

MARKET SIZE AND DEMAND FOR MARIJUANA IN COLORADO 2017 MARKET UPDATE

PREPARED FOR THE COLORADO DEPARTMENT OF REVENUE





Marijuana Policy Group LLC (MPG) (www.mjpolicygroup.com) is a consulting and research firm focused on legal cannabis markets. MPG helps governments design best-practice regulations and monitoring programs to meet public-sector goals. Private operators and investors rely upon MPG insights to excel in emerging legal markets for cannabis and hemp products. MPG was formed in 2014 by consultants and university researchers in Denver, Colorado.

This report was commissioned by the Colorado Department of Revenue, Marijuana Enforcement Division, and was conducted as a joint effort by experts from MPG and the University of Colorado Boulder, Leeds School of Business, Business Research Division. This report reflects the independent analysis of the study team.

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TABLE OF CONTENTS

- Executive Summary 1**
- 1. Overview 4**
- 2. Supply, Demand and Consumption..... 5**
 - 2.1 New Methods of Quantity Estimation 5
 - 2.2 Demand, Supply and Statewide Product Flows..... 8
 - 2.3 Colorado Resident and Visitor Consumption 10
 - 2.4 Comparing Supply, Demand and Consumption 13
- 3. Regulated Market Trends 16**
 - 3.1 Price Trends by Unit and Weight.....17
 - 3.2 Potency Trends 21
 - 3.3 Price per Serving Trends 21
 - 3.4 Product Shares 23
 - 3.5 Regional Product Shares 24
 - 3.6 Total Sales and Per Capita Spending 26
- 4. Emerging Topics 28**
 - 4.1 License Allocation 28
 - 4.2 Plant Counts and Utilization Rates 29
 - 4.3 Market Concentration and Consolidation..... 30

- Appendix A 34**
- Appendix B 38**
- Appendix C 39**
- Appendix D 44**
- References..... 46**

GLOSSARY

- **Adult use marijuana.** Marijuana that is grown and sold pursuant to the Retail Code and includes seeds and immature Plants. Unless the context otherwise requires, Adult use marijuana concentrate is considered adult use marijuana and is included in the term. The terms “retail” and “recreational” were often used in this context previously.
- **Cannabinoid.** Any of the chemical compounds that are the active principles of marijuana. Cannabinoids include THC, THCa, CBD, CBDa, CBN, and other naturally occurring compounds.
- **Caregiver.** Colorado Revised Statute 25-1.5-106 defines four types of caregivers for medical marijuana patients, the services they provide, and legal requirements: (1) Cultivating- grows marijuana on behalf of patients; (2) Transporting- transports marijuana for homebound or minor patients; (3) Parents of a minor patient- Parents of a patient under age 18; and (4) Advising- Advises patients on the medicinal use of marijuana. All cultivating and transporting caregivers are required to register.
- **Concentrate.** Refers to any product which refines marijuana flower into something more clean and potent. This umbrella term includes any type of hash, solventless (kief), as well as any hash oils (BHO, CO2 oil, shatter, wax, etc.) and indicates that these products are a concentrated form of cannabis, carrying a higher potency.
- **Edible.** Any adult use or medical marijuana product for which the intended use is oral consumption, including but not limited to, any type of food, drink, or pill.
- **Flower equivalent.** A measure developed specifically for this study that converts non- flower consumption or production into weight-based units of flower. This method allows regulators to properly compare supply, demand, potency, and pricing across different product types.
- **Infused product.** A product infused with marijuana that is intended for use or consumption other than by smoking, including but not limited to edible product, ointments, and tinctures.
- **Inventory tracking system.** The required seed-to-sale tracking system that tracks adult use and medical marijuana from either the seed or immature plant stage until the marijuana, marijuana concentrate, or marijuana product is sold to a customer at an adult use marijuana store or medical marijuana center.
- **Licensee or license holder.** Any individual licensed pursuant to the Colorado Retail Code or Medical Code.
- **Marijuana demand.** Marijuana demand is defined as the annual amount of marijuana sold in regulated adult use stores and medical centers expressed in weight.
- **Marijuana flower.** The flowering buds of the female marijuana plant that are harvested and cured for sale to processors, adult use stores or medical centers.
- **Marijuana supply.** The annual amount of marijuana flower and trim harvested expressed in weight (metric tons).
- **Medical marijuana.** Marijuana that is grown and sold pursuant to the Medical Code and includes seeds and immature Plants. Unless the context otherwise requires, Medical Marijuana Concentrate is considered Medical Marijuana and is included in the term.
- **Regulated marijuana.** Adult use and medical marijuana that is under the regulatory oversight of the Colorado Department of Revenue’s Marijuana Enforcement Division.
- **THC.** Delta-9-tetrahydrocannabinol, the main psychoactive compound in marijuana.
- **Trim (Shake).** After harvest, the marijuana plant is generally trimmed of its leaf matter, leaving behind only the buds. Trim refers to the leftover leaves, which can be used for making concentrates and infused products.

