

# 2019 Regulated Marijuana Market Update

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# PROJECT BACKGROUND

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## Overview

The Colorado Department of Revenue's Marijuana Enforcement Division (MED) occasionally commissions technical studies to highlight key aspects of the state's regulated market. The MED provides this information to improve market transparency and to inform policy makers about the status of Colorado's marketplace.

The report provides several key metrics to the MED and the public and highlights the use of the state marijuana tracking system (METRC) to evaluate regulatory performance. This report is part of the state's continuous efforts to monitor and improve a comprehensive marijuana regulatory framework.

This report is the third edition of Market Size and Demand for Marijuana in Colorado that was originally published in 2014. This edition provides data through year-end 2019 and digs deeper in the capability of the inventory tracking system to provide more detailed information on trade flows, purchase-level trends, supply patterns and many other market characteristics.

Whereas the last edition focused on supply/demand characteristics, this edition provides focus on market trends, product types and intra-state product flow. This edition still provides new views into the maturing legal marketplace from a systemwide to a licensee perspective for the now 7-year-old Colorado legal marijuana market.

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### Key Market Changes: 2017-2019

- **2017:** Combined state retail sales tax rates for adult use marijuana increase from 12.9% to 15%.
- **2017:** New medical condition: PTSD
- **2018:** New courier/transport license
- **2018:** Own-source (vertical) products requirement eliminated
- **2019:** New medical conditions: autism and any condition treated with opiates
- **2019:** New hospitality establishment & delivery license types (effective beginning 2020)
- **2019:** Public companies and nonresidents allowed to own Colorado marijuana companies

# SUMMARY

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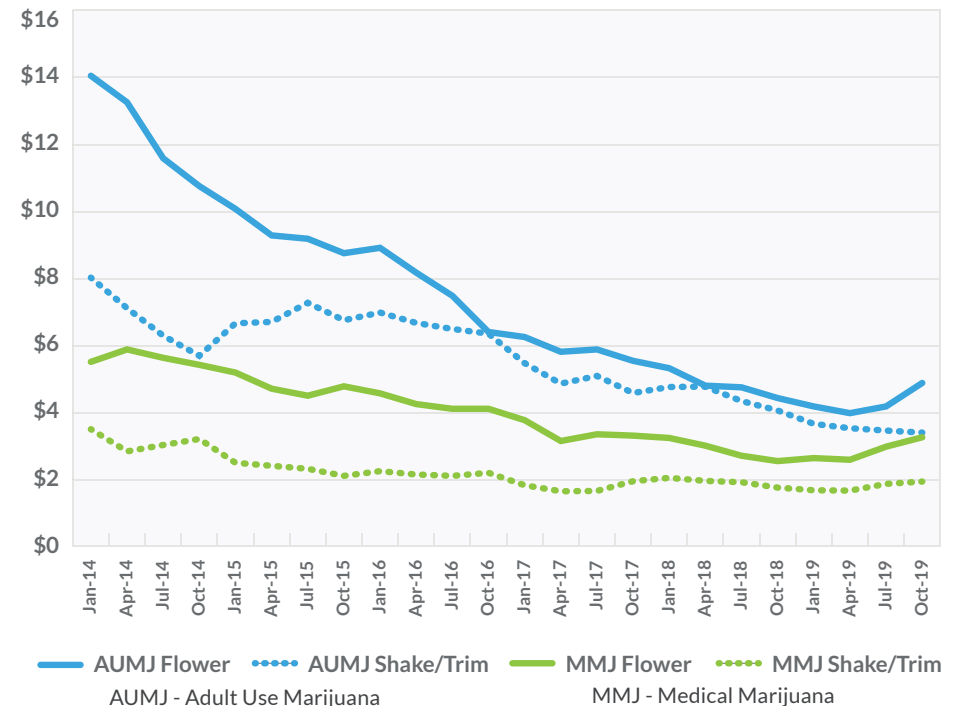
# SUMMARY

This report provides an updated view and assessment of Colorado's regulated marijuana markets through 2019, including new detail on several aspects of the adult use and medical marijuana markets (AUMJ and MMJ, respectively). This report relies on marijuana inventory tracking data, provided by the state in accordance to the terms of an interagency agreement, and contains continued coverage that provide insights into the nation's most mature regulated marijuana market. This information will be valuable as the state continuously evaluates its regulatory outcomes. Inventory tracking, data analysis, and program evaluation are tools regulators can use to promote a well-organized, safe and efficient market.

## Key themes examined in the report are summarized here:

- **The regulated market is nearing maturity now.** Several observations indicate the market is past its introductory and rapid growth phases and nearing maturity. These include current price trends, supply patterns and consolidation.
  1. **Pricing:** Since the regulated adult use market opened in 2014, market-wide prices weighted for transaction size were continuously falling. In spring 2019, average pricing dropped to its lowest point (~\$4 per gram of Flower), and then increased for the first time, settling at \$4.50 at the end of the year. Concentrate prices hit a similar floor in 2019. This indicates a market finding an equilibrium price that incorporates production costs and margin with demand and competitive factors as observed in mature consumer products markets.

## AVERAGE PRICE PER GRAM OF FLOWER & SHAKE/TRIM



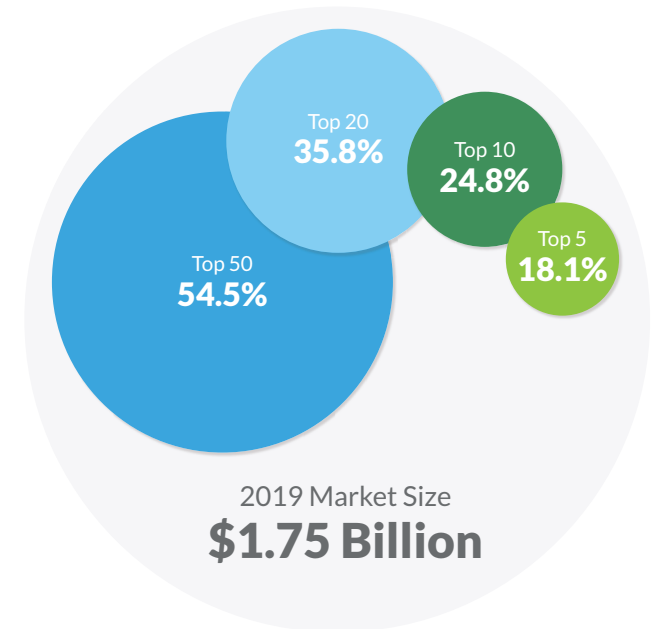
2. **Supply patterns:** Supply and cultivation volume are showing steady patterns throughout the year and slowing growth overall. Seasonal patterns are emerging strongly that show the increasing significance of the outdoor growing sector, which provides lower-cost wholesale marijuana to infused product manufacturers. Plant counts swell by about 25-30%, or about 200,000 plants, each year between May and November, Colorado's outdoor growing season. Utilization rates, however, have remained relatively constant at about 38%-40%, aside from the predictable seasonal increase.

## SUMMARY

This is an indication that the market is not artificially constrained by regulatory limits—the constraints are market-based or frictional, e.g., lack of appropriate sites, capital constraints.

- 3. Consolidation:** As of 2019, the top 5 firms accounted for 18% of sales, which is a 4-point increase from 2017. Consolidation is another indicator the industry is past its initial growth phase, as companies seek to cut down on costs; achieve more efficient operations; or to make a company more attractive to investors. The regulated marijuana market is still not as consolidated as other industries (see page 32) and will likely consolidate further as a result of allowing ownership of Colorado marijuana sales and production licenses by non-residents and public corporations.
- **A larger and more compliant market.** The trend over the last three years shows improved licensee compliance. The total residual product that is not accounted for in sales or inventory as a percent of total production volume over time has declined from 6.7 percent in 2016 to 3.2 percent in 2019. The residual figure includes product destroyed for failed testing, seized by state and local agencies, drying weight, diverted product, and losses during various production processes as well as a number of other factors. This measure indicates continued 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. The gains in compliance are notable when considering overall supply increased over the same period.
  - **Price and sales quantity trends.** Since 2014, prices for almost all regulated marijuana products have continued to decline due to improvements in production efficiencies and competition. In 2019, we observed the first indications that prices may be reaching a floor, possibly related to sustainable profit margins and the limits of technology or efficiency. Despite these low prices, total sales have continued to increase substantially year over year. This pattern is the result of significant increases in product sales that have outpaced the price declines. Concentrates, for example, have decreased in price by 60 percent since 2014, while their sales volume has increased by 7.6 times over the same period. Other product categories follow similar but less drastic trends.

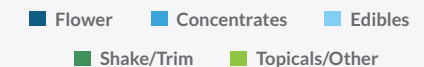
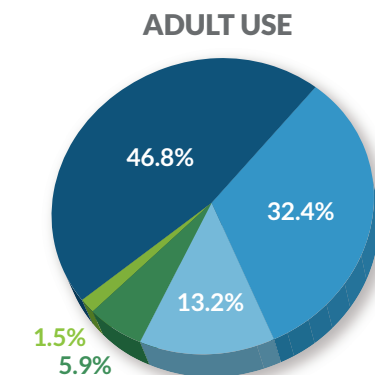
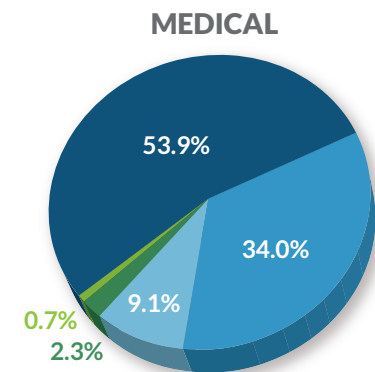
### MARKET SHARE BY ENTITY



## SUMMARY

- Adult use marijuana sales are still increasing, medical sales, not so much.** In 2018, total marijuana sales were \$1.55 billion, up from \$1.51 billion the previous year – a growth of just 2.5 percent. Sales increased again in 2019, to \$1.75 billion—growth of 13.1 percent over last year. Although still significant, adult use sales growth is slowing compared to the early years. The adult use market experienced growth of 90.5 percent and 49.2 percent growth in the first two years, respectively. A closer look shows that adult use sales grew by 11.2 percent between 2017 and 2018 and medical sales declined by 20 percent. Last year adult use sales grew by 16 percent, and medical sales grew by just 1.9 percent. This trend shows that the medical market in Colorado has reached its end-stage, where sales will likely stay stagnant and decline. Adult use market pricing is falling closer to medical market pricing (see page 16), and while key differences in edible products and purchase quantities remain, it is now clear that the adult use market has cannibalized the medical market for growth (see page 15).
- Shifting demand to Concentrates continues.** While smoking marijuana Flower is still the most common consumption method, it has steadily lost market share to marijuana Concentrates. Adult use marijuana Flower and Shake/Trim lost 17.5 points of market share by value between 2014 and 2019—medical Flower and Shake/Trim lost 20.9 points of market share over the same period. Concentrates market share has increased the most between 2014 and 2019 – increasing from 11.4 percent market share to 32.4 percent in the adult use market and from 14.0 percent to 34.0 percent in the medical market by sales value. Adult use Edibles and other infused products market share has also declined between 2014 and 2019, although more modestly, from 18.2 percent to 14.7 percent. Looking ahead, it is likely that Concentrates will continue to gain market share from Flower, which will likely influence the production patterns of both cultivators and manufacturers. Flower sold for direct consumption tends to be the highest-quality portions of the plant, while Concentrates are often made with lower quality Flower and Shake/Trim. As demand for Concentrates increases, an increasing supply of high-quality Flower may be diverted to manufacturers, or there may be an increase in cultivation space allocated for outdoor or with specific characteristics targeted to extractors.

