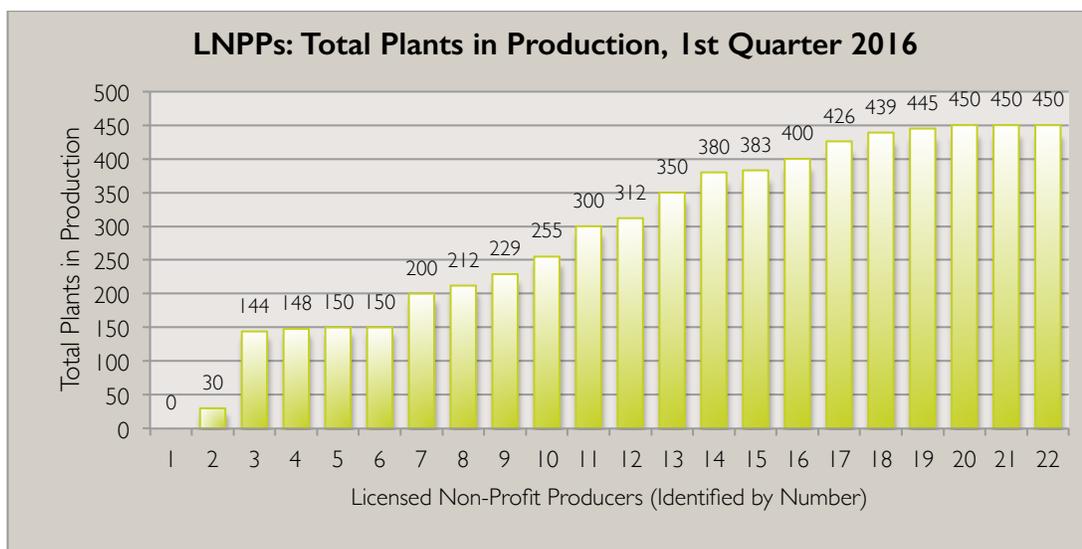
LNPPs produce and sell approximately 83 percent of regulated cannabis in New Mexico.¹¹ LNPPs operate vertically integrated grow sites and dispensaries. State regulation caps the number of LNPPs at 35, but each LNPP can operate an unlimited number of dispensaries.¹² In July 2016, 23 licensed cultivators operated 41 dispensaries in 15 counties statewide.¹³ Twelve additional producers were licensed late in 2015. At the time of this writing, in July 2016, nine of the newly licensed LNPPs were not yet producing product.

a) Production Cost

There is considerable variation in the size and intensity of LNPP grow operations. Several LNPPs cultivate the maximum number of plants in technically sophisticated grow sites with multiple annual harvests, while other licensed producers plant one outdoor crop each year.¹⁴

During the first quarter of 2016, the most recent period for which data are available, LNPPs averaged 286 plants in production. The number of plants ranged from 0 to 450, the maximum allowed under current state regulations.¹⁵ The number of plants harvested by LNPPs in the same period ranged from 0 to 310, yielding total production of 1,328,224 grams.¹⁶

Figure 5: Total Plants in Production by LNPPs (Identified by Number) in the First Quarter of 2016



Source: New Mexico Department of Health Medical Cannabis Program Licensed Non-Profit Producer Report, First Quarter, 2016

Numerous factors determine production costs for medical cannabis. These include, but are not limited to: type of production (indoor, outdoor, or greenhouse), scale of production, geographic location and climate, wages and salaries, taxes and fees, quality control and testing, final usage form, and other regulatory factors.

(i) Scale

Cannabis cultivation and processing exhibit “economies of scale.”^{17,18} Economies of scale are present when the average cost per unit of output declines as the scale of production increases. This suggests that, all else being equal, a gram of cannabis grown by an LNPP with 100 plants and a single annual harvest will cost more to produce than a gram of cannabis from a producer cultivating 450 plants and harvesting multiple times a year. Similarly, a 3,000-plant operation will have significantly lower unit costs than a 450-plant operation.

Several factors contribute to efficiencies of scale in cannabis production. Many key inputs including nutrients, lights, soil, seeds, and clones are also less costly when purchased in bulk. Another key input, electricity, is the largest component of cost for most producers. Research conducted by medical cannabis producers in Washington State found that a 10,000 square foot indoor facility produced a pound of cannabis at 24 percent lower cost than a 1,500 square foot indoor facility.¹⁹ Researchers at the BOTECH Analysis Corporation estimated long run average cost curves for different scales of indoor and greenhouse production over a variety of time horizons and found consistent declines in average cost as production increased for both methods with average cost per gram dipping below \$2 for facilities of 15,000 square feet or more. Economies of scale were larger for greenhouse production and for facilities of at least 10,000 square feet.²⁰

Cannabis cultivation requires a great deal of light. Small grows are often indoor operations with high production costs because all light must be generated artificially with energy-intensive high-intensity lighting. Larger scale production, in contrast, is more likely to occur outdoors or in greenhouses where it is possible to take advantage of ambient light. Outdoor cultivation is the most energy efficient, but allows for only one harvest a year and leaves crops more vulnerable to microbial growth and pests. In addition to being free, sunlight is more efficient for photosynthesis than artificial light, enabling plants to grow faster.

Table 2: Average Cultivation Square Footage, U.S. Wholesale Cultivators 2016

Average Cultivation Sq Footage, U.S. Wholesale Cultivators 2016	
Growing Method	
Indoor	6,000 square feet
Outdoor Growing	13,250 square feet
Greenhouse	38,000 square feet
Combination Method	8,500 square feet
Source: Cannabis Business Daily Cannabis Business Factbook 2016	

A 2010 RAND working paper explored the impact of scale and production methodology on the cost of producing a pound of cannabis and found cost savings of 100 percent to 300 percent for larger scale greenhouse/outdoor production.²¹ Constructing and equipping a greenhouse requires a significant up-front investment,ⁱⁱⁱ but the larger production volume feasible in a greenhouse spreads fixed cost out over more units of output, further lowering average cost.²²

Table 3: Change in Legal Cannabis Cultivation Methods, U.S. 2014-2015

Change in Legal Cannabis Cultivation Methods, U.S. 2014-2015		
	2014	2015
Indoor Only	72%	58%
Outdoor Only	5%	6%
Greenhouse Only	1%	9%
Combo	22%	28%
Source: Cannabis Business Daily, Cannabis Business Factbook 2016		

Electricity is also required for other production processes including dehumidification, space heating, and generation of CO₂. Very large producers may be able to purchase electricity at preferential industrial rates.²³

Larger operations provide more opportunities for productivity gains through labor specialization and automation. Automated trimmers and conveyor systems speed production and reduce labor costs by an average of \$150-\$200/lb.²⁴ Larger producers are also better positioned than small producers to take advantage of emerging technological and labor saving innovations.

Economies of scale can be internal or external. In an industry that exhibits internal economies of scale, larger operations are favored because they can produce more efficiently and price more competitively than smaller scale operations. External economies of scale exist when increased output by an entire industry decreases marginal costs for all firms in that industry. External economies of scale may exist when producers co-locate, pool labor, or share equipment. Many types of agriculture and manufacturing, including cannabis cultivation and processing, exhibit significant internal, and sometimes external, economies of scale.²⁵

(2) Production Quotas

As noted earlier, New Mexico prohibits LNPPs from having more than 450 plants at any one time. The plant cap limits production capacity and makes it impossible for regulated supply to keep pace with demand. In 2013, two-thirds of LNPPs reported running out of product within the past three months. These producers were closed due to lack of product a total of 342 days during that period, turning away an estimated 6,643 patients. Forty-five percent of LNPPs reported rationing product to 6,020 patients due to product shortages.²⁶ Forty-five percent of MCP cardholders reported having to wait to obtain medical cannabis. Figure 6 depicts waiting times reported by MCP cardholders.²⁷