EXECUTIVE SUMMARY

Shortly after the legalization of adult use marijuana in Colorado in 2014, the Colorado Department of Revenue's Marijuana Enforcement Division (MED) requested an estimate of the market size, in metric tons, for marijuana for medical and adult use consumers. It was also noted that it would be helpful to revisit market size and demand over time as more official market data are collected through the state's inventory tracking system. This market update is the culmination of those efforts. It provides an updated view and assessment of Colorado's regulated marijuana markets through 2017, and it improves upon the original 2014 market study methods.

This report relies on marijuana inventory tracking data, provided by the state in accordance to the terms of an interagency agreement, and contains several new findings that provide insights into the nation's most mature regulated marijuana market. This information will be valuable as the state evaluates its early regulatory outcomes. Through careful inventory tracking, data analysis, and program evaluation, regulators can ensure a well-organized market as envisioned by voters who approved Amendment 64 in 2012.

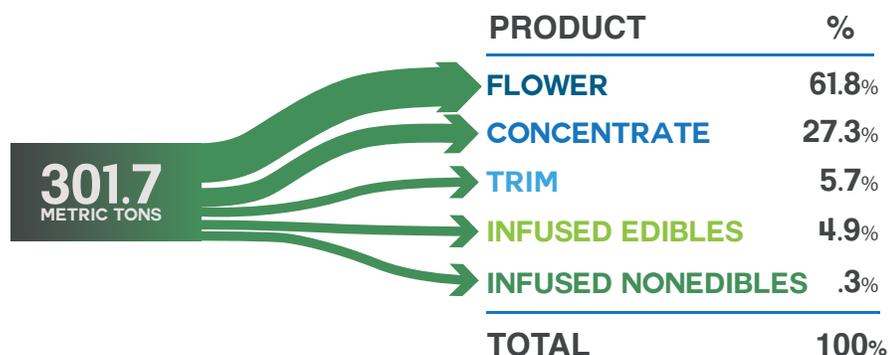
Key topics examined in the report are summarized here and presented in detail within the main report.

- Flower Equivalent Measures.** Smoking marijuana flower is still the predominant consumption method in the regulated market, but there is a clear trend toward consumption of non-flower products, such as concentrates and edibles. The study team has developed a new measure, called "Flower Equivalent", to account for non-flower consumption.

This measure converts non-flower sales or production into weight-based units of flower. This method allows regulators to properly compare supply, demand, potency, and pricing across different product types. Flower equivalent is a tool that can help regulators to establish rules, measure demand quantity, and achieve regulatory objectives going forward.

The use of a stable constant—which the flower equivalent represents—will better inform officials about adjusting tax rates, plant allocations, and other regulatory parameters. For example, plant counts or canopy size can be adjusted to account for the supply of trim, which can improve regulatory accuracy (refer to page 6-7 more information).

Colorado Marijuana Demand, 2017 Actual Sales, Metric Tons of Flower Equivalent

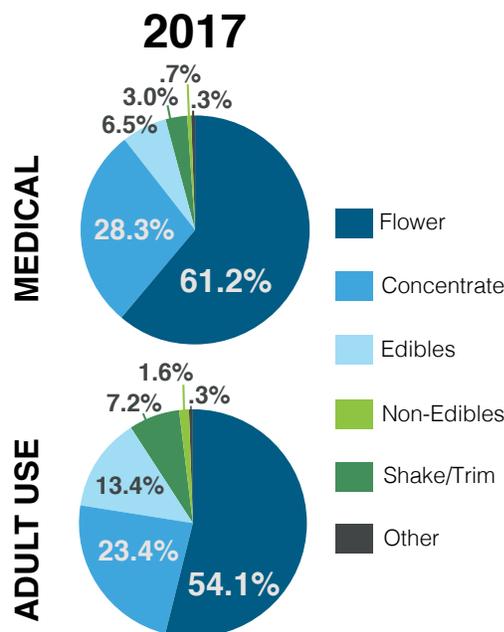


Source: Study team calculations and methods, using state sales data.

- **Improved Licensee Compliance.** The trend over the last three years shows improved licensee compliance. Total contaminated, destroyed, or seized products as a percent of total production volume over time has declined from 9.2 percent in 2015, to 2.9 percent in 2016, and down to 1.9 percent in 2017. This measure indicates broad improvement in compliance, more accurate reporting, better internal controls, better use of the inventory tracking system by state and industry, and an effective regulatory and enforcement system (refer to page 9-10 more information).

- **Market Trends.** Price trends within Colorado's adult use and medical markets continue to evolve as the marketplace matures; and as non-flower products gain market share compared to flower marijuana. Demand for flower marijuana products as a portion of overall sales has declined each year since the market opened in 2014. The study team has derived a new measure, called the "price per standard serving" of marijuana, to reflect how the price of a single serving of marijuana has declined relative to the price of each gram or unit. The price of marijuana flower is falling gradually, while the price for a "standard serving" of THC has declined more rapidly. It is unclear whether this is a long-term trend that leads to a "high THC/ low price" paradigm, or whether the market price will stabilize to suggest an equilibrium (refer to page 21-23 for more information).