### PRODUCT MIX 2019





## SUMMARY

- **Transaction analysis reveals new trends.** The inventory data now groups sales items by transaction, allowing purchase level analysis. In general, medical marijuana patients have larger and more valuable transactions, although they account for about 19% of overall market transaction value. The statewide average adult use marijuana transaction is \$51.89 and medical marijuana transaction is about double that amount—\$97.92. On average, adult use customers purchased 2.16 items per visit in 2019 compared to 2.88 for medical patients. The transaction analysis also includes a basket-of-goods module and a county/regional average transaction analysis, which shows significant variation between counties. In the basket of goods analysis, the transactions indicate that 54.3% of all adult use marijuana purchases include Flower, and 28.0% of adult use purchases that include Flower also include a concentrate product (see pages 28-32).
  - **Average potency continues a steady increase.** THC content has typically shown moderate increases over time as growers become more skilled at producing high-THC Flower, manufacturers become more efficient at extracting THC, and perhaps because the market demands higher THC products. On average, Flower tested at around 19% THC content, and Concentrates around 69% in 2019. A more detailed look at product types shows that concentrate average potency ranges from 65% to 74% THC among the different products. Flower, Shake/Trim and pre-rolled joints all average between 18.5% and 19.0% THC. In 2014, Flower averaged about 14% THC and Concentrates averaged 46.4 percent.
  - **Price per dose is decreasing.** When considering potency it is important to also consider price, and price per standard dose<sup>1</sup> of THC. Adult use marijuana Flower and Concentrates cost about \$1.35 per dose, while Edibles are notably more expensive at \$2 per dose. Price per THC dose has declined significantly since 2014, when it was \$4.12 for adult use Flower and \$5.68 for adult use Concentrates. These patterns illustrate the combined effects of increasing potency and decreasing prices, making it increasingly cheaper over time to achieve intoxication with regulated marijuana.
  - **Consumption is increasing in Colorado adults.** Colorado continues to be among the national leaders in adult marijuana consumption according to federal survey data. In 2019, about 18.5% of Colorado residents age 21 and over consumed marijuana in the past month, compared to the national average of 9.6%. Colorado past-month marijuana use is up from 16.6% in 2017. Colorado has a much higher share of “heavy” marijuana consumers compared to the national average. An estimated 4.4% of Colorado’s population uses marijuana 26 or more days per month, compared to 2.9% nationwide.
- The report is organized in three main sections:  
**1. Market Trends; 2. Market Structure;**  
and **3. Supply, Demand & Consumption.** The report also includes an appendix that provide detail on resident and tourist consumption estimation.

1. MPG identified an average single dose as 57.1mg of inhaled THC, or 10mg of ingested THC in the [2015 Equivalency Study](#).

## Definitions (PART 1)

### Adult Use Marijuana (AUMJ)

Marijuana that is grown and sold for adult use pursuant to the Retail Code and includes seeds and immature Plants. Unless the context otherwise specifies, Concentrates and Infused products are considered adult use marijuana and included in the term. The terms “retail” and “recreational” were often used in this context previously. The acronym AUMJ is used for adult use marijuana throughout the report.

### Concentrate

Refers to any product which extracts cannabinoids and other compounds into a resinous material. 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 marijuana, 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 based on relative THC content. This method allows regulators to properly compare supply, demand, potency, and pricing across different product types.

### Herfindahl-Hirschman Index (HHI)

A well-known indicator of market concentration (or consolidation), using values between 0 and 10,000. A value below 100 indicates that there are numerous competitors with no dominant operators and a value of 10,000 indicates that the market is organized as a pure monopoly, where one company accounts for 100% of sales. The HHI is calculated by taking the market share of each firm in an industry, squaring them, and summing the result.

### 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 or medical marijuana store.

### Licensee or License Holder

Any individual licensed pursuant to the Colorado Marijuana Code (previously Retail Code or Medical Code).

## Definitions (PART 2)

### **Marijuana Demand**

Marijuana demand is defined as the annual amount of marijuana sold in regulated adult use and medical stores expressed in weight.

### **Marijuana Flower**

The Flowering buds of the female marijuana plant that are harvested and cured for sale to manufacturers, adult use or medical stores.

### **Marijuana Supply**

The annual amount of marijuana Flower and Shake/Trim harvested expressed in weight (metric tons).

### **Medical Marijuana (MMJ)**

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. The acronym MMJ is used for medical marijuana throughout the report.

### **Regulated Marijuana**

Adult use and medical marijuana that is under the regulatory oversight of the Colorado Department of Revenue's Marijuana Enforcement Division.

### **Shake/Trim**

After harvest, the marijuana plant is generally trimmed of its leaf matter, leaving behind only the buds. Shake/Trim refers to the leftover leaves, which can be used for making Concentrates and Infused products.

### **THC**

Delta-9-tetrahydrocannabinol, the main psychoactive compound in marijuana.

## 2018-2019 Inventory Tracking System Data Description

### Licensees

The licensee data includes 3,877 observations. Attributes include license number, license type, licensee name, city, and zip.

### Harvest

The harvest data includes 195,722 observations for 2018 and 155,209 observations for 2019. Attributes include harvest ID, name, drying location, current weight, waste weight, wet weight, packaged weight, plant count, and harvest date.

### Plants

The plant data includes 1,330,874 observations for 2018 and 1,512,079 for 2019. Attributes include license number, licensee, immature plant count, vegetative plant count, flowering plant count, harvested plant count, and destroyed plant count.

### Plant Allocations

The plant allocation data includes 1,390 observations. Attributes include license number, licensee, tier, and allocated plants.

### Transfers

The shipment/transfer data includes 3,026,381 observations for 2017, 3,406,716 for 2018, and 3,828,543 for 2019. Attributes include the shipper facility license number and name, recipient facility license number and name, shipment type, product and product category name, and the shipped and received quantity.

### Testing

The testing data includes 8,059,500 observations covering marijuana testing data from 2014 through 2019. Attributes include the origin facility type and Id, retail indicator, package Id, package label, product category, testing facility type and Id, testing facility name and license number, test type, and test result.

### Sales

The sales data includes approximately \$1.55 billion in marijuana sales representing 43,524,912 transactions in 2018, and \$1.75 billion in marijuana sales representing 65,960,024 transactions in 2019. Transaction attributes include license number, adult use/medical, geographic location, transaction ID, package label, product category, total price and quantity sold.

# MARKET TRENDS

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## Introduction

This section contains detailed depictions of trends and patterns in both the adult use and medical marijuana markets (AUMJ and MMJ, respectively). Over time, the regulated market has evolved in prices and potency, while the characteristics of local marijuana markets within Colorado vary greatly. The analysis relies on marijuana inventory tracking data provided by MED and contains several new findings that provide insights into the nation's most mature regulated marijuana market. The analysis focuses on market-wide price and potency trends, product mix and a transaction-level analysis. Several key findings emerge from these analyses and are summarized below:

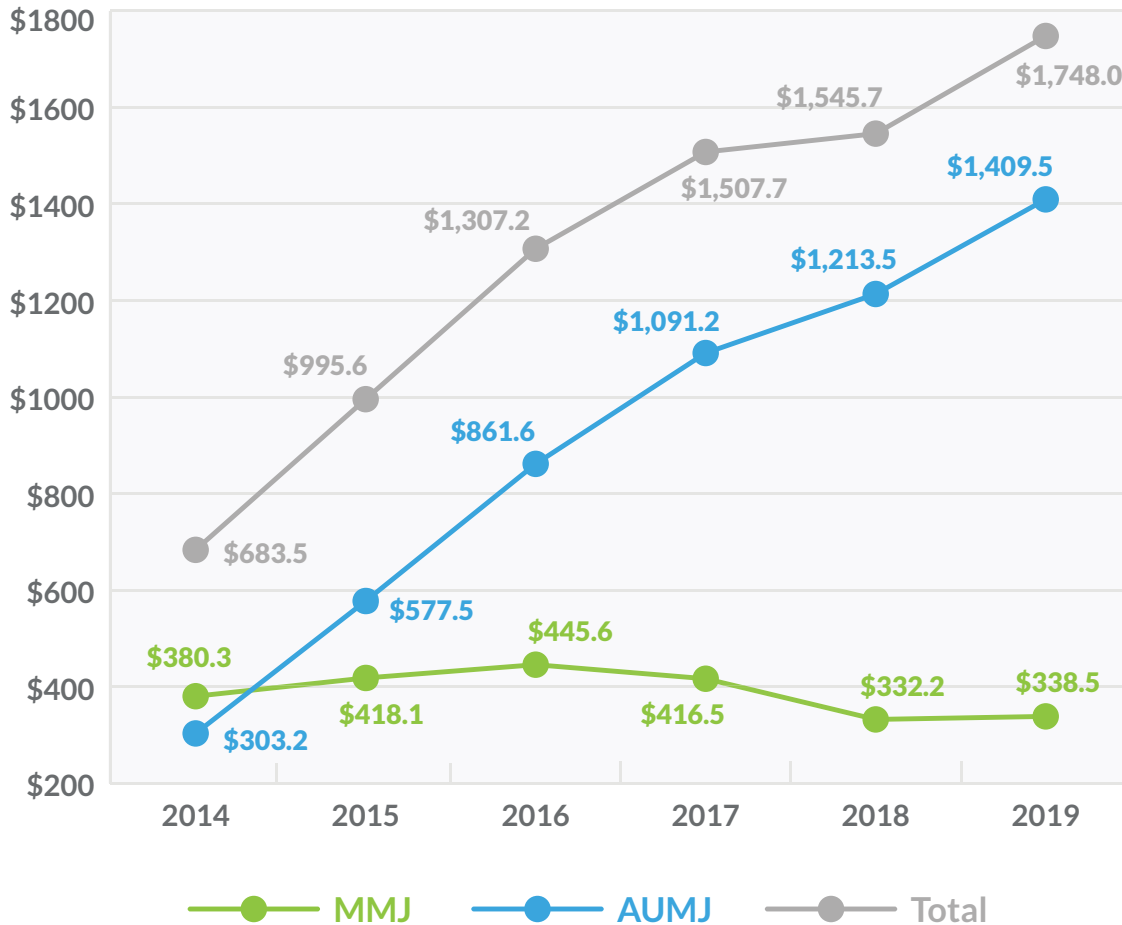
**1. Maturity, price and potency.** AUMJ prices appear to have reached a price floor in 2019 after declining consistently from 2014 through spring 2019, average annual AUMJ Flower prices fell 62.0 percent, from \$14.05 to \$5.34 per gram weighted average. Over the same period, AUMJ Concentrate prices fell 47.9 percent, from \$41.43 to \$21.57 per gram. In 2019, prices remained more constant across all product types in the AUMJ and MMJ markets, indicating market maturity. Over the same period, average Flower and Concentrate

product potency is steadily rising producing a consistent decrease in the price per THC dose (see page 17). The low price per dose is an indication of increasing production efficiency and competition but also poses new challenges as cheap intoxicants often pose a higher risk for abuse and dependency in other substances.<sup>2</sup>

- 2. Product mix evolution.** The shift in sales from Flower, and to a lesser extent Edibles, to Concentrates continues in the AUMJ and MMJ markets. Smoking Flower is still the most common form of consumption, at about 50 percent of sales by value, however AUMJ Flower and Shake/Trim lost 17.5 points of market share by value between 2014 and 2019—MMJ Flower and Shake/Trim lost 20.9 points of market share over the same period. Concentrate purchases includes vaporizer cartridges and other marijuana extracts typically sold by the gram.
- 3. A look into transactions.** Transaction-level data allows analysis of average purchase amount/value, basket of goods detail and complementary products. The statewide average AUMJ transaction is \$51.89. The average MMJ transaction is about double that amount—\$97.92. The basket of goods analysis shows that about 75 percent of AUMJ transactions include only one product type and about half of those single type purchases is for Flower only. More analysis is on pages 28-32.