Figure 6: Cannabis Supply Curve with Production Quota

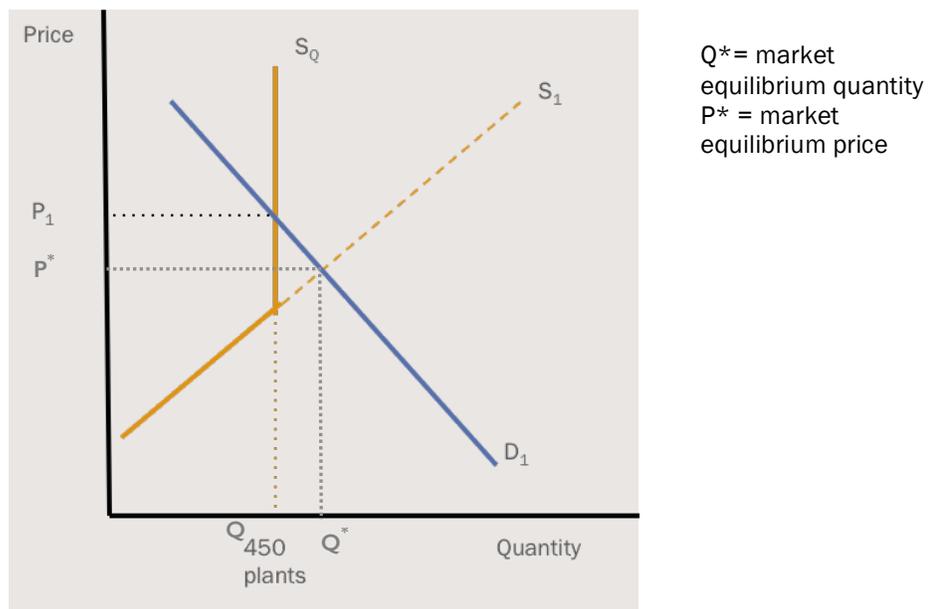


Table 4: Commercial Plant Count Limits in Medical Cannabis States, 2016

Medical Plant Count Limit in Medical Marijuana States, 2016		
Unlimited Plant Count		Maximum plants per LNPP if the same rules were applied in NM (approximate)
Arizona, Colorado, Connecticut, Illinois, Massachusetts, Minnesota, New York		N/A
Square Footage Limited (Unlimited Plant Count)		
California	Maximum 22,000 square feet	2,444 plants ¹
Washington	Maximum 35,000 square feet	3,889 plants ¹
Based on Patient Need		
Delaware	Maximum 125 lbs useable inventory per dispensary	N/A
Maine	6 plants per designated patient	4,269 plants ²
New Hampshire	3 plants, 12 seedling, 6 oz per patient	2,134 ²
New Jersey	"Needs of patients"	N/A
Rhode Island	"Needs of patients"	N/A
Vermont	2 mature, 7 immature plants, and 4 oz. per patient	1,423 plants ²
Fixed Plant Limit		
Hawaii	3,000 plants maximum/cultivation center	
New Mexico	450 plants maximum per producer	

Source: State medical cannabis programs

Table 4 shows state limits on plant count and/or production square footage. Where possible, an approximation of the equivalent number of plants per New Mexico LNPP is provided. These estimates, although somewhat imprecise, make it easier to compare New Mexico's 450-plant limit with production restrictions in other states.

Figure 7: Cardholders Reporting Delays: Length of Time to Obtain Medical Cannabis from LNPPs



Source: New Mexico Department of Health 2013 Medical Cannabis Survey

In economics, the supply curve illustrates the amount of product a firm is willing to supply at any given price. Under current New Mexico MCP regulations, the supply curve for medical cannabis is upward sloping until producers reach 450 plants, at which point it becomes vertical. An input quota, such as the plant cap, puts a ceiling on production such that, after the quota is reached, supply is completely unresponsive to price. The production quota also impacts supply by preventing producers from taking advantage of economies of scale, keeping average per-unit production

costs higher than they would otherwise be. New Mexico's production cap keeps the availability of regulated cannabis low, holding the supply curve to the left of where it would be under less restrictive market conditions.

New Mexico also limits the number of dispensary/production licenses. Currently, there are 35 LNPPs and DOH is not accepting new applications for licensure. Issuing additional licenses would likely increase supply, but not for at least two years, and at a higher per-unit cost than could be achieved by lifting the plant cap from existing producers. Increasing the number of licenses while continuing to cap the number of plants would not enable producers to take advantage of economies of scale or capitalize on the experience they have gained to grow new strains or develop new products.

The advantages and disadvantages of economies of scale

Leveraging economies of scale can benefit consumers by increasing supply and decreasing price. This is an especially beneficial effect when demand outstrips supply. On the other hand, when economies of scale are very large, there exists the potential for oligopoly – domination of the market by a small number of very large producers. Oligopolistic markets can make it very difficult for small-scale farmers to effectively compete.¹ In this way, oligopoly may limit competition and may reduce the variety of products consumers have to choose from. But oligopoly is not a foregone conclusion, even when significant economies of scale are present, nor does it necessarily preclude market participation by smaller producers. A market dominated by a handful of large producers capable of very competitive pricing may still have room for smaller producers who differentiate themselves by specific characteristics that some consumers are willing to pay extra for – organic farming and boutique strains, for example. Government can help prevent market concentration from limiting consumer choice by minimizing the extent to which regulation creates additional barriers to entry. High licensure fees and requiring vertical integration make it harder for smaller producers to enter the market. Government can help small businesses become more competitive by providing targeted tax incentives, job training subsidies, and technical assistance.

¹ Hawken, A. and Prieger, J. Economies of Scale in the Production of Cannabis. BOTEC Analysis Corporation. October 22, 2013

(3) Wages and salaries

In the first quarter of 2016, New Mexico LNPPs paid employee compensation totaling \$2,599,445 and averaging \$113,010. For the reasons discussed earlier, per-unit labor costs decline as production increases, contributing to economies of scale.

“Dispensaries and growing operations also are becoming significant employers that paid \$3 million in salaries and other compensation in the first quarter of this year, up from \$2.3 million during the same period in 2015.”

– Olivier Uyttebrouck, Albuquerque Journal, June 6th, 2016 www.abqjournal.com/786242/growing.html

(4) Taxes and fees

Nationally, permits, licenses, and applications account for ten percent of a grower's start-up costs. An additional ten percent goes to consultants for assistance with licensure and regulatory compliance.²⁸ In New Mexico, LNPPs must pay a one-time \$10,000 application fee and an annual licensure fee of \$30,000 for the first 150 plants and \$10,000 for each additional 50 plants.²⁹ LNPPs licensed for the maximum 450 plants pay annual licensure fees of \$90,000. Fees are due upfront at the time of licensure, which may reduce the number of plants an LNPP can invest in and thus the scale at which they can operate.

Sales of medical cannabis are also subject to the New Mexico gross receipts tax (GRT). GRT generates revenue for both state and local governments. Rates vary by locality from 5.50 in Bonito Lake to 8.9375 percent in Espanola.³⁰ For the first quarter of 2016, LNPPs paid a total of \$768,605 in GRT. GRT payments averaged \$34,936 and ranged from \$589 to \$82,820.³¹

(5) Quality control and testing

Strict quality control is critical to the production of high quality medical cannabis. State regulations³² require that all useable cannabis and cannabis derived-products produced, sold, or distributed by an LNPP be tested by an approved laboratory for microbiological contaminants, mycotoxins, solvent residue (concentrates only), and quantity of THC and CBD prior to sale or distribution. During the first quarter of 2016 LNPPs paid a total of \$79,944 and an average of \$3,633 for testing. Six producers reported no testing expense.³³

(6) Final Usage Form

Cannabis can be purchased in an increasingly wide array of forms, ranging from dried and cured flower, to concentrates, edibles, and infused products like lotions and patches. The degree of processing needed to create a cannabis product impacts cost in three ways. First, a certain amount of product is eliminated during refinement. Cannabis concentrate can be consumed directly and is also the basis for most infused products. Concentrate is produced via extraction, which reduces large volumes of cannabis of moderate potency to small volumes of higher potency cannabis concentrate. Depending on the method of extraction, this process is fairly efficient, however, a certain amount of potency is lost during the refinement process. For example, a recent study in Colorado estimated that one ounce of cannabis flower of “average” potency would yield between 3.1 and 5.5 grams of average potency concentrate, depending on the extraction method. However, between 6.9 and 8.1 grams of concentrate would be needed to equal the THC content of one ounce of flower.^{iv} Thus, all else being equal, a given dosage of cannabinoids in concentrate form requires more plant material than the same dosage consumed as flower. Inputs to the extraction process including labor, solvents and equipment are a second set of costs. A third set of costs arises if further processing, such as the production of edibles and topicals, is involved. As a general rule, each link in the value chain increases final cost by roughly 50 percent.³⁴

More sophisticated, targeted cannabis therapies require even larger quantities of raw plant material. Improvements in dosing, delivery, or absorption by patients require increasingly sophisticated extraction methods. The process of extracting cannabinoids from raw plant material entails a trade off between purity and yield. Pharmaceutical grade formulations of any sort demand a high degree of active pharmaceutical ingredient (API) purity in order to be reproducible with exact dosage. Cannabis plant material is a complex system containing numerous compounds.³⁵ Many of these compounds have very similar properties, which makes them very difficult to separate.³⁶ Commonly used, rudimentary extraction techniques with a 95 percent yield can produce concentrates with 65 percent purity. On the other hand, multi-step, sophisticated extraction and purification techniques can achieve over 90 percent purity, but with only a 25 percent yield. Thus, to produce the same amount of product with high pharmaceutical standards of purity and potency requires four times the starting materials.³⁷

Although many factors help determine the relative retail prices of different products, comparison of the price per mg of THC across different flower and non-flower products may give some sense of the underlying differences in production costs. The Colorado Department of Revenue compared the retail prices of a variety of flower and non-flower products on the basis of cents per milligram of THC. Prices ranged from 5.53 cents per milligram of THC in an ounce of sativa flower to 25 cents per milligram of THC in a 100 mg edible.³⁸

As patients and practitioners become more knowledgeable about the characteristics of specific cannabis strains, the wide range of cannabis products, the value of purity and precise titration, and the risks posed by contaminants and dosage errors, the demand for products produced to more exacting pharmaceutical standards will increase. The inputs and skilled labor necessary to maintain this level of quality may further increase average production costs.³⁹

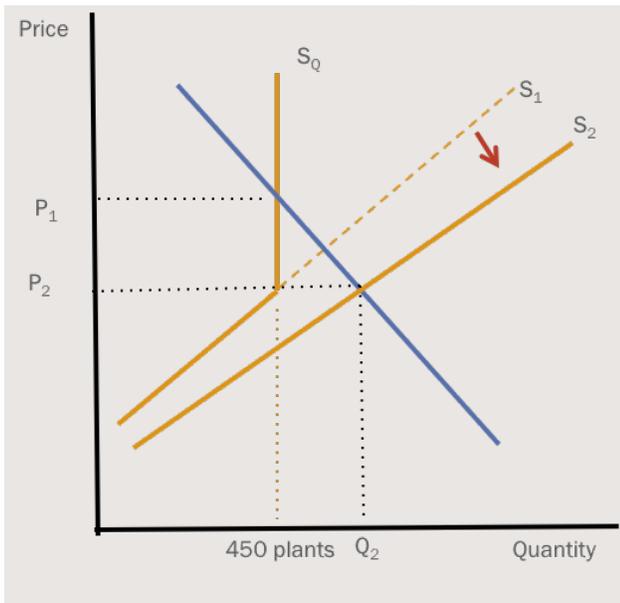
^{iv} This is an extremely simplified description of a complex and variable set of processes provided solely for purposes of illustration. An excellent and far more accurate explanation is provided in “Cannabis Equivalency in Portion and Dosage: An assessment of physical and pharmacokinetic relationships in cannabis production and consumption in Colorado” released by the Colorado Department of Revenue on Aug 10, 2015 and available at: www.colorado.gov/pacific/sites/default/files/MED%20Equivalency_Final%2008102015.pdf

Price

The average price of medical cannabis in New Mexico averaged \$11.06 per gram for the first quarter of 2016. During that period LNPP prices ranged from a low of \$6.88 per gram to a high of \$13.85 per gram.

