

MARKET SIZE AND DEMAND FOR MARIJUANA IN COLORADO

Prepared for the Colorado Department of Revenue

Provided by: The Marijuana Policy Group

Authors: Miles K. Light, Adam Orens, Brian Lewandowski, Todd Pickton



COLORADO
Department of Revenue

The Marijuana Policy Group (MPG) was formed in 2014 as a collaborative effort between the University of Colorado Boulder Business Research Division (www.leeds.colorado.edu/brd) and BBC Research & Consulting (www.bbcresearch.com) in Denver. Both entities have offered custom economic, market, financial and policy research and consulting services for over 40 years. The MPG mission is to apply research methods rooted in economic theory and statistical applications to inform regulatory policy decisions in the rapidly growing legal medical and recreational marijuana markets.

Contents

EXECUTIVE SUMMARY.....	2
BACKGROUND	4
HISTORY	4
EVOLUTION OF MEDICAL AND RETAIL MARIJUANA SALES IN COLORADO	6
MARIJUANA DEMAND ESTIMATION METHODOLOGY	8
EDIBLES AND CONCENTRATES	9
AVAILABLE DATA.....	9
RESIDENT DEMAND ESTIMATION	10
MARIJUANA USER PREVALENCE IN COLORADO	10
MARIJUANA USE TRENDS.....	11
MARIJUANA FREQUENCY OF USE.....	11
POPULATION BY DAYS OF USE	12
SURVEY UNDERREPORTING ADJUSTMENTS.....	13
COLORADO MARIJUANA USERS – 2014	15
DAILY CONSUMPTION AMONG USER TYPES	15
PRIMARY DATA COLLECTION.....	16
TOTAL RESIDENT DEMAND.....	18
COMPARISON WITH PREVIOUS STUDIES.....	19
DEMAND ESTIMATES.....	20
VISITOR DEMAND	21
DESTINATION TOURIST DEMAND.....	21
TRANSIT AND BUSINESS VISITOR DEMAND.....	24
MARIJUANA SUPPLY MODALITIES	26
ISSUES AND CHALLENGES FOR MARKET SIZE ESTIMATION	28
REFERENCES.....	30
TERMS AND DEFINITIONS.....	32

EXECUTIVE SUMMARY

Total demand for marijuana, measured in metric tons, is estimated for the State of Colorado in this report. The process of estimation reveals a number of new and unique characteristics related to Colorado’s market for marijuana. These characteristics are introduced and discussed throughout the report as part of the estimation process.

The demand for marijuana by Colorado adult residents is estimated to be 121.4 metric tons in 2014. In addition, the demand by visitors to the state is estimated to be 8.9 metric tons for a total estimated demand of 130.3 metric tons. This reflects a point estimate for the adult (21+) population only. The true size of Colorado’s market may be smaller or larger than this. We believe the potential range for total adult marijuana demand, including visitor demand, is between 104.2 and 157.9 metric tons. State demand is driven by a combination of user prevalence, user frequency, and the amount of marijuana used (the dosage) each day for different user types.

This demand is supplied through various channels. Medical marijuana dispensaries and licensed retail marijuana vendors are the most obvious suppliers. However, a significant portion of demand is also supplied by medical marijuana caregivers, who are informal producers and vendors of medical marijuana sanctioned by state laws, but are also considered to be “gray-market” vendors. Remaining demand is supplied by home production, unlicensed vendors and individuals who represent the black market.

There are an estimated 487 thousand adult regular marijuana users who consume marijuana at least once per month. This represents 9.0 percent of the 2014 forecast population in Colorado of 5.363 million residents (all ages). Another 201 thousand adult residents reported using marijuana within the past year, which is 3.8 percent of the state population. In addition, 184 thousand residents under 21 reported past year use, of which 59 thousand reported past-month use. The scope of this report only includes the demand from consumers who are 21 years of age and older.