2. <https://www.drugabuse.gov/publications/research-reports/prescription-opioids-heroin/heroin-use-driven-by-its-low-cost-high-availability>

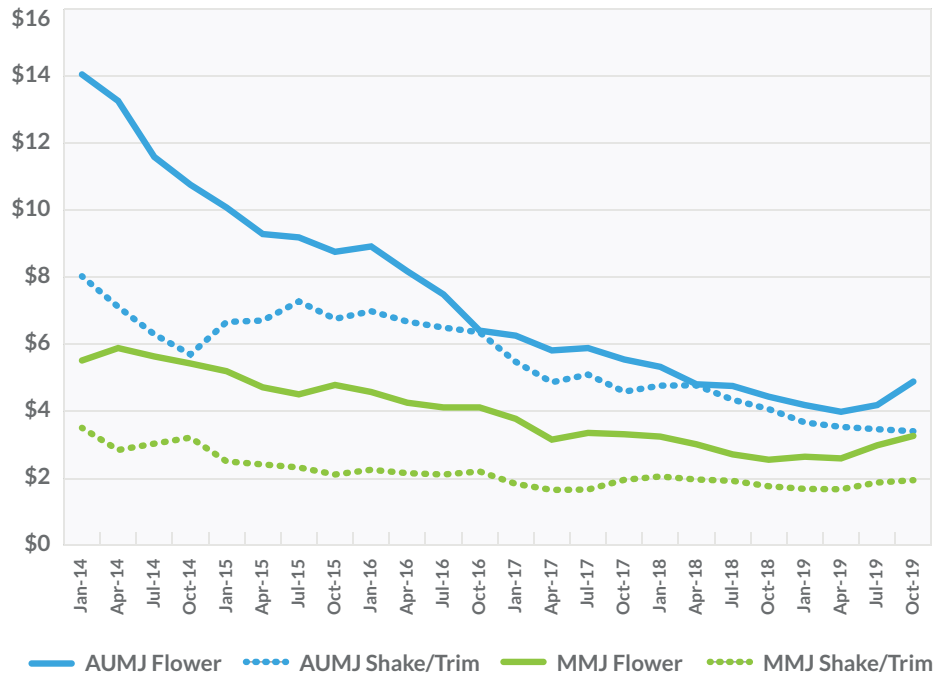
## Annual Sales Colorado Regulated Marijuana 2014-2020



- Total regulated marijuana sales have grown steadily year-over-year since 2014, reaching a record total of \$1.75 billion in 2019. On average, total sales have increased 17 percent annually since 2016.
- Growth has been driven entirely by the AUMJ market, which has increased from less than half the total market in 2014 at \$303 million, to over 80 percent in 2019 at \$1.41 billion. In the same period, MMJ sales slightly increased from \$380 to \$446 million, but then shrunk back to \$339 million, or less than 20 percent of the overall market.
- Based on these trends, it is likely that some of the demand has transitioned from the MMJ market into the AUMJ market despite modestly higher AUMJ prices, perhaps as patients seek to avoid the hassle or costs of registration, and as cross-market prices have more parity. There are more AUMJ stores across the state, so accessibility also plays an important role in growth.
- AUMJ and MMJ prices have declined over the same period, signifying a steadily growing demand that has outpaced price declines in the AUMJ market, and largely kept pace in the MMJ market.

# MARKET TRENDS

## AVERAGE PRICE PER GRAM OF FLOWER & SHAKE/TRIM



## AVERAGE 2019 PRICE PER GRAM OF FLOWER & SHAKE/TRIM

Product	AUMJ	MMJ
Flower	\$4.53	\$2.86
Shake/Trim (g)	\$3.81	\$1.86
Pre-Rolled Joint (each)	\$10.49	\$6.04

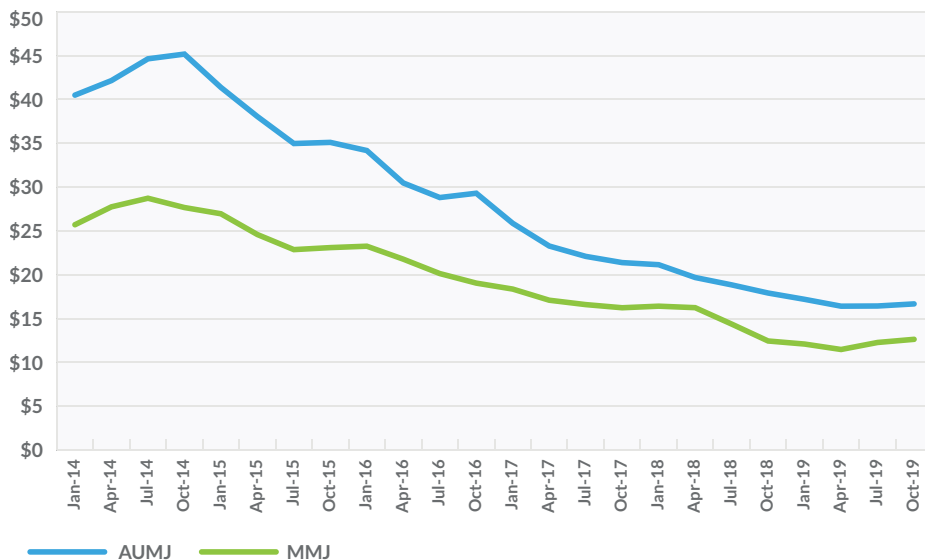
- Prices for Flower and Shake/Trim declined steadily over the last five years, likely driven by increased competition & productivity among Cultivators.
- AUMJ customers paid \$4.53 per gram of Flower and \$10.49 per pre-rolled joint in 2019, compared to \$2.86 and \$6.04 in the MMJ market.
- The higher cost compared to Flower and Shake/Trim accounts for additional materials (papers, filters) & labor needed to produce joints.
- A common joint typically contains 0.75g to 1.0g of Flower or Shake/Trim, however some can also include THC crystals (kief), wax, or oil as additives to increase potency and/or flavor.

- From 2014 to 2019, the weighted average price of a gram of AUMJ Flower declined from \$10.96 to \$4.53, an average 16.0 percent year-over-year decrease. MMJ Flower prices declined similarly from \$5.44 to \$2.86, an average of 11.8 percent per year. Shake/Trim has consistently been priced slightly lower than Flower and demonstrated a downward trend, although with more variability, as it is produced and purchased as a by-product of Flower production.
- In Fall 2019, both MMJ and AUMJ prices for Flower flattened out and then ticked upwards at the end of the year. This could suggest that demand is plateauing; the market is reaching saturation; and competition has driven profit margins down to minimum sustainable levels.



# MARKET TRENDS

## AVERAGE PRICE PER GRAM OF CONCENTRATES

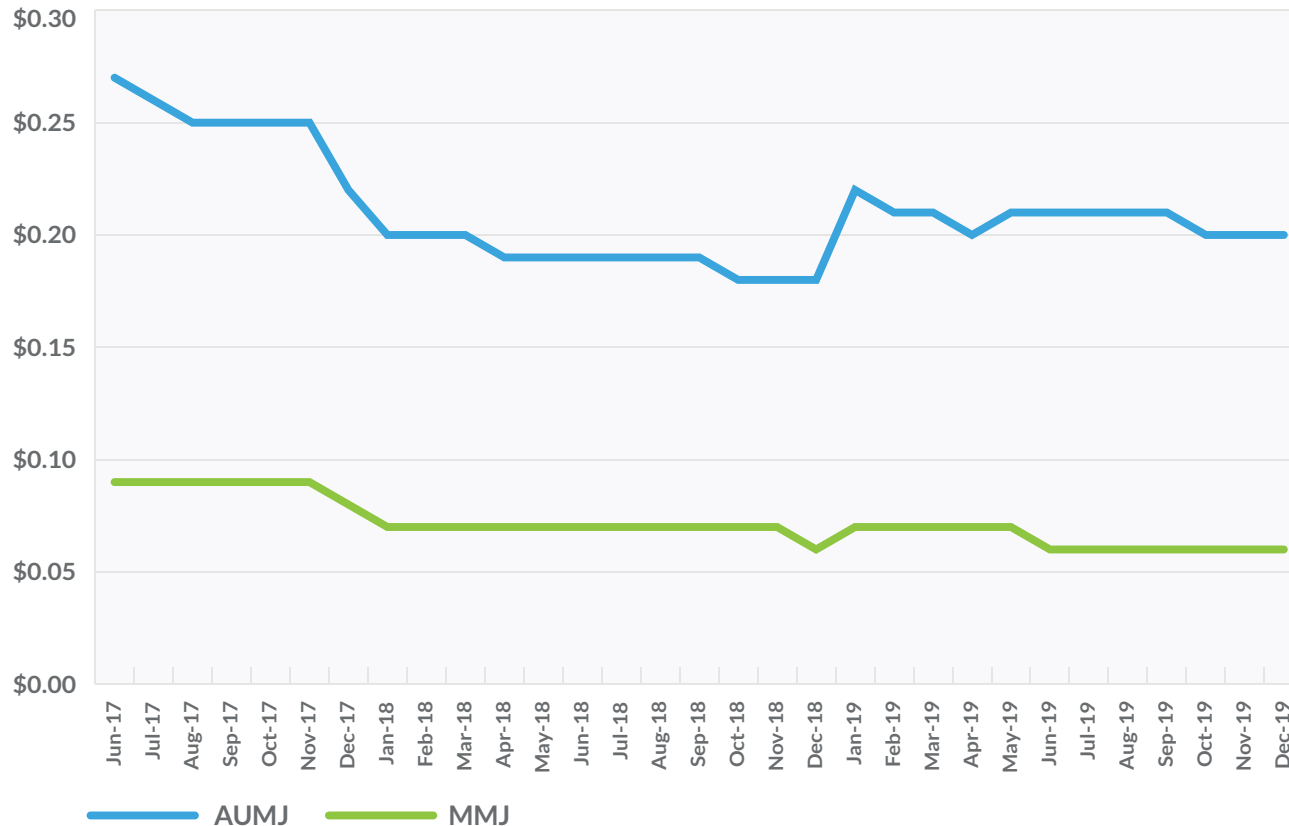


## AVERAGE 2019 PRICE PER GRAM OF CONCENTRATE, BY TYPE

Product	AUMJ	MMJ
<b>Concentrates (g)</b>	<b>\$17.06</b>	<b>\$12.40</b>
500mg Vaporizer Cartridge (each)	\$26.02	\$16.47
Oil (g)	\$24.19	\$18.39
Resin (g)	\$22.21	\$16.57
Hash (g)	\$17.26	\$12.37
Sugar (g)	\$15.16	\$11.28
Wax (g)	\$15.15	\$11.62
Shatter (g)	\$14.54	\$10.78

- Concentrates have followed a decreasing price trend like Flower, declining from \$45.61 per AUMJ gram in 2014 to \$17.06 in 2019, an annual average decline of 17.7 percent. MMJ Concentrates decreased from \$27.89 to \$12.40 over the same period, for an annual average decrease of 14.9 percent.
- The most expensive form of Concentrates is pre-filled vaporizer Cartridges, commonly sold in 500mg units. These are more expensive because they include the cartridge, which is comprised of a glass chamber, metal casing, and electrical heating element, and require additional processing time and expense to fill the cartridges.
- Other Concentrate types can be grouped into the more expensive Oil, Resin, and Hash, and less expensive Sugar, Wax, Butter, and Shatter.

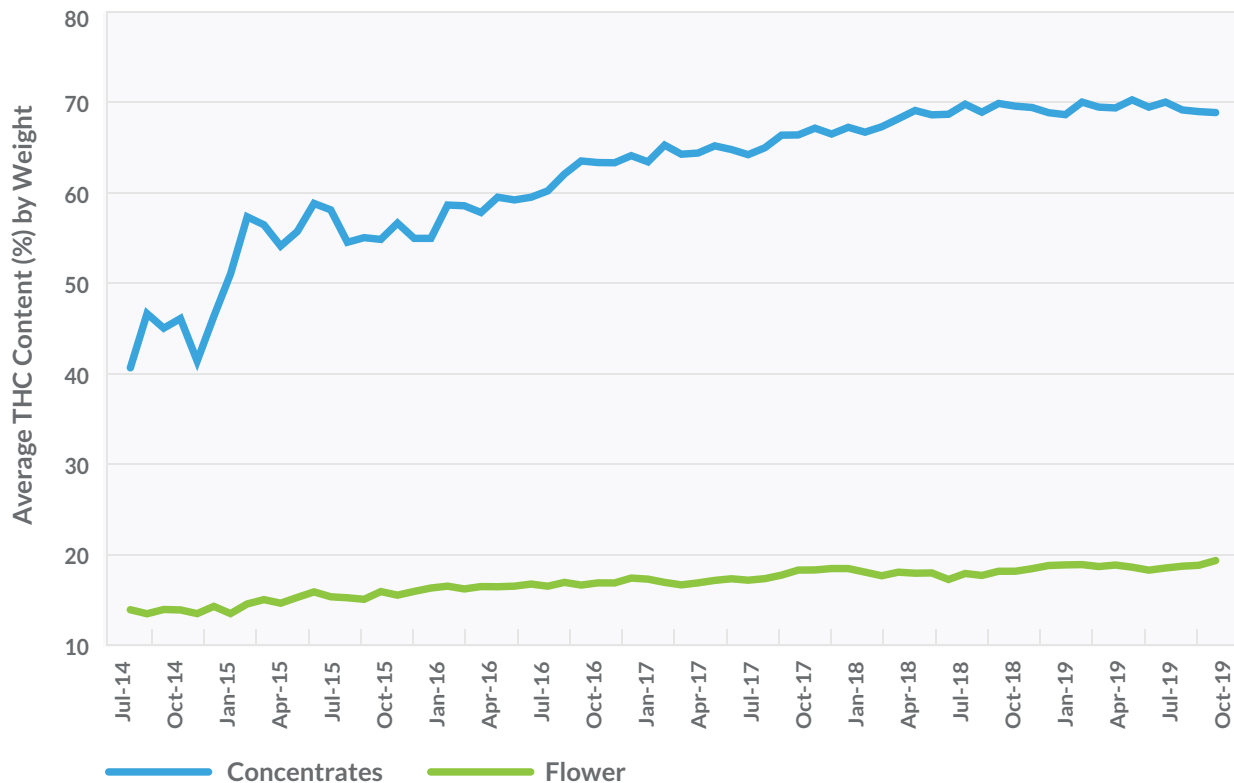
## Average Price per Milligram of Edible THC



- Edibles are sold in several different serving sizes, with the most common products containing 10mg or 100mg of THC in the AUMJ market.
- This chart shows the weighted average price per milligram of THC for all Edible package sizes in the AUMJ and MMJ markets.
- In 2019, AUMJ Edibles would cost \$2 for 10mg or \$20 for 100mg, compared to \$0.60 and \$6 for MMJ Edibles of the same size.
- Edible THC prices have steadily trended downward since 2017, with a notable dip in prices between November 2017 and December 2018.
- In January 2018, there was a pronounced drop in both AUMJ and MMJ Edibles per-milligram prices that coincides with a change in packaging and labeling rules.