Cannabis price is a function of production costs and competition, both of which are influenced by regulatory climate. A traditional supply curve depicts a positive relationship between price and quantity – the higher a good’s price, the more of that good suppliers are willing to provide. Factors other than price – such as production costs, competition, and regulatory factors -- impact the position of the supply curve. If the price of an input to production decreases, the supply curve shifts right, meaning that, for any given price, the supplier is willing to provide a greater quantity than before. Removal of the production quota would enable LNPPs to exploit economies of scale, reducing per unit production costs. Lower average costs and the expectation of increased competition will shift the supply curve right (see Figure 8), allowing price to fall even as consumption increases.⁴⁰

Figure 8: Removal of Production Quota Increases Supply



2. Personal Production Licenses

Personal Production Licenses (PPLs) are available to qualified patients who wish to grow medical cannabis for their personal use only. There is a \$30.00 application fee that may be waived for low-income applicants. PPL holders are authorized to possess no more than four mature female plants and a combined total of 12 seedlings and male plants, and may possess no more than an “adequate supply” of cannabis, currently defined by the New Mexico Department of Health as eight ounces of useable cannabis over a 90 day period. A personal production license holder may also obtain cannabis from LNPPs.

Twenty-two percent (5,714) of the 26,568 July 2016 MCP patients hold PPL licenses. Twenty-nine percent of respondents to the 2013 DOH survey held PPL licenses and roughly half reported that they were currently utilizing the license. Survey respondents who held and utilized a

PPL reported harvesting an average of 108.5 grams annually. Based on survey results, DOH estimated that MCP patients harvested an annual total of 188,415 grams, 17 percent of the previous year’s estimated harvest.⁴¹

If patterns of production by PPL holders have remained constant, and there is no evidence that they have not, they will have produced 77,496 grams in the second quarter of 2016. The finding that personal production constitutes a relatively small share of legal cannabis in New Mexico is supported by recently published research by the RAND Corporation comparing patterns of cannabis consumption for medicinal and recreational users in Washington, Oregon, Colorado and New Mexico.⁴² Between 5.1 percent and 7.2 percent of medicinal cannabis users who took part in the RAND survey said they grew at least some of the cannabis they used. It is worth noting that although PPL holders produced roughly 17 percent of legal cannabis in 2013, the 188,415 grams they produced constituted roughly 3.7 percent of the 5.1 million annual grams DOH estimated would be needed to *fully* satisfy demand from the 9,760 patients enrolled at the time of the survey.⁴³

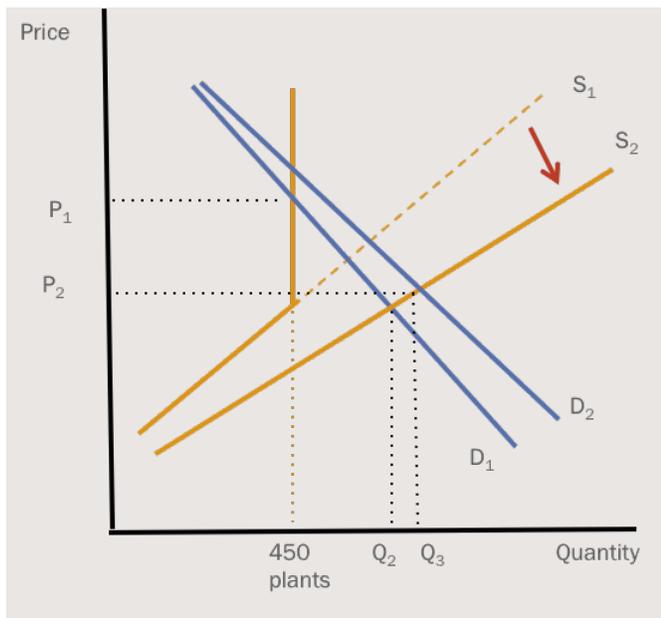
B. Demand

In June 2016, 26,568 patients were enrolled in New Mexico’s medical cannabis program, up from 15,265 in June 2015. Growers and others close to New Mexico’s cannabis industry expect the rapid growth in demand to continue for the foreseeable future.⁴⁴

The demand curve depicts the quantity demanded at each price. The quantity demanded of most goods, including cannabis, is a negative function of price. The price elasticity of demand (PED) measures the change in demand resulting from a one percent change in price. When consumers are relatively unresponsive to price an increase in price causes a less-than-proportional decrease in quantity demanded and demand is said to be “inelastic.” Although there do not appear to be any studies measuring the price elasticity of demand for medical cannabis specifically, studies of the market for illicit and adult use retail cannabis suggest that demand is relatively inelastic – a 1 percent change in price induces a change in demand of between .59 percent and .79 percent.^{45,46 47 48}

Factors other than price, including demographics, public awareness, product variety, income, and the availability of substitute goods, also impact demand. These factors determine the position of the demand curve. When they are altered, the demand curve shifts. A number of factors, including an aging population, high prevalence of certain qualifying conditions, the opioid crisis, greater public acceptance of cannabis, and higher visibility of dispensaries, have likely shifted the demand curve for medical cannabis, contributing to surge in demand in New Mexico and throughout the U.S..

Figure 9: Outward shift in demand curve for medical cannabis, with and without production quota



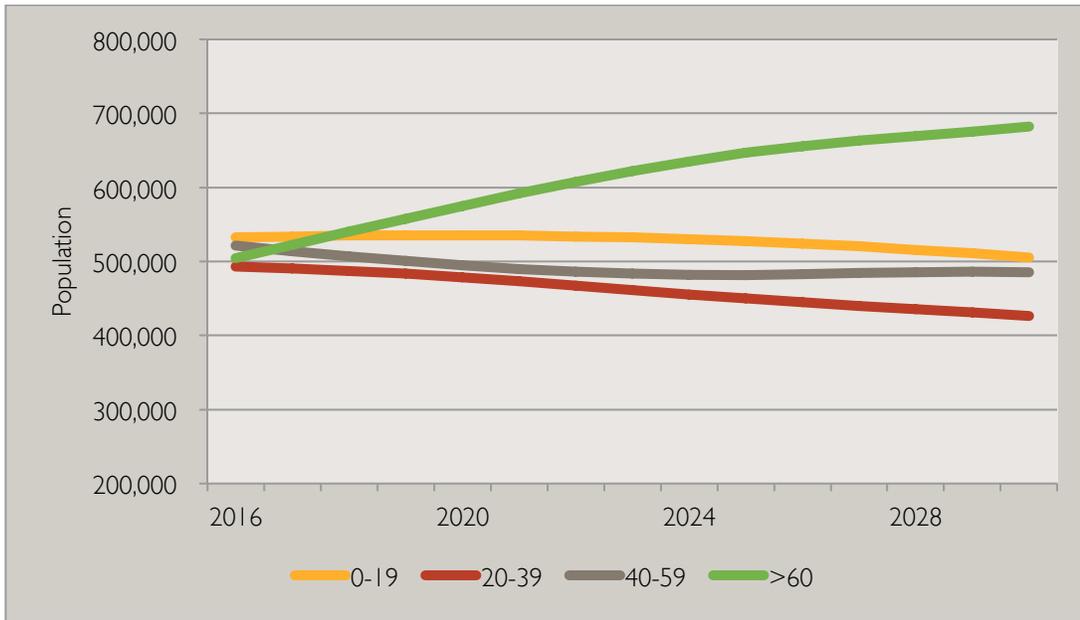
1. Drivers of Demand

a) Demographic Factors

New Mexico’s population, like that of the entire U.S., is aging rapidly. People over 60 made up 22 percent of New Mexico’s population in 2012 and are expected to constitute 33 percent in 2030.

With age comes increased prevalence of illness, disability, and several MCP qualifying conditions, including cancer, chronic pain, Parkinson’s disease, and admittance to hospice care.⁴⁹

Figure 10: New Mexico population by age Group and year



Source: U.S. Census Bureau

b) Epidemiology

Eighty-three percent of MCP cardholders have one or more of three conditions – chronic pain, PTSD, and cancer. Although consistent state-by-state comparisons are hard to come by, particularly for the first two conditions, what data exist suggest that the prevalence of chronic pain is increasing nationwide⁵⁰ and, due to characteristics of the state’s population, New Mexico may have relatively high rates of both PTSD and chronic pain.