The vast majority of marijuana demand emanates from the regular users—and in particular from the heavy users who consume marijuana on a near-daily basis. In Colorado, the top 21.8 percent of users account for 66.9 percent of the demand. In contrast, the entire population of rare users (less than once per month), a group that accounts for almost one-third of all users, represents less than 1 percent (0.3 percent) of total demand. Table 1 shows Colorado user segments and corresponding demand shares.

Table 1: Adult (21+) User Prevalence and Estimated Quantity of Marijuana Demanded (Thousands of Grams)

Frequency of use:	Usage Amounts: ('000 grams)			Share of ..	
	Low	Central	High	users	demand
<1	240	361	721	29.2%	0.3%
1-5	2,625	4,039	5,756	24.5%	3.3%
6-10	2,138	3,289	4,686	7.5%	2.7%
11-15	1,476	2,271	3,237	3.2%	1.9%
16-20	3,728	5,735	8,172	5.8%	4.7%
21-25	19,888	24,478	29,067	8.1%	20.2%
26-31	66,007	81,240	96,472	21.8%	66.9%
Total:	96,103	121,412	148,112	100%	100%

Source: Marijuana Policy Group calculations. One million grams equals one metric ton.

Visitor Demand:

Colorado does not have Amsterdam style “coffee shops,” and it is illegal to consume marijuana in areas where most visitors may be, such as rental cars, hotels, and public spaces. Despite these restrictions, a significant share of retail sales appear to come from visitor purchases. Using a combination of sales tax receipt information, point-of-sale statistics, and data from county tourist offices, it is possible to impute visitor demand. For example, we estimate that purchases by out-of-state visitors currently represent about 44 percent of metro area retail sales and about 90 percent of retail sales in heavily visited mountain communities. Visitor demand is most prevalent in the state’s mountain counties,¹ where combined medical and retail marijuana sales more than doubled after retail sales were legalized in January, 2014. In comparison, Front Range metropolitan combined sales only increased between 15 and 19 percent over the same period.

Visitor prevalence is reflected in retail sales (versus medical) because visitors do not have medical marijuana patient registry ID cards. Point-of-sale data confirm that out-of-state ID cards represented almost one-half of all new retail sales, whereas ongoing medical sales were exclusively to in-state residents.

Summary Points:

This study finds total marijuana demand to be much larger than previously estimated. Our point estimate of demand is 121.4 tons per year for adult residents. This is 31 percent higher than a recent Department of Revenue assessment, 89 percent higher than a study by the Colorado Futures Center, and 111 percent higher than an older study by the Colorado Center for Law and Policy. The primary difference is caused by much heavier dosage amounts consumed by the state’s “heavy user” population – those who consume marijuana on a daily basis.

Heavy users drive almost 70 percent of total marijuana demand, and the prevalence of heavy users in Colorado is higher than the national average. According to the National Survey on Drug Use and Health, 23 percent of the user population in Colorado consumes near daily, compared with a 17 percent share nationwide. The second highest user cohort is also larger, with a 9 percent share in Colorado, compared to a 6 percent share nationwide.

This study accounts for the recent revelation that dosage levels increase with frequency of use. The drug use literature shows that heavy users consume doses that are three times larger per day than regular or light users.

Using the latest retail marijuana tax statistics from the Department of Revenue, we also found that conversions from medical to retail consumption is relatively low. Instead, retail supply of marijuana is growing, while medical marijuana is relatively constant. This may indicate that medical consumers would rather pay the medical registration fees as opposed to the higher tax rates, or that there are currently relatively few retail outlets compared to medical centers. Therefore, the retail demand is derived primarily from out-of-state visitors and from consumers who previously purchased from the Colorado black and gray markets.