# MARKET TRENDS

## AVERAGE THC CONTENT (%) PER GRAM OF FLOWER & CONCENTRATE

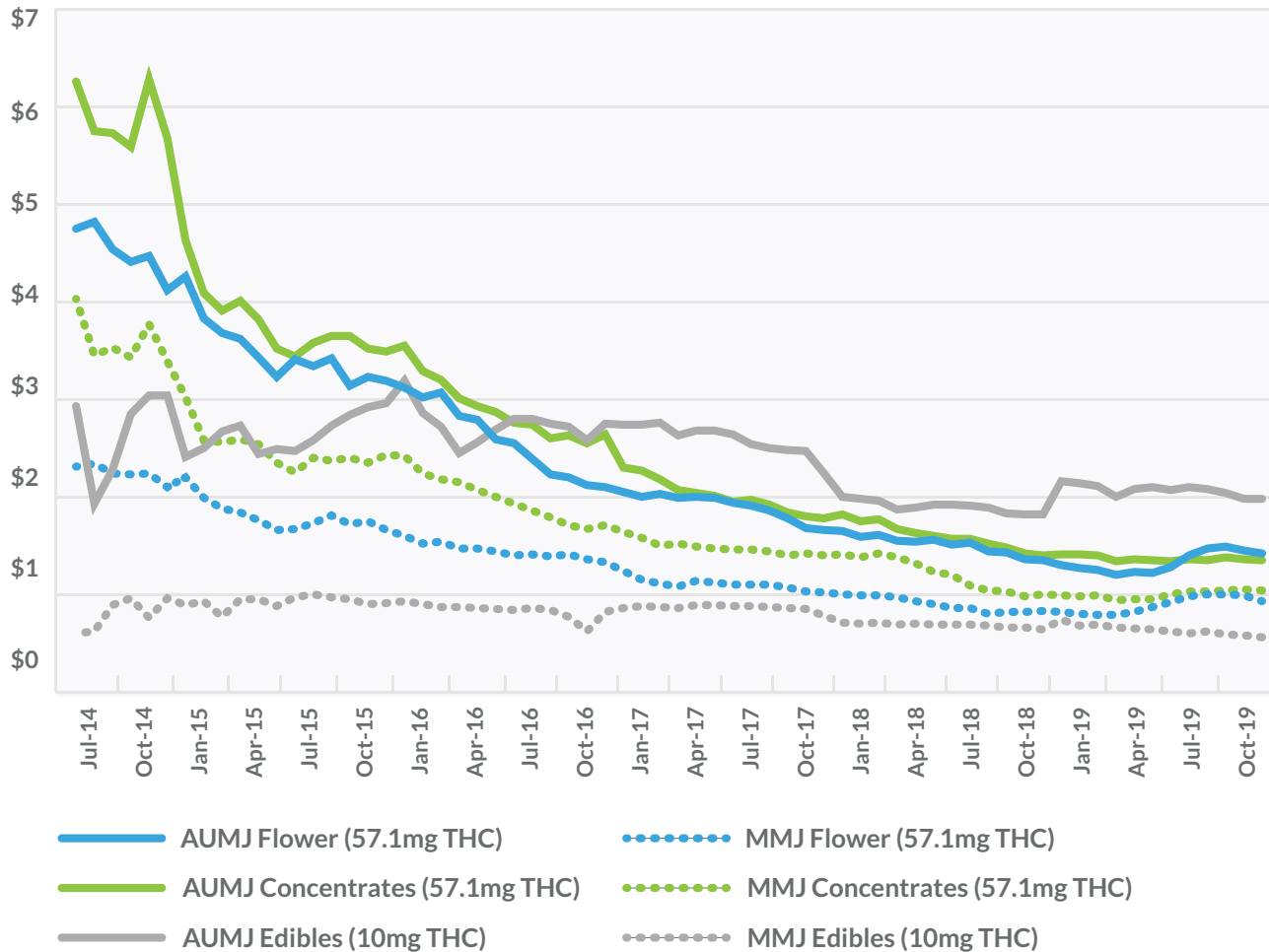


## 2019 AVERAGE THC CONTENT (%), BY PRODUCT

Product	Avg THC %
Flower (g)	18.8%
Shake/Trim (g)	18.5%
Pre-Rolled Joint (each)	18.8%
Concentrates (g)	69.4%
Sugar (g)	73.5%
Hash (g)	71.2%
Resin (g)	70.0%
Butter (g)	69.9%
Wax (g)	69.6%
500mg Cartridge (each)	69.1%
Shatter (g)	66.7%
Oil (g)	65.3%

- THC content has typically shown moderate increases over time as growers become more skilled at producing high-THC Flower, manufacturers become more efficient at extracting THC, and perhaps because the market continually demands higher THC products.
- On average in 2019, Flower tested at 18.8 percent THC content, Shake/Trim at 18.5 percent, and Concentrates at 69.4 percent.
- The average THC content for each sub-category of Concentrates are shown in the Table above, with marginal variability among Concentrate types.

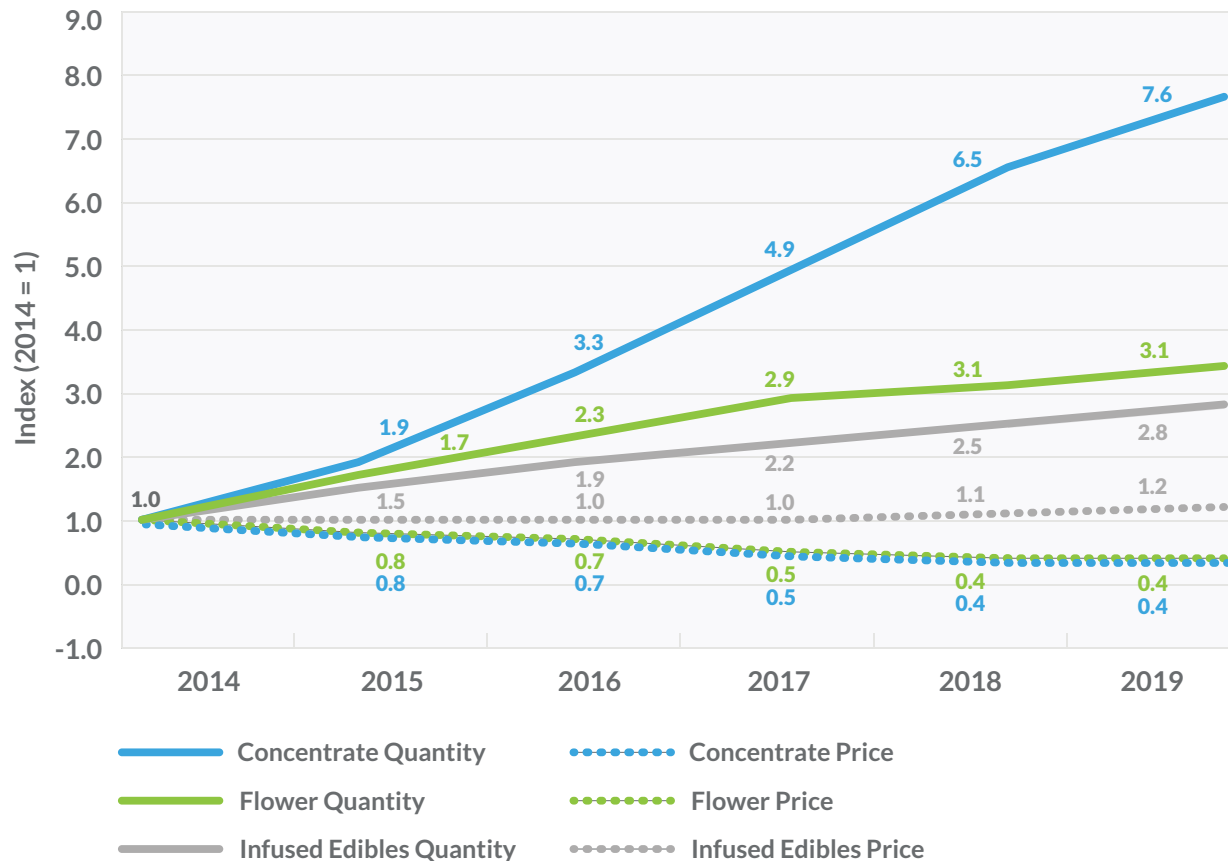
## Average Price per THC Dose, by Product



- Previous work in the Equivalency Study<sup>1</sup> has identified an average single dose as 57.1mg of inhaled THC, or 10mg of ingested THC. The chart above illustrates the cost of a single use dose for Flower, Concentrates, and Edibles in both markets.
- MMJ products provide the best value per dose, at around \$1 for Flower and Concentrates, and only \$0.20 per dose for Edibles.
- AUMJ Flower and Concentrates cost about \$1.35 per dose, while Edibles are notably more expensive at \$2 per dose.
- These patterns illustrate the combined effects of increasing potency and decreasing prices, making it increasingly cheaper over time to achieve intoxication with regulated marijuana.

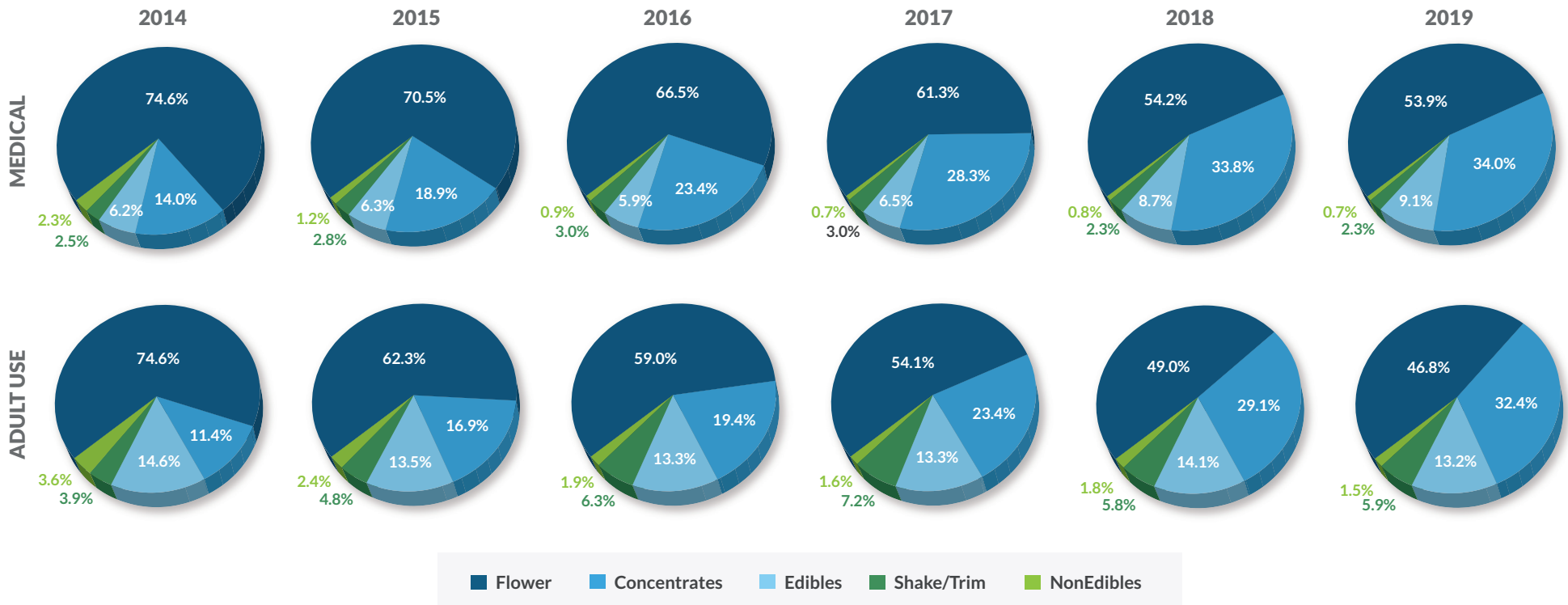
1. MPG identified an average single dose as 57.1mg of inhaled THC, or 10mg of ingested THC in the [2015 Equivalency Study](#).