(i) Post-traumatic stress disorder (PTSD)

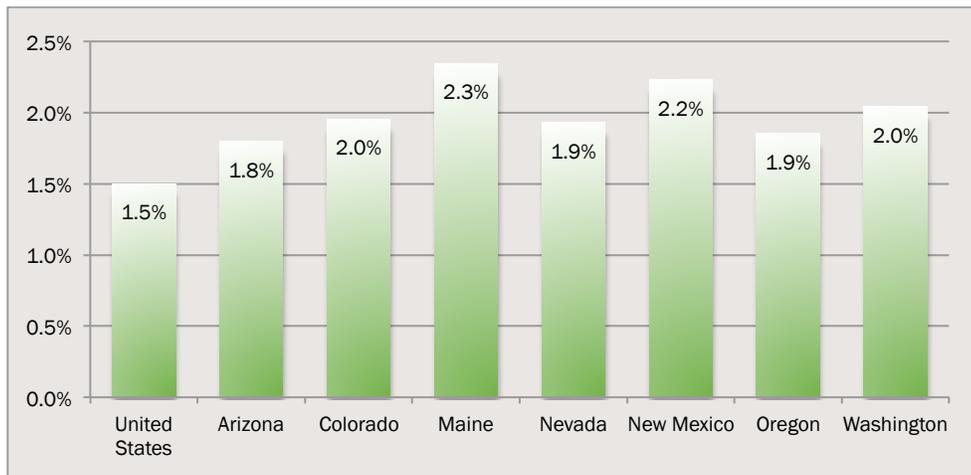
People develop PTSD after experiencing or witnessing a traumatic event. PTSD occurs in a range of severities, and can be extremely debilitating for some patients. PTSD symptoms may include flashbacks, anxiety, irritability, difficulty sleeping, outbursts of anger, and avoidance of situations likely to trigger upsetting memories.⁵¹

The estimated lifetime prevalence of PTSD among American adults is 7.8 percent. Annual prevalence is estimated at 3.5 percent.⁵² Based on national statistics, an estimated 121,000 New Mexico adults will experience PTSD at sometime in their lives and, in any given year, 54,200 New Mexico adults will be actively experiencing the symptoms of PTSD. Forty-six percent of New Mexico MCP cardholders list PTSD as their qualifying condition.

Although the estimate of the number of New Mexicans with PTSD presented here is based on the prevalence of PTSD nationally, there are several reasons New Mexico’s rate of PTSD may actually exceed the national average. If this is case, the number of New Mexicans currently experiencing PTSD exceeds 54,200.

Although anyone can experience PTSD, the condition is especially prevalent among combat veterans. Over 170,000 veterans currently reside in New Mexico.⁵³ Among veterans, lifetime prevalence of PTSD may be as high as 30 percent. At any given time, between 10 percent and 15 percent of veterans are thought to be experiencing the symptoms of PTSD.⁵⁴ New Mexico is home to a relatively high share of the U.S. veteran population. Veterans constitute 10.9 percent of New Mexico’s civilian population 18 years and older compared to 8.7 percent of the U.S. civilian adult population.⁵⁵ Twenty percent of New Mexico veterans and 17 percent of U.S. veterans have a service-related disability.⁵⁶ Figure 11 shows the percentage of civilian adults who are veterans with a service-related disability for New Mexico, the U.S., and several medical cannabis states.

Figure 11: Percentage of civilian adults who are veterans with a service related disability: N.M., the U.S., and several medical cannabis states, 2010-2014



Source: US Census, American Community Survey 5-Year Estimates 2010-2014 Table B21100

Native Americans have also been shown to experience disproportionately high rates of PTSD. The lifetime prevalence of PTSD among persons living in on Native American reservations is estimated at 23 percent,⁵⁷ three times the national average. Native Americans constitute between nine and ten percent of New Mexico's population and less than two percent of the U.S. population overall. Finally, interpersonal violence is major cause of PTSD. Rates of domestic violence and child abuse in New Mexico are consistently above national averages.⁵⁸ New Mexico has one of the nation's highest rates of violent crime with an estimated 450 aggravated assaults per 100,000 state residents, a rate almost twice the national average.⁵⁹ New Mexico also has one of the nation's highest rates of sexual violence.⁶⁰ Almost 20 percent of New Mexico women report having been raped at some time in their lives and it is estimated that one-third of all rape victims develop PTSD.⁶¹ An additional 49 percent of adult women and 21.5 percent of adult men have experienced some form of sexual victimization other than rape. Twenty-two percent of sexual violence victims have symptoms of PTSD.⁶²

New Mexico was the first state to list PTSD as a qualifying condition for medical cannabis.⁶³ Since then, seven other states have added PTSD as medical cannabis qualifying condition.

(2) Chronic pain

Chronic pain is pain that lasts more than three to six months. It can impact all aspects of a patient's life and may severely impair day-to-day functioning.⁶⁴ Between one-quarter and one-third of Americans suffer from chronic pain.⁶⁵ Certain factors increase an individual's risk for experiencing chronic pain. Many of these factors are more prevalent in New Mexico than elsewhere in the U.S. suggesting that New Mexicans may experience chronic pain at higher rates than the general U.S. population. Some of the risk factors for chronic pain include:

1. Low income⁶⁶ -- 20.9 percent of New Mexicans and 15.6 percent of Americans live in poverty.⁶⁷
2. Limited education⁶⁸ -- 84 percent of New Mexico adults and 86.3 percent of U.S. adults have graduated high school.⁶⁹
3. Disabilities -- 14.3 percent of non-institutionalized New Mexicans and 12.3 percent of non-institutionalized Americans have one or more disabilities.⁷⁰
4. Diabetes -- 11.5 percent of New Mexico adults and 10.5 percent of U.S. adults have been told by a healthcare provider that they have diabetes⁷¹

(a) Opioid Alternative

Opioid misuse and overdose death are national crises that are particularly severe in New Mexico. New Mexico ranks second among states for deaths from drug overdose. Twelve of New Mexico's 33 counties have drug-

overdose death rates more than twice the U.S. average.⁷² In New Mexico, prescription opioids (i.e., methadone, oxycodone, morphine) accounted 48 percent of unintentional overdose death and heroin, also an opiate, accounted for an additional 34 percent. Many individuals who come to misuse opioids are initially prescribed them for pain after surgery or a visit to the ER. Identifying safer forms of analgesia is essential to addressing the state's opioid crisis.

Cannabis, alone or in combination with other drugs, can be an effective analgesic that also helps quell the nausea associated pain and the use of other pain relievers. In some cases, cannabis can be an equally effective, much safer alternative to opiates with fewer unpleasant side effects. In fact, recent research has found medical cannabis laws to be associated with decreased use of opiates by chronic pain patients⁷³ and significantly lower state-level opioid overdose mortality rates.^{74 75}

(3) Cancer

New Mexico's cancer incidence rate is lower than the national average,^{76,77} but roughly 7,500 New Mexicans develop or die from cancer each year and over 100,000 have had or are currently living with the disease.⁷⁸

c) Dosage

Medical cannabis users are more likely than recreational users to use cannabis on a daily or near daily basis and tend to use larger amounts of cannabis as measured by grams per day.⁷⁹ There is no formal schedule of recommended dosages of cannabis for different qualifying conditions.⁸⁰ Rather, the amount of medical cannabis an individual takes varies based upon a number of factors including: their condition, personal preference, level of experience with cannabis, and mode of consumption (flower, concentrate, infused products, or edibles).

"Dispensaries also are starting to operate more like ordinary businesses. Many make their names and logos visible on major commercial streets and shopping centers. Patients don't need to press a buzzer and stare down a security guard to enter... and they can bring their children and pets inside."⁸¹

d) Public Acceptance

State cannabis programs throughout the country are expanding rapidly,⁸² due, at least in part to greater acceptance of cannabis by the general public. Fifty-eight percent of Americans support legalization of cannabis for adult use, up from 36 percent in 2005, according to a recent poll.⁸³ Another national poll found that 81 percent of Americans support legalization of medical cannabis.⁸⁴

Trends in New Mexico parallel those observed nationally. According to a survey of over 400 New Mexico adults conducted in January, 2016, 71 percent of New Mexicans support the state law, enacted in 2007, that legalizes and regulates medical cannabis and 61 percent to 69 percent support legalizing, taxing, and regulating cannabis cultivation and sales to adults 21 and over. Adults age 18 to 34 are more likely than other New Mexicans, particularly seniors, to support medical use and legalization for general use. Seventy-four percent of U.S. adults ages 18 to 34 and 86 percent of New Mexicans 18 to 34 support legalization of cannabis for adult use. Strong support by young people suggests that public acceptance of cannabis will continue to increase over time.⁸⁵

New Mexico has the nation's 10th highest per capita rate of cannabis use.⁸⁶ During 2013-14, 9.73 percent of New Mexicans and 8.04 percent of Americans 18 and older said they had used cannabis in the past month. Five percent of New Mexico adults describe themselves as regular cannabis users and an additional 6 percent say they use cannabis occasionally. Over half of New Mexico adults have tried cannabis at least once.⁸⁷