Efforts to measure Colorado’s market size have become more complicated as demand for concentrates and edible products increase. Currently, there are no weight-equivalent conversions between these product types and dry weight of marijuana flower. On the other hand, our ability to measure medical and retail volumes sold, including

¹ Mountain counties reporting sales in early 2014 include Summit, San Miguel, Clear Creek, and Gilpin counties.

edibles and concentrates, is improving as the State Marijuana Inventory Tracking System accumulates more data. A subsequent report revision is planned during the first quarter of 2015. This follow-up report is expected to provide improved clarity related to edibles and concentrates, as additional information becomes available.

BACKGROUND

The Colorado policy to legalize recreational marijuana was not challenged by federal authorities subject to guidance in the August 29, 2013, memorandum from James Cole, the US Deputy Attorney General, titled “*Guidance Regarding Marijuana Enforcement*” under the Controlled Substance Act (CSA) of 1970. In this memorandum, he indicates that federal enforcement agencies are unlikely to enforce the CSA in states where marijuana has been legalized, and where the regulation and control is functional.

The memorandum lists eight enforcement priorities that are of particular importance to the federal government. Among them, two items are particularly relevant to this study:

- Preventing the diversion of marijuana from states where it is legal under state law in some form to other states; and
- Preventing the distribution of marijuana to minors.

In order to demonstrate proper control and regulation of state-level marijuana production, the Colorado Marijuana Enforcement Division (the “MED”) has retained the Marijuana Policy Group (the “MPG”) to determine the demand for marijuana in Colorado and to help design the regulatory framework surrounding the control and pricing measures necessary to maintain an orderly market.

In order to assess the overall market for marijuana in Colorado, the MPG uses a combination of survey results, findings from related literature, and Colorado-specific primary data to triangulate the most accurate estimate possible. While this study relies substantially upon recent work in the marijuana field, especially the recent RAND/BOTEC Washington market assessments, it also provides some improvements upon recent demand and prevalence estimation methods.

One improvement is that we can now use actual price and quantity data from the regulated market to compare the “sales gap” between estimated demand from all sources and the amount of marijuana available in the regulated market. Point-of-sale data, as well as local survey results, have also led to more specific conclusions about state-level use prevalence and the likelihood of underreporting among different user cohorts.

HISTORY

Marijuana was scheduled as a narcotic and made illegal at the federal level in the 1930s under President Franklin Roosevelt. The drug became increasingly popular during the 1960s and 1970s, which prompted state-level enforcement responses, and led to the start of state-led drug enforcement decisions. Some states became increasingly strict, while others moved toward de-criminalization of marijuana.

A major shift toward legalization began in 1996, when Oregon and California passed legislation that legalized marijuana possession and use for medical purposes. Today, 20 states and the District of Columbia allow the cultivation and use of medical marijuana in some form.

Federal law continues to prohibit possession, cultivation, and consumption of marijuana and related products, but several state and local governments have either de-criminalized marijuana possession while other states, such as Colorado and Washington, have begun to fully legalize marijuana through a regulated market.

Colorado voters passed Amendment 20 to the Colorado Constitution in 2000, which established a caregiver-patient system and permitted qualifying patients or caregivers to possess six plants or two ounces of useable marijuana for medical purposes. In 2007, a Denver District judge ruled that a 5:1 patient to caregiver ratio violated state law. This court ruling, and the publication of the Ogden memo in 2009 (Ogden 2009), led to a proliferation of medical marijuana dispensaries operating as caregivers. In response, the Colorado General Assembly passed HB-1284, which established a framework for medical marijuana centers (dispensaries), cultivation facilities, and manufacturers of edible marijuana products.

In 2012, Colorado and Washington were the first two states to approve measures that allow recreational cultivation and use of marijuana among adults 21 of years or older within each state.

Because marijuana has remained an illegal substance under federal law, several business complications have arisen. The most prominent example is banking. Since banks are federally regulated, they face penalties or license revocation for enabling marijuana sales transactions in Washington and Colorado. Even though the federal government has issued statements of clarification that allow financial transactions related to marijuana, very few banks currently allow account creation by firms that are related to the marijuana business.