## Sales Versus Price Trends, 2014-2019



- Despite the declining prices illustrated in the report, total regulated marijuana sales continue to increase year over year. This pattern is a result of product sales that have increased faster than the pace of price decline.
- This figure illustrates the relative growth in product sales volumes, compared to their respective price declines.
- Each quantity data point represents the amount sold each year, relative to the amount sold in 2014. For example, in 2015 there were 1.9 times more Concentrates sold than in 2014, 1.7 times more Flower, etc.
- The price data points similarly represent prices in a given year, relative to their price in 2014. For example, Concentrates and Flower cost 20 percent less in 2015 than in 2014.
- As this chart indicates, the growth in total sales volume for all products has significantly outpaced their respective price declines. Concentrate sales, for example, have increased by 7.6 times since 2014, while prices have declined by 60 percent.

## Product Shares, by Annual Sales (PART 1)

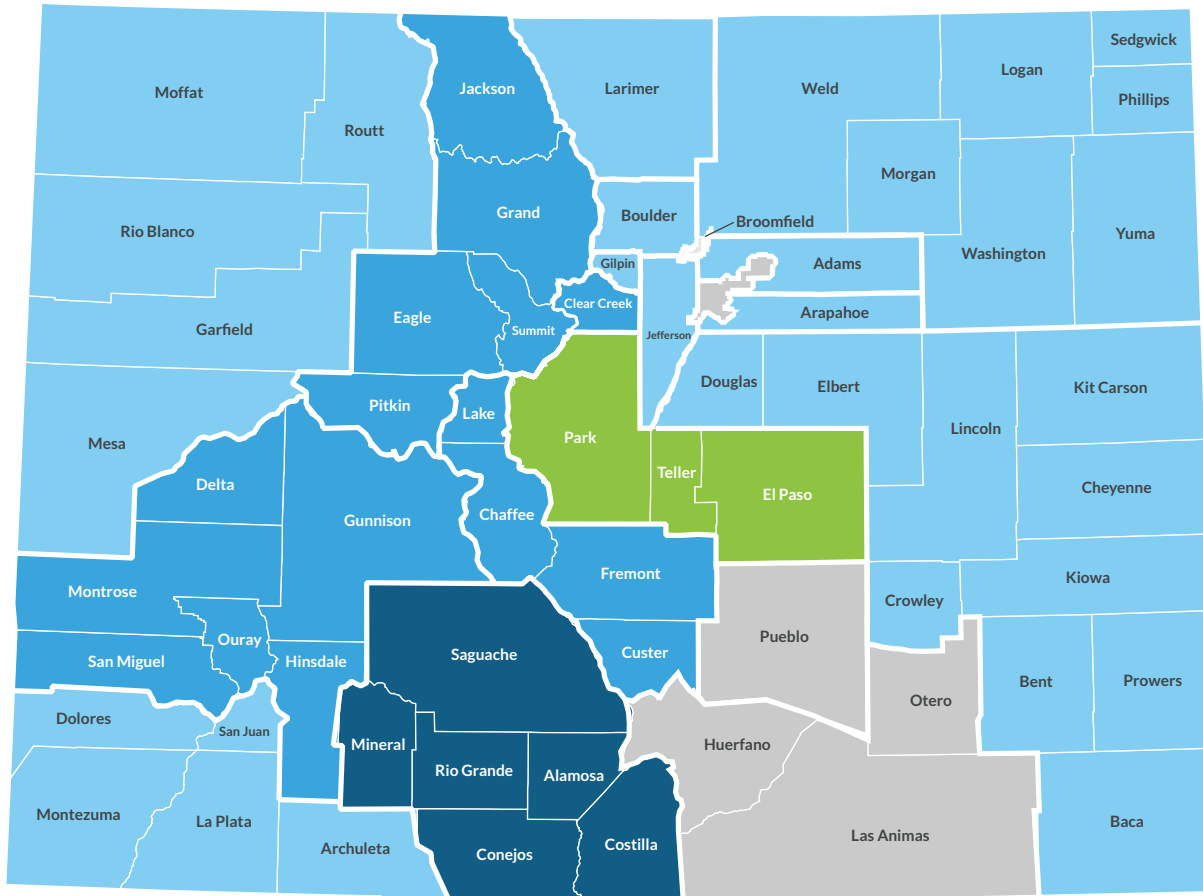


- Over time, consumer preferences in both the MMJ and AUMJ markets have shifted in similar patterns.
- Flower as a share of total expenditures has decreased dramatically over time - from 75 percent of all MMJ expenditures in 2014 to 54 percent in 2019, and from 66 percent of all AUMJ expenditures in 2014 to 47 percent in 2019. This shift could reflect an increasing demand for products that do not require smoking, and for higher-potency products such as Concentrates or Edibles.

### Product Shares, by Annual Sales (PART 2)

- Concentrates have exploded in popularity in both markets from 2014 to 2019, by a factor of approximately 2.5. Concentrates offer significantly increased potency and more consumption methods than raw Flower. The market continues to offer new diversified Concentrate products, more so than in any other product category.
- With the exception of a slight increase in Edible expenditures in the MMJ market, expenditure shares for other products have remained relatively stable in both markets. With other product shares remaining steady, it appears that shift is occurring as a result of users in both markets switching from Flower to Concentrates.
- Looking ahead, it is likely that Concentrates will continue to gain market share from Flower, which will likely influence the production patterns of both Cultivators and Manufacturers. Flower sold for direct consumption tends to be the highest-quality portions of the plant, while Concentrates are often made with lower quality Flower and Shake/Trim. As demand for Concentrates increases, an increasing supply of high-quality Flower may be diverted to Manufacturers, reducing the availability and/or increasing the price of AUMJ Flower.

## County/Regional Analysis



### AVERAGE PRICE PER GRAM OF AUMJ FLOWER BY COUNTY/REGION 2019

- The weighted average price of a gram of AUMJ Flower was \$4.53 for the state in 2019.
- In general, lower prices are found in the more competitive markets, like in Denver, where the average price of AUMJ Flower was \$3.93 per gram.
- Highest regional prices were found in the region containing Park, Teller, and El Paso counties, with weighted average per gram prices of over \$9.60. Colorado's south central region containing the San Luis Valley also reported higher prices.

#### AUMJ Average Price per Gram



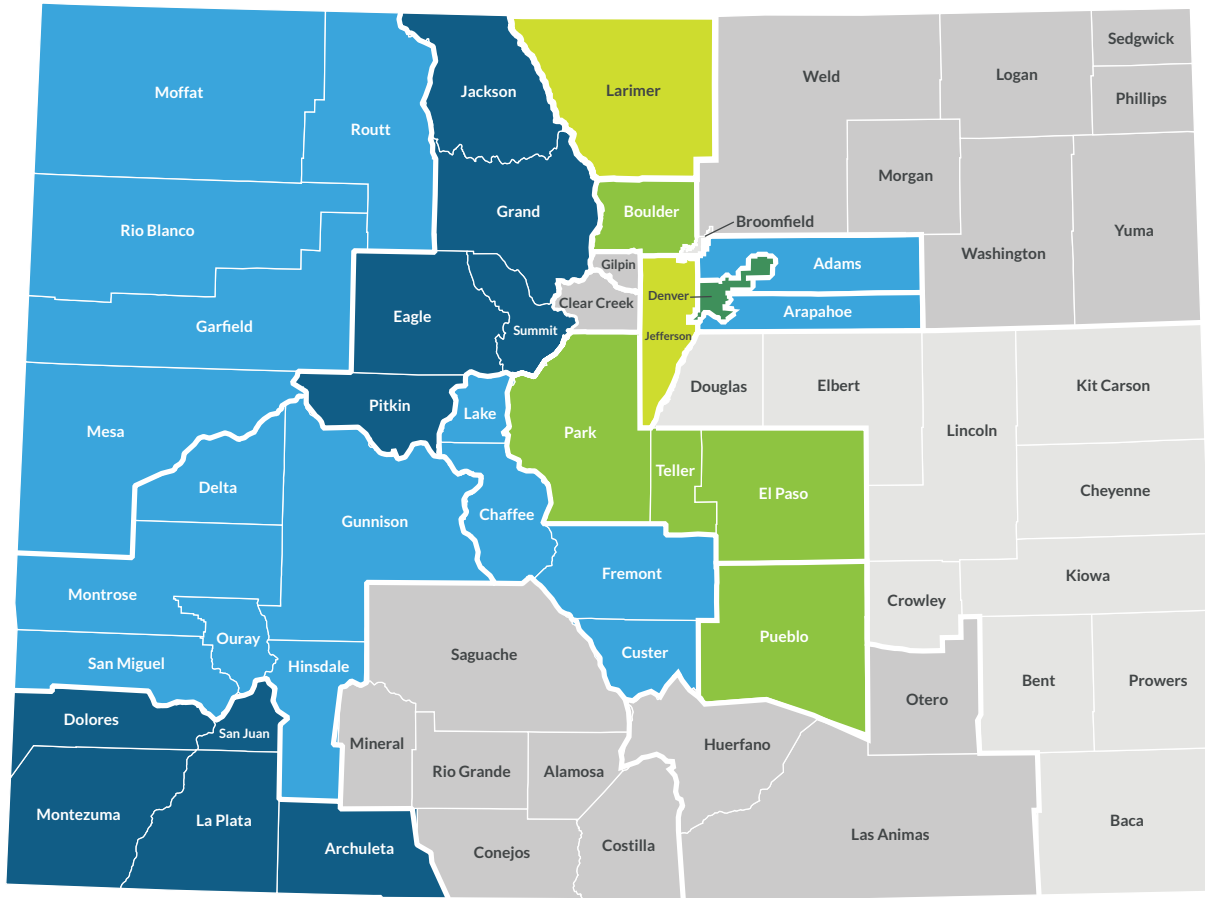
Note: Results are reported for each state region marked in the map above. Some regions contain more than one county, and counties within a region may prohibit marijuana activity. In those cases results are reported for the entire region.