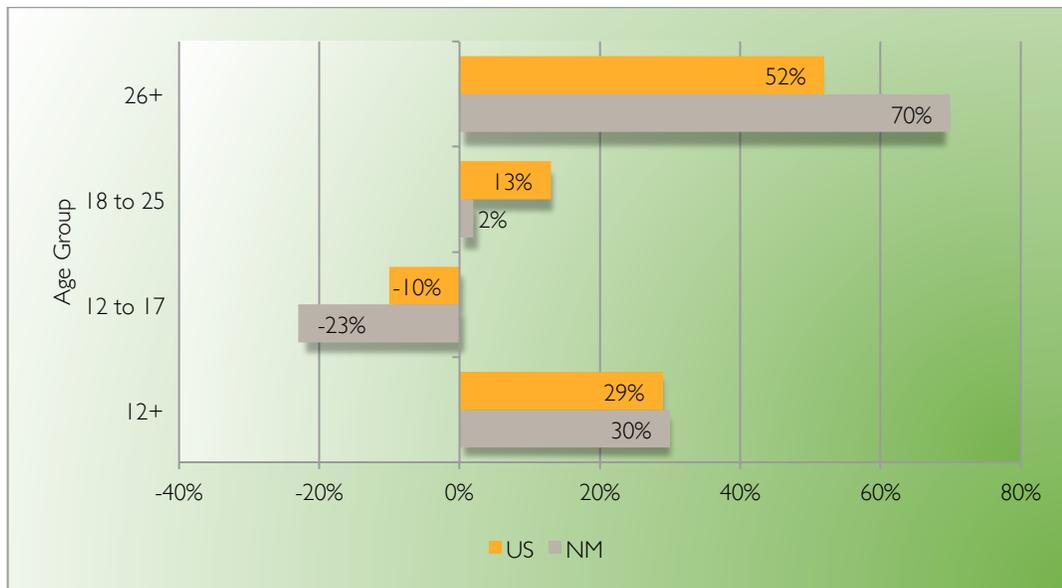
Over the last decade, cannabis use by adults has trended upward in both New Mexico and the U.S. while use by youth has trended down.⁸⁸ Cannabis consumption by New Mexico adults 26 and older increased by 70 percent between 2003 and 2014, compared to a 52 percent increase for the same age group nationwide.⁸⁹ Also during that period, New Mexico experienced a 46 percent decrease in the percentage of adults who perceive cannabis use once a month as "highly risky."⁹⁰ During the same period, cannabis use by youth ages 12 through 17 decreased by 23 percent in New Mexico and 10 percent in the U.S. overall.

Table 5: Cannabis use in the past month by age group: NM and U.S. 2002-2014

Cannabis Use in the Past Month by Age Group: NM and U.S.				
	New Mexico		United States	
	2002-03	2013-14	2002-03	2013-14
12+	7.37% ^a	9.56%	6.18% ^a	7.96%
12 to 17	10.35% ^b	7.98%	8.03% ^a	7.22%
18 to 25	18.98%	19.32%	17.17% ^a	19.32%
26+	4.74% ^a	8.06%	4.01% ^a	6.11%

^a Difference between the 2002-2003 and 2013-2014 population percentages is statistically significant at 0.05
 Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2002, 2003, 2013, and 2014.

Figure 12: Percentage change in cannabis use 2003-2014 U.S. and New Mexico



Source: Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2002, 2003, 2013, and 2014.

e) Regulatory and Administrative Change

As programs mature, their administration can become more streamlined and, in some cases, more responsive to the needs of health care providers, caregivers, and patients. Prior to 2015, New Mexico required that patients exhaust all conventional treatments for their condition(s) before a practitioner could recommend medical cannabis.⁹¹ Elimination of this administrative hurdle likely increased demand, at least somewhat.

f) Product mix

Medical cannabis comes in an increasingly wide variety of forms, include edibles, infused products, and concentrates. Non-flower cannabis products constitute a large and increasing share of state cannabis markets.⁹² Having a variety of products from which to choose increases demand by targeting specific needs and preferences. Consumers seeking precisely titrated dosages may choose tablets, concentrates, or tinctures. A need for alternative modes of ingestion can be met with topicals or suppositories; and a patient seeking a discrete way to medicate outside the home may choose edibles. A 2009 survey of adults in Oregon, Washington, Colorado and New Mexico found that 32 percent of cannabis used medicinally was in non-flower form. The study characterized medical cannabis users as “much more likely to vaporize or consume edible forms of the drug than recreational users.”⁹³ Similarly,

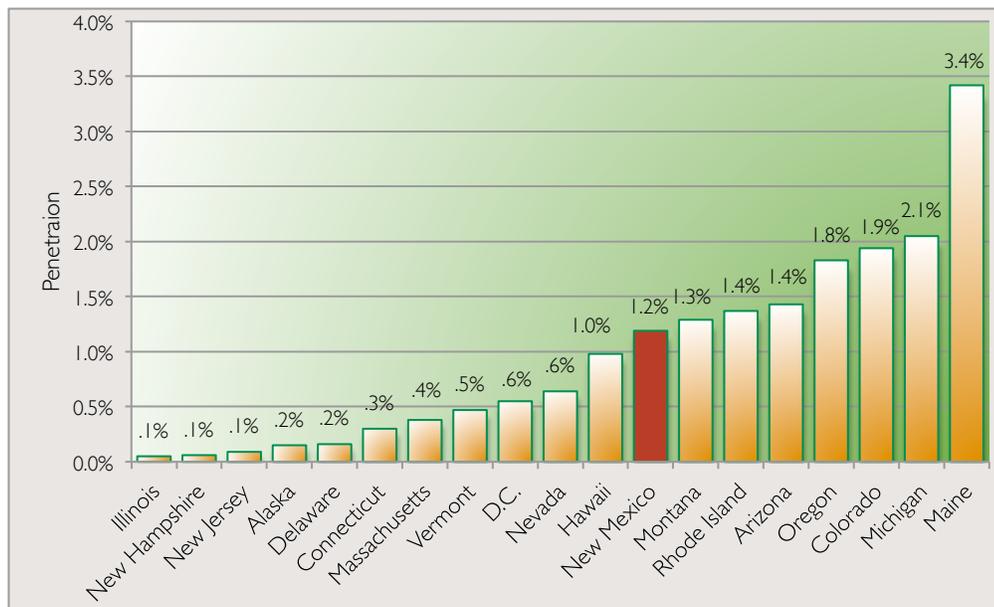
concentrates, infused products and edibles now make up 40 percent of medical cannabis sales revenue in Washington State.⁹⁴ Research has shown that consumers in legal markets are more selective about products and strains than those who buy from the black market. This may be due to better access to consumer information and the wide variety of products from which to choose in legal markets.⁹⁵

g) Product Availability and Public Awareness

Increased public awareness and product availability are also important factors in releasing pent-up demand. In New Mexico, strict production quotas have limited the number of MCP participants by limiting the number of dispensaries and the amount of cannabis dispensaries have in stock. Patients with qualifying conditions have little incentive to enroll in the MCP if there are no dispensaries in or near their communities. Patients may also be reluctant to purchase from a dispensary with insufficient and unpredictable supply. Forty-five percent of respondents to the 2013 New Mexico Department of Health survey of MCP cardholders reported having difficulty obtaining product from LNPPs when they needed it, 52 percent because LNPPs were out of product.

In 2015 DOH increased the maximum number of plants per LNPP from 150 to 450. Greater availability of product increased the number of dispensaries and stimulated competition, increasing public awareness and thus demand.

Figure 13: State Medical Cannabis Penetration Rates 2015-16



Source: ProCon.org

Product availability also increases demand by making purchases more convenient and less time-consuming.⁹⁶ Similarly, a large body of research shows a positive correlation between utilization of primary care and proximity to health care providers, particularly among rural residents, the elderly, and medically under-served populations.⁹⁷ Marketing and advertising, which are stimulated by competition, further increase sales.

2. Measuring Demand

Twenty-six thousand New Mexicans are currently qualified to purchase medical cannabis at retail, however the state's potential market for medical cannabis is substantially larger. The potential size of the medical cannabis market is a function of state population, medical cannabis guidelines, and product availability.⁹⁸

Table 6: Penetration Rates and Qualifying Conditions: NM and Selected Western States,

Penetration Rates and Qualifying Conditions: NM and Selected Western States					
	AZ	CO	NM	OR	WA
Penetration (average % of population enrolled, 2015-16)	1.4%	1.9%	1.2%	1.8%	1.9%
Conditions					
Admittance into hospice care			X		
ALS (Lou Gehrig's disease)	X		X		
Alzheimer's disease	X			X	
Anorexia			X		X
Cachexia or wasting syndrome or nausea	X	X	X	X	X
Cancer	X	X	X	X	X
Crohn's Disease	X		X		X
Glaucoma	X	X	X	X	X
Hepatitis C	X		X		X
HIV/AIDS	X	X	X	X	X
Inclusion body myostitas			X		
M.S. or persistent muscle spasms	X		X	X	X
Painful peripheral neuropathy			X		
Parkinson's disease			X	X	
Post-Traumatic Stress Disorder			X	X	X
Seizure disorders/epilepsy	X	X	X	X	X
Severe and/or chronic pain	X	X	X	X	X
Severe nausea	X	X	X	X	X
Cervical dystonia			X		
Traumatic brain injury and post-concussion syndrome					X