Evolution of Medical and Retail Marijuana Sales in Colorado

In January of 2009, the medical marijuana registry listed 5,051 valid medical ID cards in Colorado.² Today, there are 111,031 residents with valid “red cards,” which represents 2.1 percent of the state population and 22.8 percent of the estimated marijuana user population who are over 21 years of age. The group of medical marijuana consumers is likely to include many of the “heavy users” within the state. While some of these patients have debilitating medical conditions like cancer, glaucoma, or cachexia, other red-card holders indicate more generic conditions, such as “severe pain.” The official breakdown of medical conditions indicated by red-card holders is shown in Table 2.

Table 2: Reported Conditions for Colorado Marijuana ID Cards as of January 31, 2014

Condition	Number of Patients	Share of Patients*
Severe Pain	103,918	94%
Muscle Spasms	14,632	13%
Severe Nausea	10,904	10%
Cancer	3,118	3%
Seizures	2,111	2%
Glaucoma	1,133	1%
Cachexia	1,126	1%
HIV/AIDS	668	1%

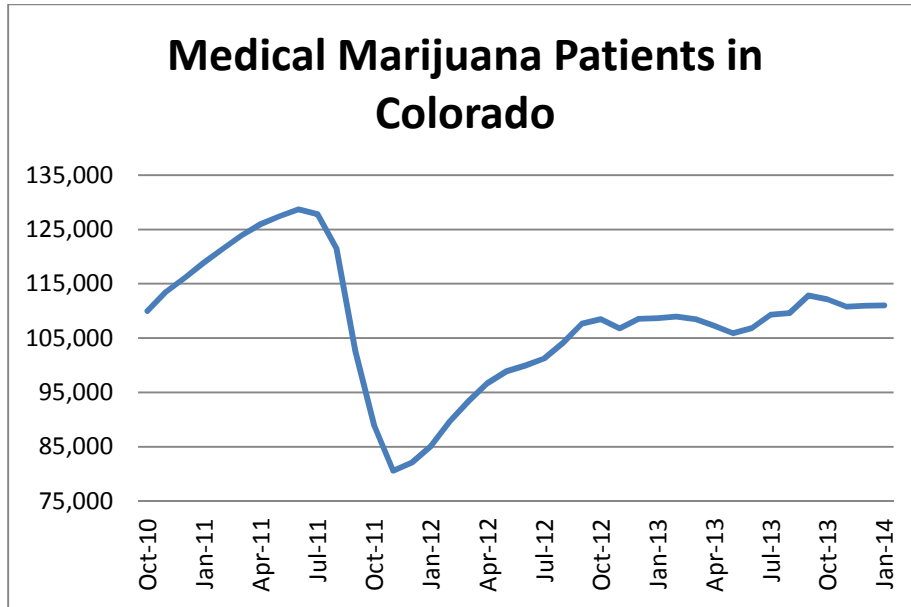
*Note: Total does not add to 100% due to multiple conditions reported.

Source: Colorado Medical Marijuana Registry.

Among the medical card holders, two-thirds are male and one-third are female, which reflects the marijuana consumer population more closely than the general population of Colorado (101.4 males for every 100 females). The trend in patients has been relatively volatile, with as many as 125,000 card holders in April 2011, to as few as 79,000 in November of the same year. State policymakers and regulators are currently watching the number of red-card holders who switch to the retail market to determine how the two markets will coexist following the passage of Amendment 64.

² January 2009 statistical archive, Colorado Medical Marijuana Registry.

Table 3: Historical Tally of Medical Marijuana Card Holders in Colorado



Source: Colorado Medical Marijuana Registry, Quarterly Report Archives.

Those who suggest there will be a migration of medical card holders point to the cost of medical marijuana registration fees and the required doctor’s prescription. Consumer anonymity when purchasing as a retail buyer is also cited as another factor that would attract current patients to the retail market. However, the cost of registering for a red card has recently declined. The fee was lowered from \$100 to \$90 in 2012, then to \$35 in 2013, and is just \$15 as of February 2014.