Product Type Market Share by Value, 2017



Source: Study team calculations using state sales data.
 Note: "Other" sales includes immature plants, seeds and related products.

- **Geographic Variation.** Observed prices are generally above average in mountain tourist regions but are highest in regions with a limited number of adult use store locations. This indicates that retail margins are larger in markets with limited competition than in tourism-based or in high-volume markets. Per capita sales are high in regions with large numbers of annual visitors, including border regions, which indicates that visitors account for a sizable portion of sales. Denver County, which is home to 13 percent of the Colorado population, accounted for nearly 34 percent of all marijuana sales in 2017. The broader Denver Metro Area (51 percent of the state population) combined for 54.9 percent of the state marijuana sales (refer to page 24 more information).

- **Supply, Demand and Consumption.** For the purposes of this study, regulated marijuana supply is defined as the annual amount of marijuana flower and trim harvested expressed in weight (metric tons). Regulated marijuana demand is defined as the annual amount of marijuana sold in regulated adult use stores and medical centers expressed in weight. Consumption is the estimated amount of marijuana consumed by Colorado residents and tourists calculated using survey results.

In 2017, regulated cultivators in Colorado supplied 340.7 metric tons of flower equivalent to the market. Demand for regulated marijuana in 2017 is 301.7 metric tons of flower equivalent as calculated from actual sales of marijuana product. Companies held 32.6 metric tons of inventories and there was a 1.9 percent residual value. Several factors contribute to the residual value, including seizure and destruction of

marijuana; failure to meet quality assurance standards; losses in harvest, trimming and extraction processes; inventory shrinkage; and other factors. Refer to Section 2 (page 5) for a detailed discussion of supply/demand dynamics.

The study team estimates Colorado residents and tourists consumed 208.7 metric tons of flower equivalent in 2017, using standard consumption estimation techniques updated from the 2014 study.

A comparison of inventory tracking data and consumption estimates signals that Colorado's preexisting illicit marijuana market for residents and visitors has been fully absorbed into the regulated market. The 2017 results also highlight an evolution from the last study, conducted in 2014. In 2014, the study team estimated that the regulated market would capture about 65 percent of resident and tourist consumption.

For 2017, the results also suggest there is additional demand for Colorado marijuana that is not captured in standard resident and tourist consumption estimation techniques. This discrepancy between demand and consumption estimates can be caused by several factors including: at-home consumer inventory; legal in-state purchases that are consumed out of state; demand from the under-21 population; under-estimated demand or waste by visitors; and the inclusion of edible and concentrate products that were not fully considered in federal surveys. A full discussion of these factors is included in Section 2.

It is not surprising to observe a variance between supply, demand and consumption figures, because this is the first full-scale study to use official sales data that captures all product types and converts them to flower equivalent units, thus enabling comparison of total supply, demand and estimated consumption by residents and visitors. Stakeholders may wish to monitor these supply, demand and consumption factors going forward and to establish benchmarks or standards. Such benchmarking allows regulators, stakeholders, and policymakers to compare outcomes over time, and between different states. Colorado offers valuable insights as the most mature and evolved legal market in the U.S.

- **Plant Allocations and Utilization.** The authorized medical marijuana plant allocation in Colorado is driven by patients' physician recommendations regarding consumption amounts. The authorized adult use marijuana plant allocation is controlled through state issued licenses that determine the maximum plant count in a tiered system. At the end of 2017, medical marijuana cultivators were growing 322,800 plants, while permitted to grow up to 555,000 plants—an average utilization of 58 percent. In the adult use market, cultivators were growing 675,005 plants at the end of 2017, while permitted to grow up to 1,985,400—an average utilization of 34 percent. This suggests a saturated market, where producers are adjusting production to pricing and consumer demand (refer to page 29 more information).
- **Market Competitiveness and Consolidation.** An emerging topic of interest is the consolidation of cannabis companies in the United States and worldwide. To assess the degree of market concentration in Colorado, the study team applied economic measures of consolidation to Colorado's regulated marijuana market, and then compared those indicators to other markets. The study team found that while there exists some consolidation, the marijuana market is relatively more competitive (i.e., has more corporate entities vying to capture the same market share) than other markets such as beverages, food products, jewelry, and tobacco. Further consolidation may occur, but the economic and market implications related to this pattern remain to be seen (refer to page 32 more information).

The report is organized in four sections: 1. Overview; 2. Supply, Demand and Consumption; 3. Regulated Market Trends; and 4. Emerging Topics. The report also includes appendices that provide detail on resident and tourist consumption estimation and on market dynamics from 2016.