Sources: State medical cannabis programs

a) Market Penetration

New Mexico has a population of 2.1 million. It is estimated that roughly 30 percent of New Mexicans (630,000) have one or more MCP qualifying conditions, while only 1.2 percent take part in the MCP.⁹⁹

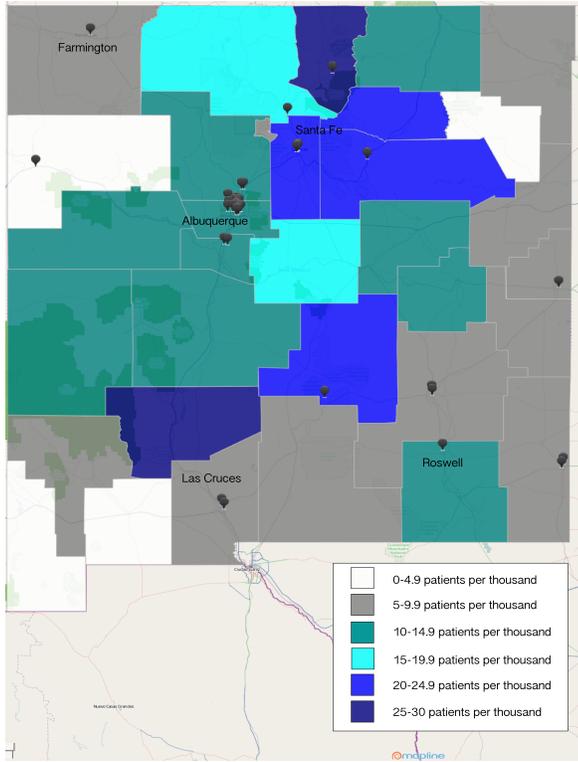
Market penetration-- the number of patients licensed to purchase medical cannabis per 1,000 state residents – is a measure of market growth potential. Despite the surge in MCP enrollment, New Mexico still lags some medical cannabis states in market penetration, suggesting significant as-yet-untapped growth potential. Several states including Maine, Michigan, Oregon, Washington, and California, enroll a higher percentage of patients. Two of those states – Oregon and Washington – have qualifying conditions almost identical to New Mexico's. Colorado, which has a more limited list of qualifying conditions, has a per capita enrollment rate 80 percent higher than New Mexico's.¹⁰⁰

b) Consumption

Respondents to the 2013 DOH survey reported consuming an average of 9.7 grams of cannabis per week. The 79 percent of respondents who said that they had purchased from an LNPP in the last three months reported purchasing an average of 10.1 grams per week from dispensaries.¹⁰¹ Thirty-five percent of survey respondents said that at least once in the previous three months they needed to use more than their typical dosage. These patients reported needing additional cannabis an average of 1.5 times per month and using an additional 6.42 grams on those occasions. Adding the additional amounts increases average weekly consumption by MCP patients to 10.3 grams

per week or 1.5 grams per day, assuming daily use. Average consumption amounts derived from the DOH survey are similar to those reported by medical cannabis patients in Washington State (9.1 grams)^v and Colorado.^{vi} 102

Figure 14: Dispensaries and Penetration Rates by County



Supporting Federal Goals by Out-Competing the Black Market

Less than ten percent of New Mexicans who use cannabis are MCP cardholders. Consequently, the vast majority of cannabis consumed by New Mexicans is obtained from illicit sources. A survey of adults in four western states including New Mexico found that seven percent of adults had used cannabis for medical purposes at some time in their lives and over half of them did so without a physician's recommendation.¹⁰³ Another study of cannabis use in legalizing states found that "many people who used medical cannabis were getting it from dealers, rather than from dispensaries."¹⁰⁴ One-in-three New Mexicans have one or more qualifying conditions, so it is likely that many black market customers would switch to the regulated market if medical cannabis were as inexpensive and accessible as illicit cannabis. Although a medical cannabis program cannot eliminate the black market, it can greatly reduce black market purchases by medical cannabis patients.

At the federal level, cannabis remains a Schedule I controlled substance. However, the Obama administration has urged federal prosecutors not to prosecute people for distributing

medical cannabis in accordance with state law and the United States Department of Justice has deferred the right to challenge legalization in Colorado and Washington. In a memorandum entitled "Guidance Regarding Marijuana Enforcement under the Controlled Substance Act (CSA) of 1970," US Deputy Attorney General James Cole indicated that the federal government would limit enforcement of federal cannabis prohibitions in state-authorized cannabis markets, provided that those states established "strong and effective regulatory and enforcement systems" to prevent:

- Distribution of cannabis to minors
- Receipt of cannabis revenue by criminal enterprises
- Distribution of cannabis to other states from states where it is legal
- State-authorized cannabis activity being used as a cover or pretext for the trafficking of other illegal drugs or other illegal activity
- Violence and the use of firearms in the cultivation and distribution of cannabis
- Drugged driving and the exacerbation of other adverse health consequences of cannabis use
- Cultivation of cannabis on public lands

Conversely, states that do not vigorously control cannabis production, processing, sale, and use so as to avoid these outcomes may attract federal enforcement action.¹⁰⁵

^v Washington residents who use cannabis 21 or more times per month consume, on average, 1.3–1.9 grams during a typical use day (See: Caulkins, Hawken, Kilmer, & Kleiman, (2012) and Kilmer, B. et al. (2013). "Before the Grand Opening: Measuring Washington State's Cannabis Market in the Last Year Before Legalized Commercial Sales," RAND Drug Policy Research Center. <http://www.rand.org>) Assuming use 26 days per month and 1.6 g/day = 9.1 grams per week

^{vi} In 2014, Colorado medical cannabis patients consumed 8.8 grams of flower/week. This doesn't include concentrates, edibles or other infused products, which are a large portion of the Colorado market. In 2014, 1,964,917 units of medical edibles were sold in Colorado. Edibles vary widely in THC content. Assuming each edible contains 10 mg THC and that 10 mg THC is equivalent to 1 gram yields 9.3 grams per week.

It is possible to maintain a robust regulatory structure and closely monitor the cannabis market without artificially constraining supply or otherwise undermining the market's functioning. In fact, policies that promote a robust, competitive market for medical cannabis are likely to be especially effective at displacing black market suppliers. Colorado and Washington are cultivating on large, active legal markets to comply with the federal mandates and force black market suppliers out of business.¹⁰⁶ In both states, retail prices have dropped significantly as the number of retailers has increased and competitive pressure has intensified.¹⁰⁷ In Washington the average price of "adult use" retail cannabis declined from \$25-\$30/gram in July 2014 to \$10.3/gram in January 2016.¹⁰⁸

C. Supply and Demand Model

A model of New Mexico's medical cannabis market was constructed to forecast future demand and predict how production of regulated cannabis would change under current regulatory conditions between 2016 and 2018.

$$\begin{aligned} \text{Commercial medical cannabis demand (MCD)} &= f(C,G,V,PPL) \\ \text{Where:} & \\ C &= \text{Cardholders} \\ G &= \text{Consumption per cardholder (grams)} \\ V &= \text{Product variety} \\ PPL &= \text{Personal production amount (grams)} \\ \\ \text{LNPP cannabis supply (LCS)} &= f(Pr, Pl, Y) \\ \text{Where:} & \\ Pr &= \text{Producers} \\ Pl &= \text{Plant count} \\ Y &= \text{Yield (grams)} \\ \\ \text{Excess demand} &= \text{MCD} - \text{LCS} \end{aligned}$$

a) Methodology

(i) Cardholders and Personal Production

New Mexico's demand for medical cannabis, as reflected by the number of MCP cardholders, increased 74 percent between June 2015 and June 2016. When the June 2016 patient count is adjusted to include the 38 percent of MCP applications that are taking more than the requisite 30 days to process, the 12 month rate of growth is 81 percent.^{vii} As noted previously, growth in demand is part of a national trend and reflects a growing acceptance of medical cannabis among policy makers and the general public. Demand growth in New Mexico and other legal cannabis states, is due, in part, to increased advertising by cannabis dispensaries, active patient advocacy groups, events catering to medical cannabis culture, and the presence of dispensaries in communities that were previously un-served. None of these trends shows signs of abating, nor is the prevalence of the major qualifying conditions likely to decline. On the contrary, as the population ages, chronic pain, cancer, glaucoma and other qualifying conditions are likely to impact an ever-larger share of New Mexicans. In fact, at the time of this writing in July 2016, the New Mexico Department of Health is taking more than the requisite 30 days to process 38 percent of MCP applications due to the large number of New Mexicans requesting cards. In addition, despite rapid growth in the MCP, New Mexico remains behind similar medical cannabis states in MCP penetration, further indicating that continued growth is highly likely. Therefore, the model assumes that the number of cardholders increases at its current rate (18.5 percent per quarter, the average growth over the past four quarters) for the third quarter of 2016 and then at a rate that declines by 1 percentage point per quarter (17.5% in the fourth quarter of 2016, 16.5 percent in the first quarter of 2017, and so on and that the share of MCP cardholders with PPLs is 23 percent throughout that period. Based on DOH data discussed earlier (see page 12), the model further assumes that, in any quarter, 50 percent of PPL holders are actively producing cannabis and that active PPL holders produce an annual

^{vii} May 2016 card count was 24,902 and June card count was 26,568, suggesting a 1,666 increase in MCP patients. However, according to DOH, only 62 percent of applications were processed timely. Including the 38 percent of applications received but not reflected in the June cardholder statistics increases the June estimate by 1,021 from 26,568 to 27,589.

average of 108.5 grams for their own consumption (see page 12). MCP cardholders are assumed to use an equivalent of 9.3 grams per week. This is less than the 10.3 grams reported on the 2013 DOH survey, but consistent with the findings of other recent medical cannabis studies (see page 20).