The red-card registration fees are likely to be offset by lower tax rates paid for medical marijuana, compared to retail marijuana. Medical marijuana is subject to state and local sales taxes, but retail marijuana is also subject to a 15 percent excise tax and a special state sales tax rate of 10 percent. In addition, each city can apply higher tax rates to retail marijuana. For example, the Denver sales tax rate is 3.62 percent for medical marijuana, but the rate is 7.12 percent for retail marijuana. The effect is compounded by state and district taxes. The final rate a red-card holder pays for medical marijuana in Denver is 7.62 percent, compared to the retail sales tax rate of 21.12 percent.³

This makes it unclear how many medical marijuana users will choose to become retail buyers. Another factor that contributes to medical marijuana users lack of conversion is that retail marijuana is not available in all jurisdictions that allow the sale of medical marijuana. A more likely outcome is that gray-market and black-market customers will choose the retail market, because they can select from a variety of high-quality products in a safe and predictable environment.

³ <http://www.denvergov.org/Portals/571/documents/TaxGuide/Tax%20Rates%20and%20Rounding%20-%202093.pdf>
Page | 7

MARIJUANA DEMAND ESTIMATION METHODOLOGY

The amount of marijuana consumed in Colorado by adults is not a known quantity and must be estimated. The total size of the marijuana market can be measured by using a supply-side approach or a demand-side approach.

The supply-based approach requires information from marijuana producers and sellers across the state. Starting January 1, 2014, production quantities by licensed marijuana companies is being recorded, but it is unlikely that the Colorado marijuana market is limited to licensed production alone. Home production, imports, and black market growing operations have been important contributors to Colorado's marijuana ecosystem in the past. While the amount of underground and illegal production is expected to decline significantly, some level is believed to exist to date. Therefore, in order to determine the total market for licensed and unlicensed marijuana, a demand approach is more practical. The demand estimate is then compared to licensed supply in order to determine the underground production gap.

This study is the first analysis that combines both methods: demand and supply. By comparing our estimates of demand to sales statistics and actual production, we believe that a more reliable examination of the marijuana market is possible.

In the demand approach, the number of users is first estimated, and then the quantity of marijuana consumed is estimated for each type of user over a specified period of time. The time period is dictated by the survey data source. In most cases, the surveys used for this analysis ask respondents whether they have consumed marijuana in the past 30 days. We identify users based upon their reported frequency of use by month. Next, the quantity demanded is tallied based upon dosage estimates. The quantity of marijuana used during a dosage can vary widely.

Social marijuana users may consume a small (less than a gram) amount on rare occasions, whereas heavy users and those with chronic pain will consume more than one gram per each day of use. The prevalence of marijuana use in Colorado can be estimated from survey responses, but the quantity used is not available from these surveys. Therefore, the next step is to identify how much is consumed by different types of marijuana consumers in a given year. This may sound trivial but due to the illegal nature of the product no records of use have been recorded, and survey data are often distorted by potential misreporting by survey respondents.⁴

The disparity between user types is highlighted in the 2013 analysis by the RAND group.⁵ They concluded that heavy users consume two to three times as much marijuana per day as infrequent users. When this heavy use is combined with more frequent use, the heavy user demographic becomes the primary group driving demand. According to the study, over 80 percent of demand is consumed by the top 20 percent of marijuana users in Washington State. Other studies that use a population average dosage amount will miss these important details, which are necessary to properly estimate the overall demand.

⁴ Usage amounts are typically underreported, due to factors such as social stigma related to the drug, or because respondents cannot remember each consumption event. These respondents typically revert to their typical pattern of use, rather than the actual use.

⁵ See Caulkins, Hawken, Kilmer, & Kleiman, 2012. (and) B. Kilmer, et al. (2013). "Before the Grand Opening: Measuring Washington State's Marijuana Market in the Last Year Before Legalized Commercial Sales," RAND Drug Policy Research Center. See <http://www.rand.org>.