## County/Regional Analysis



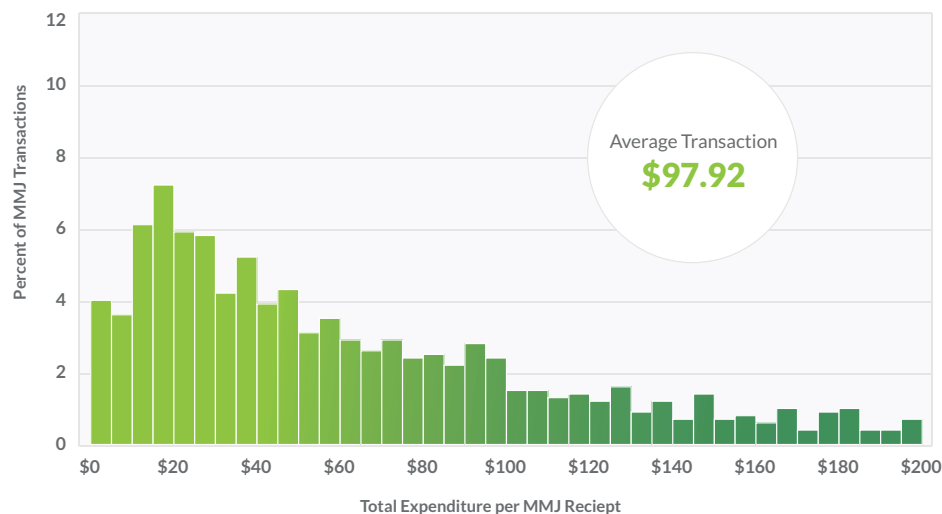
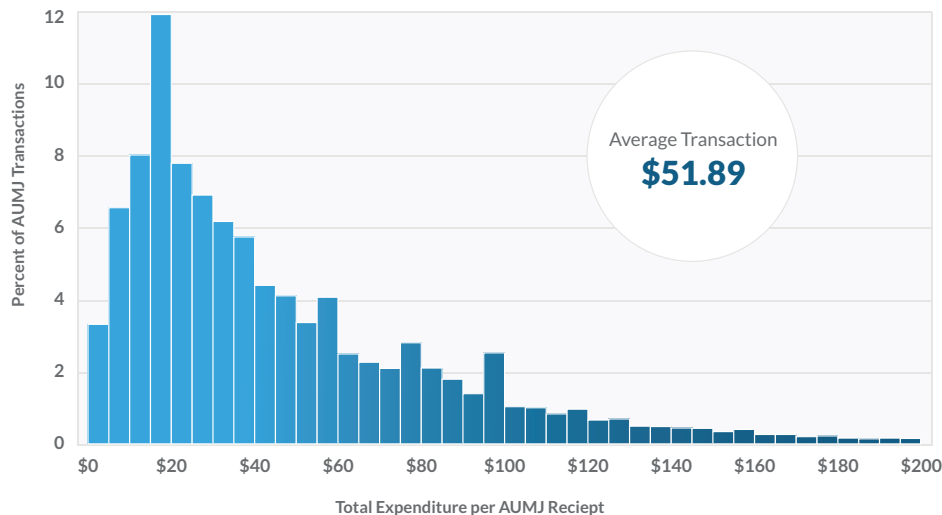
### MONTHLY MMJ SALES PER PATIENT BY COUNTY/REGION, 2019

- MMJ sales per patient is influenced by dispensary location and patient residence. MMJ patient counts have generally declined over time as the adult use market has emerged.
- Denver County is the commercial center for MMJ sales in the state and posts the highest monthly sales per registered patient (\$1,100) indicating it serves patients from multiple counties. The statewide average is \$333.
- In general Western Slope regions counted sales of about \$100-\$140 per patient. The Front Range, including the Colorado Springs and Pueblo regions, have higher sales per patient. The northern Front Range has sales of \$160-\$200 per patient - the southern Front Range is \$250-\$500 per patient.

#### MMJ Sales per Patient (monthly)



## Transaction Analysis – Total Expenditures per Transaction



- The Figure at left shows total receipt expenditures as a percentage of all 2019 transactions. Each bar represents a \$5 range, where the furthest left bar in AUMJ indicates that approximately 3 percent of all AUMJ transactions were less than \$5, approximately 7 percent were between \$5-10, and so forth.
- The most common transaction value for AUMJ was between \$15-20, accounting for approximately 14 percent of all AUMJ transactions.
- Nearly 30 percent of all AUMJ transactions are for less than \$20, and almost 90 percent cost less than \$100.
- Only 21 percent of MMJ transactions were less than \$20, while 77 percent were less than \$100.
- The overall average AUMJ transaction was \$51.89, nearly half the average \$97.92 MMJ receipt.
- The primarily cash nature of sales is apparent in AUMJ transactions, where customers tend to spend in \$20 increments. This is less pronounced in MMJ transactions, though still observable.

## Transaction Analysis – Basket of Goods (PART 1)

A new transaction indicator variable in the Inventory Tracking System data allows examination of the average product mix and purchase amounts for AUMJ and MMJ transactions. These Tables show the percentage of transactions that included each product type in 2019.

AUMJ	Product 1 Purchases		Product 2 Purchases   Product 1 Purchase				
Product 1 Purchased	Only Product 1	Includes Product 1	Flower	Concentrates	Shake/Trim	Edibles	Non-Edibles
Flower	37.3%	54.3%	100.0%	28.0%	26.6%	28.4%	23.9%
Concentrates	19.1%	35.2%	18.1%	100.0%	21.8%	28.7%	26.5%
Shake/Trim	9.3%	18.3%	9.0%	11.3%	100.0%	14.1%	11.6%
Edibles	8.6%	20.1%	10.5%	16.4%	15.4%	100.0%	44.6%
Non-Edibles	0.7%	2.1%	0.9%	1.6%	1.3%	4.6%	100.0%

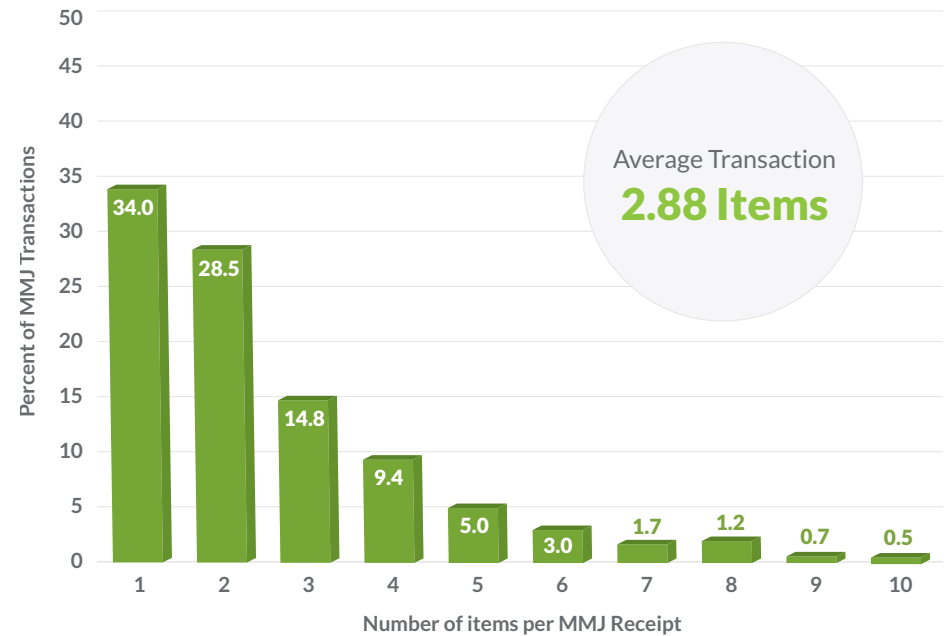
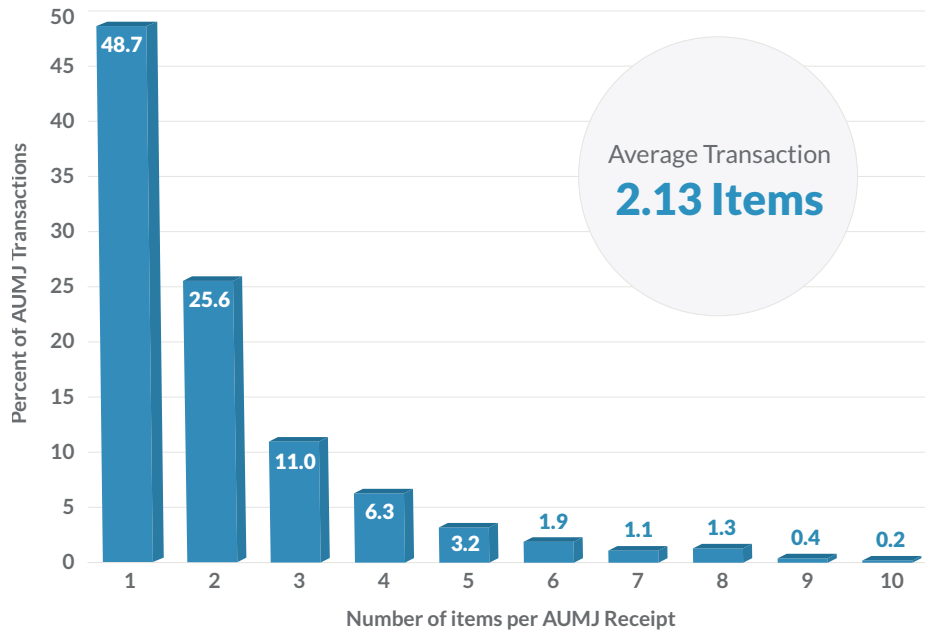
- The “Only Product 1” Column describes the percentage of all transactions that only included a single product type, i.e. 37.3 percent of all AUMJ transactions included only Flower products.
  - 75 percent of all AUMJ transactions included only one product type, while 25 percent of transactions had more than one product type.
- The “Includes Product 1” Column describes the percentage of customers purchasing some of the product type.
  - 54.3 percent of all AUMJ purchases included Flower.
- Starting with the fourth column from the left and moving right, these columns are labeled with each product type, and describe the percentage of transactions that contain a second product type (Product 2), accompanying a Product 1 purchase.
  - 28 percent of MMJ transactions that include Flower also include Concentrates, 28.4 percent include Edibles, etc.

## Transaction Analysis – Basket of Goods (PART 2)

MMJ	Product 1 Purchases		Product 2 Purchases   Product1 Purchase				
	Only Product 1	Includes Product 1	Flower	Concentrates	Shake/Trim	Edibles	Non-Edibles
Flower	37.2%	60.7%	100.0%	36.2%	42.2%	38.6%	39.0%
Concentrates	21.2%	42.5%	25.3%	100.0%	27.6%	36.4%	35.1%
Shake/Trim	4.4%	12.2%	8.5%	7.9%	100.0%	9.4%	9.2%
Edibles	6.4%	18.7%	11.9%	16.0%	14.5%	100.0%	40.5%
Non-Edibles	0.5%	1.9%	1.2%	1.5%	1.4%	4.1%	100.0%

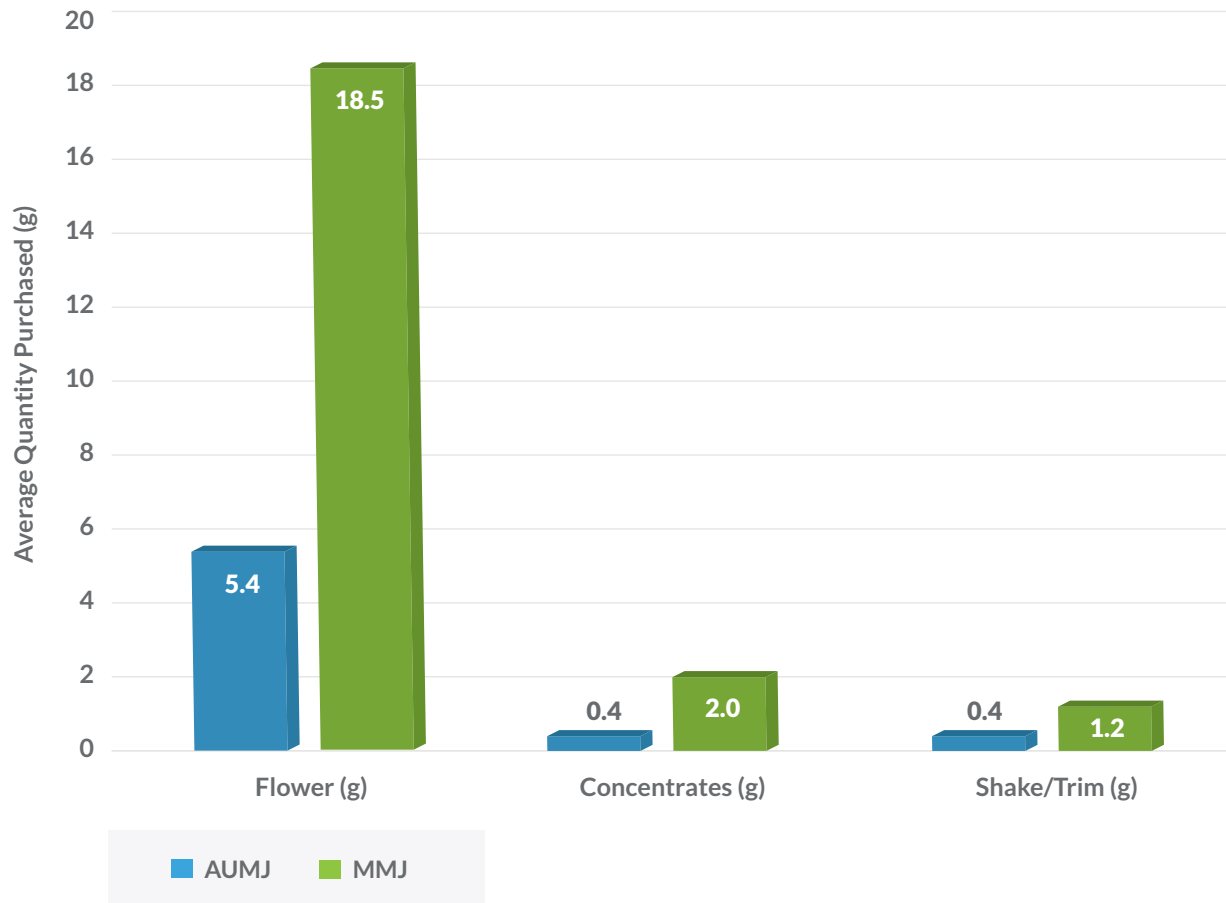
- MMJ transactions more commonly include multiple product types (30.3 percent vs. 25 percent for AUMJ).
- MMJ transactions are also more likely to include both Flower and/or Concentrates.
- A smaller proportion of MMJ transactions include Edibles and/or Shake/Trim, suggesting that patients are less likely to purchase pre-roll joints and favor Concentrates and Flower as consumption methods.