(2) Product Variety

As noted earlier, the variety of cannabis products available to New Mexico consumers is more limited than in other western states where medical cannabis is legal. Given adequate access, medical cannabis users are even more likely than recreational users to use concentrates and infused cannabis products (see page 18). Concentrates, edibles, and other infused products already constitute upwards of 30 percent of the medical cannabis market in some western states (see page 18). Thus, the demand model assumes that non-flower cannabis products constitute 30 percent of New Mexico's currently pent-up demand and that the non-flower products require 30 percent more plant material than dried flower per mg THC (see page 11). Therefore, demand is increased by 7.5 percent to reflect the pent-up demand for concentrates and edibles by current and new MCP cardholders.^{viii}

(3) Plant Count

The model assumes that the 23 LNPPs currently in active production have an average of 338 plants in the second quarter of 2016^{ix} and that the average number of plants per producer increases by 2 percent per quarter until the first quarter of 2018, when it plateaus at 382 plants per LNPP, reflecting the fact that, due to cultivation practices, licensing fees, and personal preferences, some LNPPs will choose to produce less than the maximum number of plants, regardless of demand. The nine licensed but not-yet-producing LNPPs are assumed to bring product to market starting in the fourth quarter of 2016. 2017 licensure data indicates that LNPPs intend to produce 13,800 plants in 2017, an average of 394 plants per producer at full capacity. The forecast model assumes 90 percent of these plants are in production in the first quarter of 2017, ramping up to 97 percent in the fourth quarter of 2017 and all subsequent quarters.

Table 7: 2017 LNPP licensed plant count

Licensed plant count	Number of producers	Maximum plants
200	3	600
250	3	750
300	4	1,200
450	25	11,250
Total	35	13,800
Source: New Mexico Department of Health Medical Cannabis Program		

(4) Yield

Both the 23 original LNPPs and the 12 new LNPPs are assumed to increase their average yield per plant over the forecast period. The original LNPPs start at 337 grams per plant harvested in the second quarter of 2016 (the average productivity per plant harvested over the previous four quarters) and top out at an average of 443 grams per harvested plant in the first quarter of 2018. The new producers start the fourth quarter of 2016 with an average yield of 150 grams per plant harvested and increase average productivity at a rate of 15 percent per quarter

^{viii} This is a conservative assumption. Many production processes, particularly those with high standards of purity and precise titration, use much larger volumes of plant material per unit of potency (Panaxia Pharmaceutical Industries LTD. Purity VS Yield in the Pharmaceutical Industry)

^{ix} The actual plant count for the second quarter of 2016 had not yet been released by NMDOH at the time of this writing in July 2016.

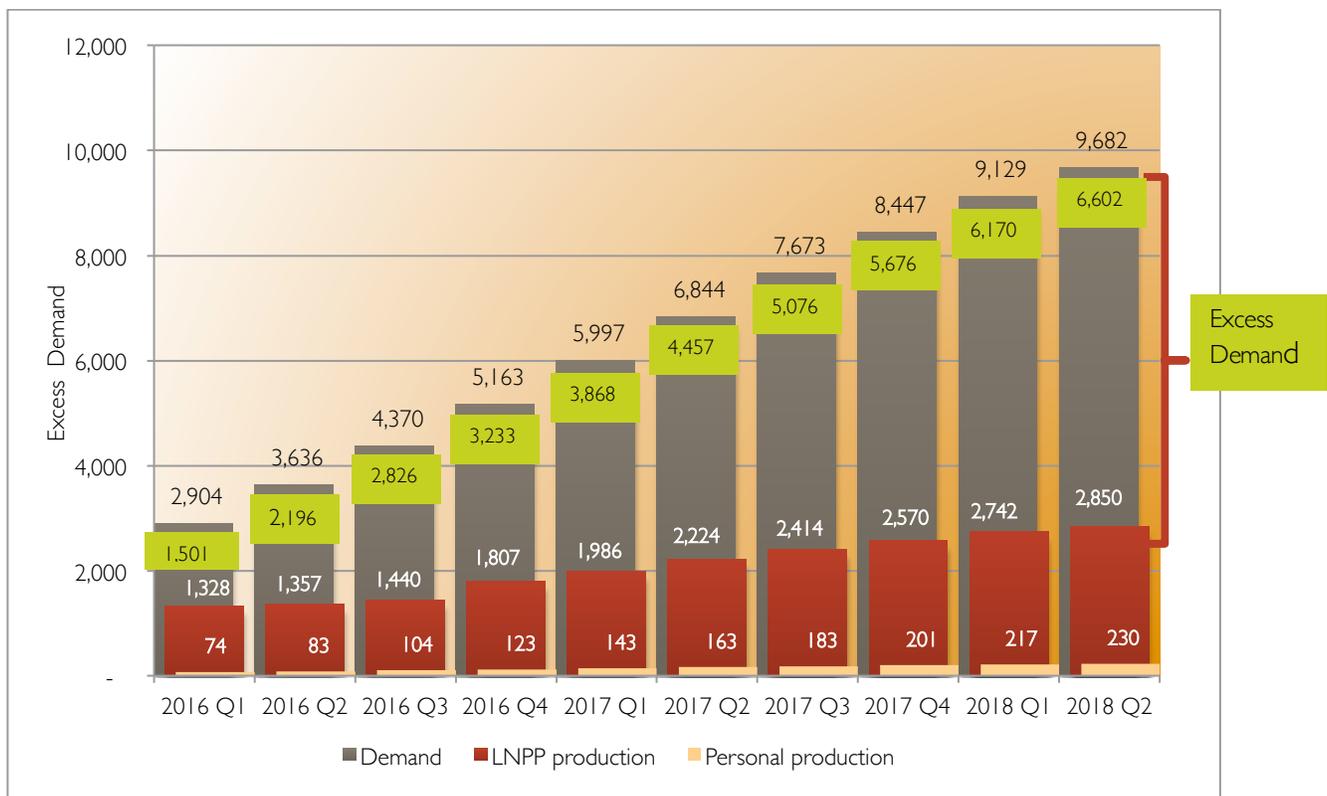
through the first quarter of 2018. The number of plants harvested in any quarter is equal to 52 percent of plants under cultivation in that quarter (the average ratio of harvested plants to total plants reported by LNPPs between the first quarter of 2014 and the first quarter of 2016).

b) Results

Model results indicate that over the forecast period demand exceeds supply by an amount that increases from 2.8 million grams per quarter in the third quarter of 2016 to 6.2 million grams in the first quarter of 2018. This scenario corresponds penetration rate of 3.3 in the first quarter of 2018.

An alternative approach to estimating demand relies on estimates derived from the RAND survey of adults in western legal cannabis states described earlier (see page 12). Five percent of respondents to the RAND survey reported having used cannabis for medicinal purposes at some point in their life *and* having used cannabis at least once in the past month. Applying this percentage to New Mexico yields roughly 79,410 likely MCP candidates -- New Mexico adults who currently use cannabis and have used it medicinally at some point. Subtracting the 27,589 current and pending MCP cardholders from the 79,410 possible participants leaves 51,821 potential new MCP cardholders. If two-thirds (34,202) of these individuals were to enroll in the MCP, excess demand would total 5.5 million grams per quarter and the state penetration rate would be 3.0 percent.

Figure 15: Supply and Demand Forecast (in 1,000 grams)



Source: Author calculations

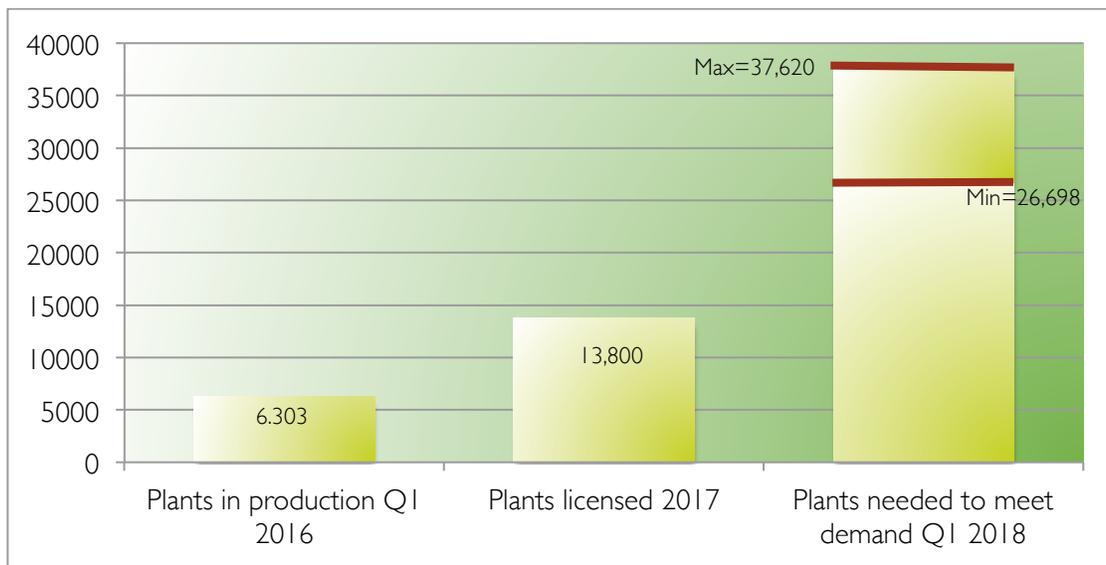
Yet another perspective comes from analysis of data collected and reported by the United States Substance Abuse and Mental Health Services Administration (SAMSHA). According to SAMSHA, in 2014, 9.4 percent of New Mexico adults (149,291 individuals) had used cannabis in the past month (see pages 16-17). Based on the high prevalence of MCP-qualifying conditions in the New Mexico population, it is likely that *at least* one third (49,266) of current cannabis users have one or more MCP qualifying conditions. Subtracting the 27,589 July 2016 MCP

participants from 49,266 current cannabis users with one or more qualifying conditions leaves 21,677 potential new MCP clients. Their enrollment would result in a 2.4 percent state penetration rate and excess demand totaling 4.4 million grams, assuming an increasing average plant count. Note that this is probably an under-estimate because it assumes that no one who isn't already a regular cannabis user enters the MCP after June 2016.

(i) Plant Count

The model predicts an average yield of 394 grams per plant in the first quarter of 2018. If roughly 50 percent of plants are harvested in any given quarter and unmet demand ranges from 4.4 million grams to 6.2 million grams, between 22,298 and 31,420 additional plants would be needed to equate supply and demand. An additional 2,200 to 3,100 plants would provide a modest cushion against routine crop losses and a comparable number would provide the raw material for production innovation. All told, by 2018, an additional 26,698 to 37,620 plants will be needed to support a robust medical cannabis market in New Mexico.

Figure 16: LNPP Plant Count: Current and Needed to Meet Projected Demand



The level of production necessary to support a functional and fair medical cannabis market cannot be achieved by simply doubling, tripling, or even quadrupling the current plant cap. Production varies widely across New Mexico's LNPPs and this does not seem likely to change. The maximum plant count was increased three fold in February 2015, but, as of March 2016, producers had an average of 287 of plants in production, and only seven producers had 400 or more plants.¹⁰⁹ Thus, a relatively limited number of LNPPs are positioned to expand production in response to increasing demand. The variation in capacity means that doubling the maximum plant count will not double production. Eliminating the plant cap, a policy in line with that of the majority of medical cannabis states, would enable the market to adjust in the most efficient and expedient manner and allow producers to bring a greater variety of higher quality products to market.

D. Discussion

Despite recent growth in the state's medical cannabis program, New Mexicans continue to have substantial unmet demand for medical cannabis and, in the absence of regulatory change, the extent to which demand exceeds supply will continue to grow over the next two years. New Mexico's pent-up demand for medical cannabis takes three principle forms: MCP-eligible New Mexicans who are not yet enrolled, current MCP cardholders who are not able to obtain enough cannabis from legal sources, and current and potential cardholders who would purchase more concentrates, edibles, and infused products were they more readily available.

1. Production Quotas Are Counter-productive

The gap between supply and demand is widening. Greater awareness and acceptance of cannabis is markedly increasing the number of patients seeking to explore its benefits but stringent supply constraints imposed at the state level, most notably the 450-plant cap, are preventing producers from sufficiently increasing supply. New Mexico's medical cannabis market is therefore in a perpetual state of disequilibrium, resulting in shortages, inefficient production, reduced innovation and product development, and high reliance by patients on black market suppliers. Because demand is a function of public awareness and geographic proximity to dispensaries, the 450-plant cap also stifles demand, making the market imbalance seem less acute than it actually is. Production limits stifle demand in four primary ways:

1. Creating shortages, temporary closures, and supply uncertainty at existing dispensaries.
2. Limiting the number of viable dispensaries and thus the proximity of many New Mexicans, particularly low income, minority, and rural residents to a source of medical cannabis.
3. Inflating prices by limiting potential economies of scale and artificially constraining supply.
4. Reducing the variety of products by limiting the amount of plant material available for product innovation and production of concentrates and infused products.

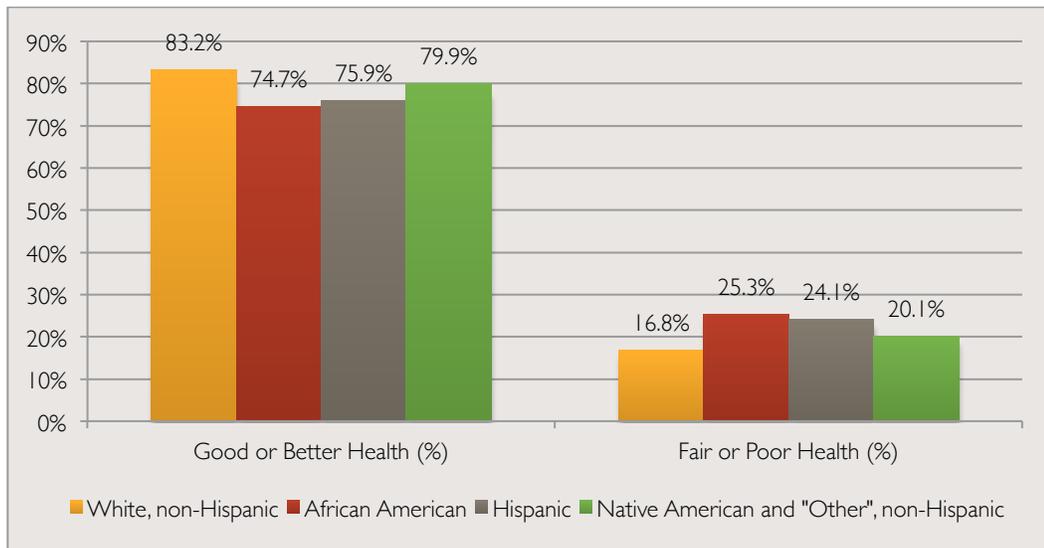
Production limits appear to serve no practical purpose. In fact, the two issues used to justify plant count restrictions – potential diversion to the black market and oligopoly in the medical cannabis market -- are actually exacerbated by supply constraints. The black market is stimulated by lack of supply in the legal market. In acknowledgement of this, Colorado and Washington are relying on large, vigorous, and largely unfettered legal markets to comply with federal mandates by crowding out black market suppliers.¹¹⁰ In both states, retail prices have dropped significantly as the number of retailers has increased and competitive pressure has intensified. Similarly, stifling production by licensed producers does not prevent cannabis market concentration, rather it shifts that concentration and attendant market power into the black market. New Mexico could more effectively combat excessive market concentration by reducing the significant barriers to entry created by high up-front licensure fees and the requirement that LNPPs be vertically integrated. Reducing licensure fees, or not predicating them on the number of plants cultivated, would reduce the risk inherent to ramping up production for small producers. Allowing but not mandating vertical integration would enable small businesses interested in retailing or growing, but not both, to enter the market and effectively compete.

Issuing more licenses while keeping the plant cap in place will not adequately or appropriately address the widening gap between supply and demand. Additional licenses alone will not enable producers to realize economies of scale nor will it provide producers with the supply of plant material they need to develop and produce a broader range of products that target the specific needs of medical cannabis consumers.

2. Disparities in Health and Access to Healthcare

Failure to ensure adequate supply of medical cannabis deprives patients of medicine critical to their well-being and exacerbates existing health disparities. The symptoms of many of the health conditions that disproportionately impact disadvantaged communities can be treated with medical cannabis, but supply shortages limit access for low-income and medically under-served New Mexicans, causing them to forego relief, obtain cannabis from unregulated, black market sources, or utilize more readily available and dangerous treatments, such as prescription opiates or illicit narcotics.

Figure 17: Self-Reported Health Status of New Mexico Adults by Race and Ethnicity



Source: Behavioral Risk Factor Surveillance System

As noted earlier, New Mexico has one of the nation's highest poverty rates. Over 36 percent of New Mexicans speak a language other than English and almost 60 percent are racial minorities.¹¹¹ Disparities in health and access to healthcare are some of New Mexico's most pressing public health challenges. People who are low-income and those who have limited education or English proficiency are at increased risk for many poor health outcomes, as are rural residents and communities of color. These large segments of New Mexico's population are also more likely than other state residents to be uninsured, have inadequate access to healthcare, and to report being unable to access care when they need it due to cost.¹¹² Not surprisingly, under-served New Mexicans are at elevated risk for multiple chronic diseases¹¹³ and chronic pain.¹¹⁴ Research also shows that patients from disadvantaged backgrounds are less likely than other patients to be provided with appropriate and adequate analgesia.^{115 116 117}

New Mexico's medically underserved communities have been particularly hard-hit by the opioid crisis. Rates of drug overdose are highest in New Mexico's poorest counties. As discussed previously, research has demonstrated that cannabis can be a highly effective and far less dangerous alternative to prescription opioid pain medication or narcotics. Research has also shown it to ease some of the symptoms of opiate withdrawal.¹¹⁸

Unequal access to medical cannabis is another health disparity experienced by disadvantaged New Mexicans. Health insurers don't cover medical cannabis and supply limitations keep prices artificially high and dispensaries concentrated in more affluent areas of the state. Consequently, the communities most impacted by chronic disease, chronic pain, inadequate health services, and opiate-related harms are the least likely to have access to medical cannabis.

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