## Transaction Analysis – Average Number of Items per AUMJ & MMJ Transaction, 2019



- On average, MMJ patients purchased 2.88 items per visit, more than the average 2.13 items purchased by AUMJ customers.
- Nearly 50 percent of all AUMJ transactions had only one item, compared to only 33 percent for MMJ.
- Approximately 85 percent of all AUMJ transactions had three or less items, compared to 77.3 percent for MMJ.

## Transaction Analysis - Transaction Size 2019



- The transaction data illustrates the differences between AUMJ and MMJ shopping carts.
- MMJ patients purchase more of all product types, including over three times as much Flower (18.5g) per transaction as AUMJ customers (5.4g).
- MMJ patients also purchase more Concentrates per transaction at 2.0g, compared to 0.4g for AUMJ customers. Cartridges are included in this category and are commonly sold in 0.5g quantities.
- Shake/Trim transactions often represent pre-rolled joints. Where a common joint typically contains 0.75 - 1.0g, AUMJ customers buy an average of less than one pre-roll per transaction, while patients purchase one.



# MARKET STRUCTURE

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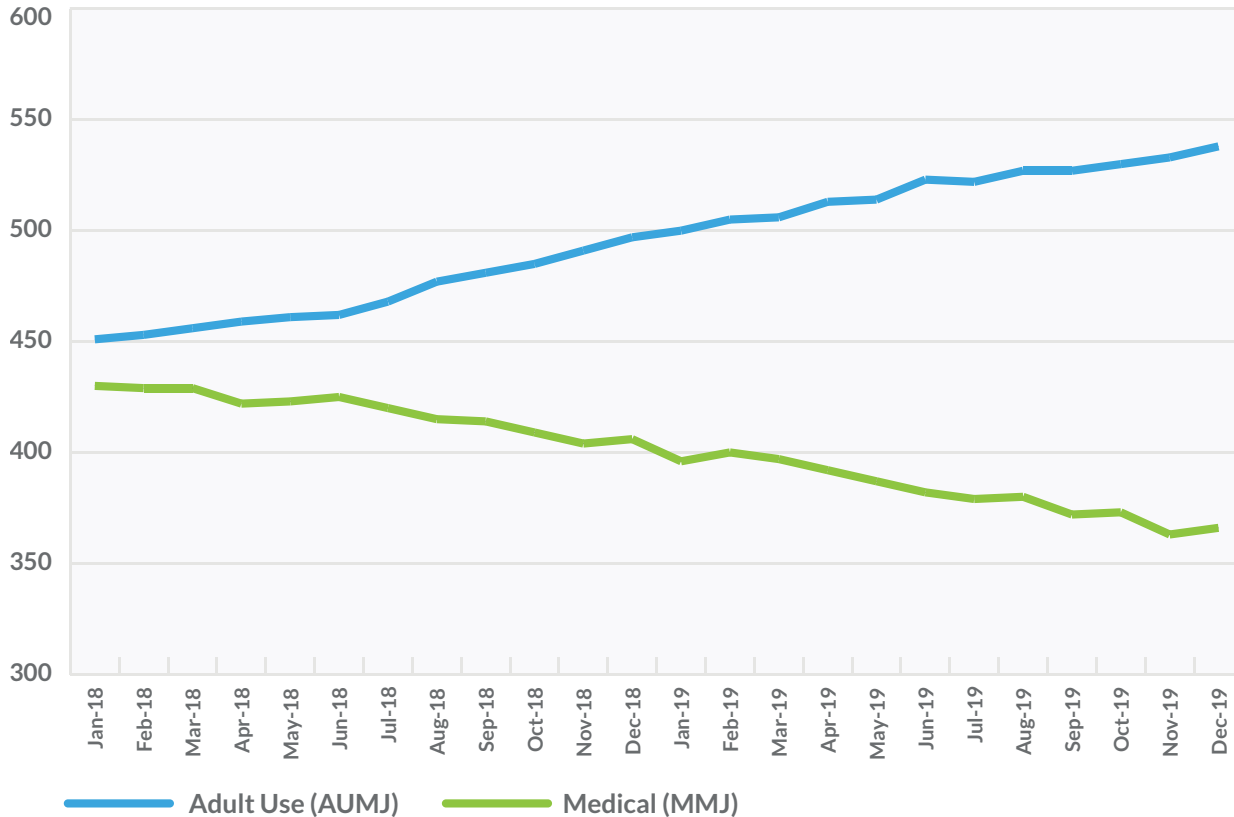
## Introduction

This section provides information on the adult use and medical marijuana market structure in Colorado, which has completed several evolutionary steps from its origin as a vertically-integrated medical-only regulated market. The market went through several large-scale changes, including the opening of the adult use market in 2014; an end to the vertical integration requirement; and rapid growth of the adult use market between 2014 and 2019.

There are several regulatory changes implemented in late 2019 that allow for more investment from outside Colorado and more varying corporate ownership structure. The impacts of these changes will likely become clearer at the end of 2020 and in 2021. The expanded market structure analysis focuses on market concentration and inter-county trade flows. Key findings from these analyses are summarized below:

- 1. Licenses and sales.** New licensed businesses or locations continue to enter the market, there was a 10 percent growth in licenses for adult use or medical stores. The balance is shifting towards adult use licenses as a share of total active licenses have increased from 51.2 percent in January 2018 to 59.5 percent in December 2019. Over half of store locations (53.1 percent) report sales of over \$1 million, and 10.0 percent of locations have annual sales of \$5 million and over. These figures also indicate a large amount of market share – 42 percent – that come from corporations that would be considered a small business by the U.S. Small Business Administration (less than \$8 million for specialty retail stores).
- 2. Corporate sales concentration.** The other side of that figure, however, is that over half of the market (58 percent) is controlled by what would be considered medium or large businesses. The top five corporations control about 18 percent of sales and the top 10 companies account for 25 percent. Over time the market is concentrating, the corporate concentration index has increased by 22 points since 2017, although the Colorado marijuana market is not as concentrated as other comparable industries such as beer, tobacco or pharmaceuticals.
- 3. Trade flows.** A new trade flow analysis is included in this edition where intra-state trade flows are presented for the first time. As expected, sales and production are both concentrated along the Colorado Front Range, but several interesting trends emerge about the geographic flow of goods. Denver City/County is the state's largest net producer, and neighboring Arapahoe County is the state's largest net consumer. Pueblo County is another important production center, accounting for 17.4 percent of all transfers between counties. There has yet to be any large-scale de-urbanization of mostly indoor marijuana cultivation facilities, owing largely to a mix of difficulties in accessing capital markets and rural county prohibition of facilities.

## Active Store License Count, 2018-2019

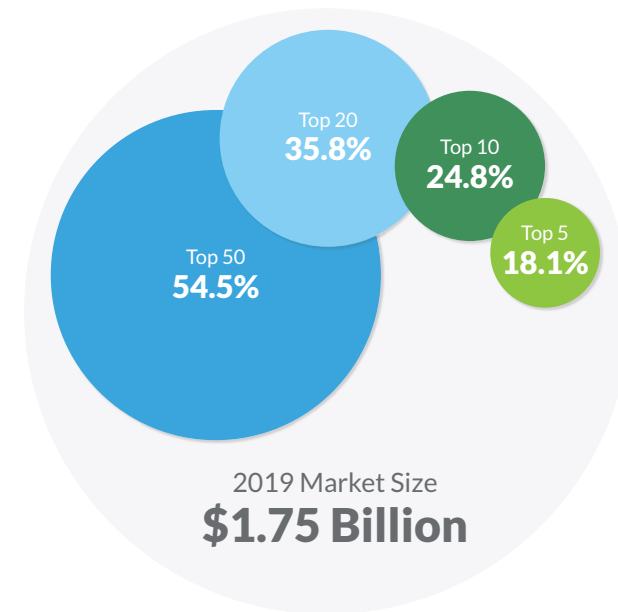


- Examining data from 2019 Inventory Tracking System sales tables, there were 972 unique store licenses that reported sales, compared to 963 in 2018.
- Adult use store licenses have been on an upward trend each month, with a 10.6 percent increase from 2018 to 2019 in the average number of licenses reporting sales each month, compared to a decrease of 8.7 percent for MMJ store licenses. A single location may have 2 store licenses, for medical and adult use sales.
- AUMJ store licenses as a share of total active store licenses have increased from 51.2 percent in January 2018 to 59.5 percent in December 2019.
- The number of individual store licenses reporting sales of \$1 million or more grew to 517 (53.1 percent), out of a total of 972 AUMJ and MMJ store licenses in 2019. Approximately 49.5 and 46.7 percent of store licenses reported sales over \$1 million in 2018 and 2017, respectively.

## Market Concentration

- Matching licenses to corporate entities, the project team calculated market share allocations for 2019. Of the 416 corporate entities, the top 5 were responsible for 18.1 percent of total sales in 2019, while the top 100 were responsible for 71.4 percent.
- The top ten individual store locations with the most sales in 2019 were in Larimer/Weld, El Paso, Denver, and Arapahoe Counties.
- Using the Herfindahl-Hirschman Index, a measure of market concentration, the marijuana market is competitive when viewed by company (HHI=122.2). An HHI below 100 indicates a highly competitive industry, while an HHI above 2,500 indicates a highly concentrated industry.
- Colorado's marijuana industry is much more competitive than the U.S. tobacco industry (HHI=3,100) and the U.S. brewing industry (HHI=2,162).

## MARKET SHARE BY ENTITY



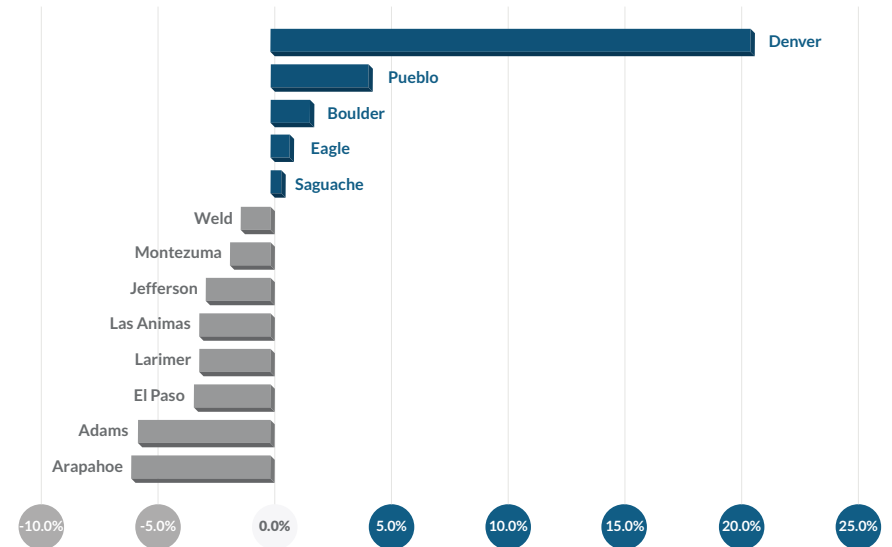
## HHI INDEX COMPARISON

Industry	HHI
Tobacco (2013)	3,100
Beer (2013)	725
Pharmaceuticals (2016)	210
Colorado Marijuana (2019)*	122

Source: The Roosevelt Institute; Hawkins, B., et. al. 2016.  
\* HHI by corporate entity

## Within-County Flower Production Surplus , Ranked (2019)

County	"Production Share (Plants Harvested)"	"Consumption Share (Flower+Shake Weight Sold)"	"Production Surplus"
Denver	58.96%	38.31%	20.64%
Pueblo	10.00%	5.80%	4.20%
Boulder	6.74%	5.05%	1.69%
Eagle	1.35%	0.53%	0.82%
Saguache	0.58%	0.12%	0.46%
Weld	0.62%	1.91%	-1.28%
Montezuma	0.23%	1.97%	-1.74%
Jefferson	0.65%	3.44%	-2.78%
Las Animas	0.86%	3.92%	-3.06%
Larimer	1.29%	4.35%	-3.06%
El Paso	7.33%	10.61%	-3.29%
Adams	0.30%	5.99%	-5.69%
Arapahoe	1.87%	7.85%	-5.98%



- The table above on the left shows counties' production share of total plants within the state, their sales share of Flower and Shake/Trim, and their ranked production surplus. For example, Denver accounted for 58.9 percent of all plants harvested in Colorado in 2019, and 38.3 percent of all Flower and Shake/Trim sold to consumers and patients (by weight), making them a net producer with a 20.6 percent production surplus.
- The chart on the right provides a visual representation of the highest and lowest net producers. Denver, Pueblo, and Boulder all produce more Flower and Shake/Trim than they sell, while Arapahoe and Adams must import significant amounts to meet their annual sales volume.

## Primary Origin & Destination Counties for Flower Transfers (2019)

Origin County	Share of All Other County Imports
Denver County	43.40%
Pueblo County	17.40%
Boulder County	6.20%
Arapahoe County	6.10%
Garfield County	3.90%
El Paso County	2.90%

Destination County	Share of All Other County Exports
Denver County	24.80%
Arapahoe County	11.30%
Pueblo County	11.20%
Adams County	8.50%
Jefferson County	8.30%
Boulder County	6.60%

- The first table shows the list of primary suppliers of Flower to other counties, while the second table shows the list of Flower recipients from other counties.
- These tables illustrate the counties with the highest level of Flower imports/exports to and from other counties but does not consider net within-county Flower production.
- Denver supplies 43.4 percent of all inter-county Flower Transfers. Considering the high number of Cultivation licenses in the county, this is no surprise.
- Pueblo is the second largest supplier of Flower, accounting for 17.4 percent of all inter-county Transfers. Large outdoor cultivation operations generate significant supplies during the outdoor grow season.
- In the second table, counties are listed based on their share of inter-county import Transfers.
- Denver receives 24.8 percent of all Flower transferred between counties, followed by Arapahoe at 11.3 percent and Pueblo at 11.2 percent.

## Denver County Trade Flows

Rank	Recipient County of Denver Bud + Shake	Share of Denver Exports
1	Denver County	58.60%
2	Arapahoe County	7.50%
3	Pueblo County	6.30%
4	Jefferson County	5.50%
5	Adams County	4.60%
6	Boulder County	2.90%

Rank	Origin County of Denver Bud + Shake	Share of Denver Exports
1	Denver County	71.40%
2	Pueblo County	9.00%
3	Arapahoe County	3.90%
4	Boulder County	3.00%
5	Garfield County	2.70%
6	Las Animas County	2.60%

- Denver County is the largest producer and consumer of regulated marijuana—primary trade partners are shown in the tables above.
- The table on the left shows the main recipients of Flower and Shake/Trim cultivated in Denver. As illustrated, most of the marijuana (58.6 percent) cultivated in Denver is also sold in Denver. The next largest importers of Denver-grown marijuana are Arapahoe, Pueblo, etc.
- The table on the right shows the main suppliers of Flower and Shake/Trim sold in Denver. As above, most of the marijuana (71.4 percent) sold in Denver is also cultivated in Denver. The next largest suppliers of Flower and Shake/Trim sold in Denver are Pueblo, Arapahoe, Boulder, etc.

# SUPPLY, DEMAND, & CONSUMPTION

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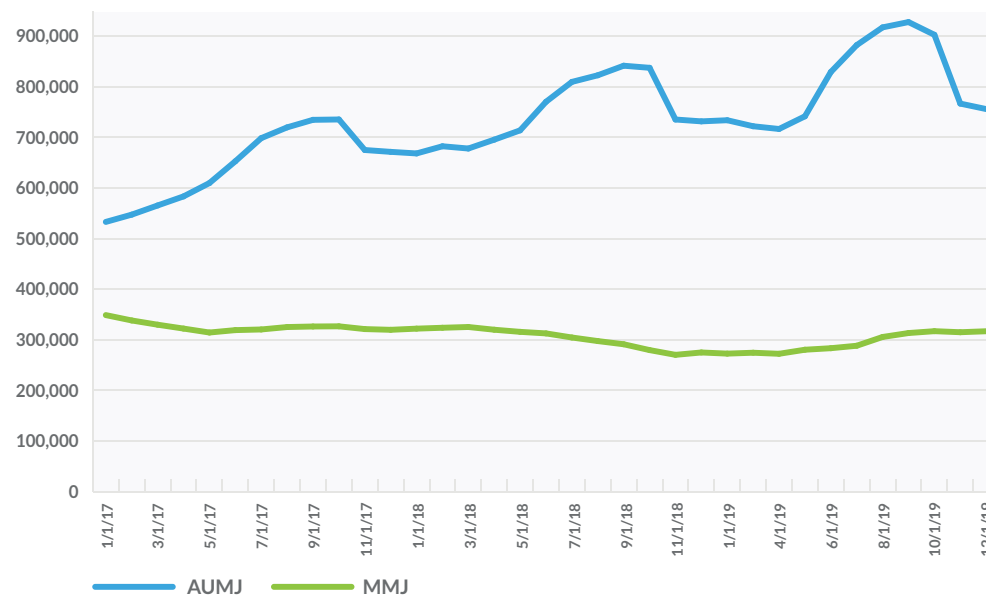
## Introduction

This section includes an updated analysis of supply patterns and the attendant plant count utilization rate over time, as well as a quantification of demand and resident consumption. This section also provides an improved tracking and quantification of all marijuana grown, harvested, processed and sold, obtained from the state inventory tracking system. Total supply is computed using transfer data from the inventory tracking system, then traced through the supply chain until it is ultimately sold to the customer or held as inventory. Total marijuana demand is calculated from actual sales to consumers reported in the inventory tracking system. Most supply/demand analyses presented in this section convert Concentrates and Edibles into their Flower equivalent units for calculations across product types. Major findings include:

- 1. Supply, demand and statewide product flows.** There were 552.8 metric tons of marijuana Flower equivalent produced and transferred out of licensed cultivation facilities in 2019, which represents an increase of 38 percent from 2017. Sales by Flower equivalent weight increased by 18 percent to 357.5 metric tons over the same period. The difference is accounted for through remaining on-hand inventory, amounts submitted for testing, and residuals. The residual amount includes product destroyed for failed testing, product seized by state and local agencies, drying weight, diverted product, weight losses during production processes, and other factors. In general, there is growth in licensees, production and demand as expressed in sales.
- 2. Supply patterns and utilization.** Supply and cultivation volume are showing steady patterns throughout the year and steady growth overall. Seasonal patterns are emerging strongly that show the increasing significance of the outdoor growing sector, which provides lower-cost wholesale marijuana to infused product manufacturers. Plant counts increase by about 25-30% or by 200,000 plants each year between May and November, Colorado's outdoor growing season. Utilization rates, however, have remained relatively constant at about 38-40 percent, aside from the annual seasonal increase.
- 3. Inventory and residuals.** The tracking system also reports the amount of product remaining in the system and the residual amount. In 2019, about 117.8 metric tons of Flower equivalent is reported in inventories at year-end, which represents an increasing trend. The remaining residual amount is 17.6 metric tons, which represents 3.2 percent, and is down from 6.7 percent in 2016.
- 4. Resident and visitor marijuana consumption.** Resident consumption rates continue to rise in Colorado—about 19.4 percent of Colorado residents consume marijuana on a monthly or more frequent basis, compared to 10.2 percent national average. Colorado also has a relatively large population of daily or near-daily consumers, accounting for about 75 percent of demand.

## Supply – Plant Count (PART 1)

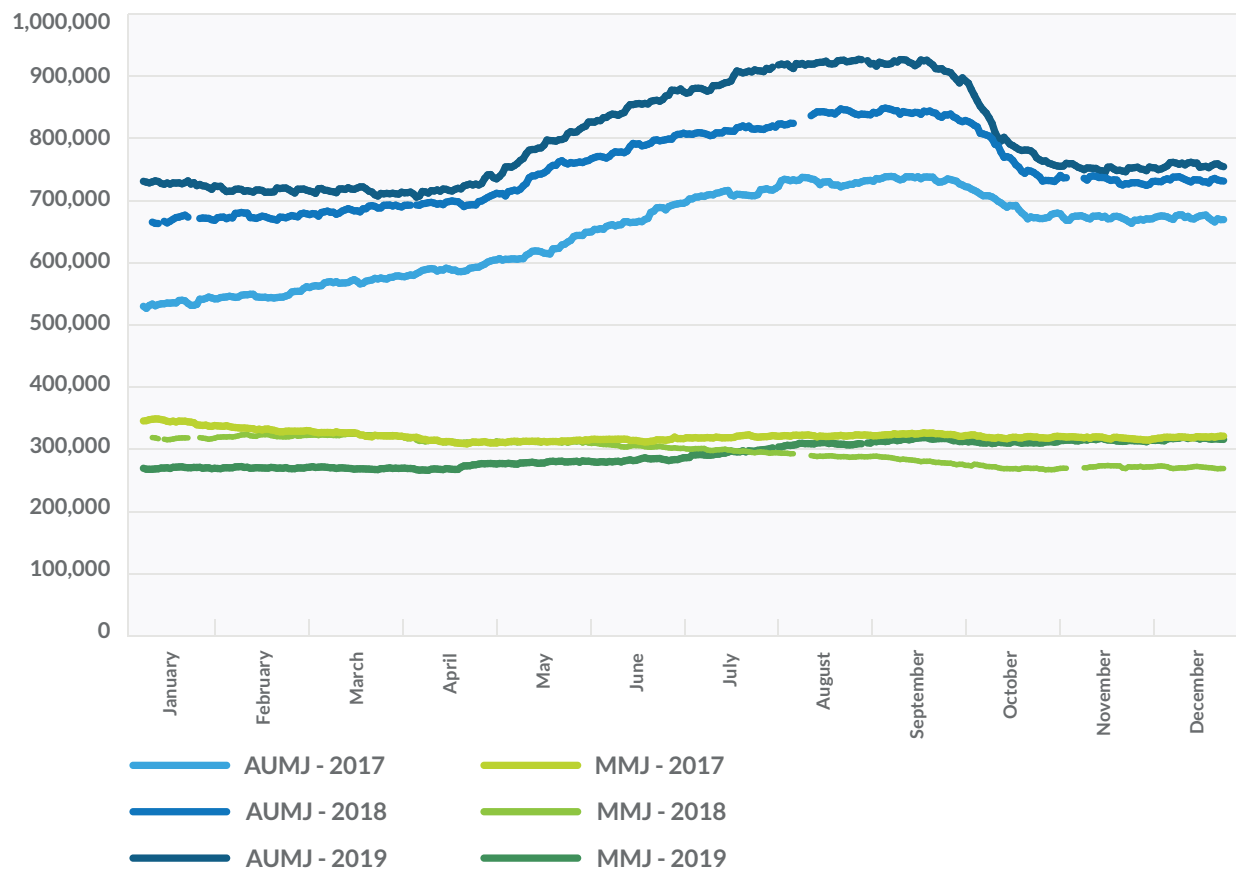
- The Figure below presents the average daily Vegetative and Flowering plant count from 2017 through 2019.
- There is pronounced seasonality in the number of AUMJ plants as plant counts increase significantly during the outdoor grow season from May through November.
- The number of MMJ plants is much more stable without exhibiting any notable seasonality.



- This is most likely because MMJ grows are more commonly smaller-scale indoor operations.
- The Table below shows the annual growth in Vegetative and Flowering plant count from 2017 through 2019
- AUMJ plant counts have grown significantly year over year, while MMJ plant counts continue to decline.

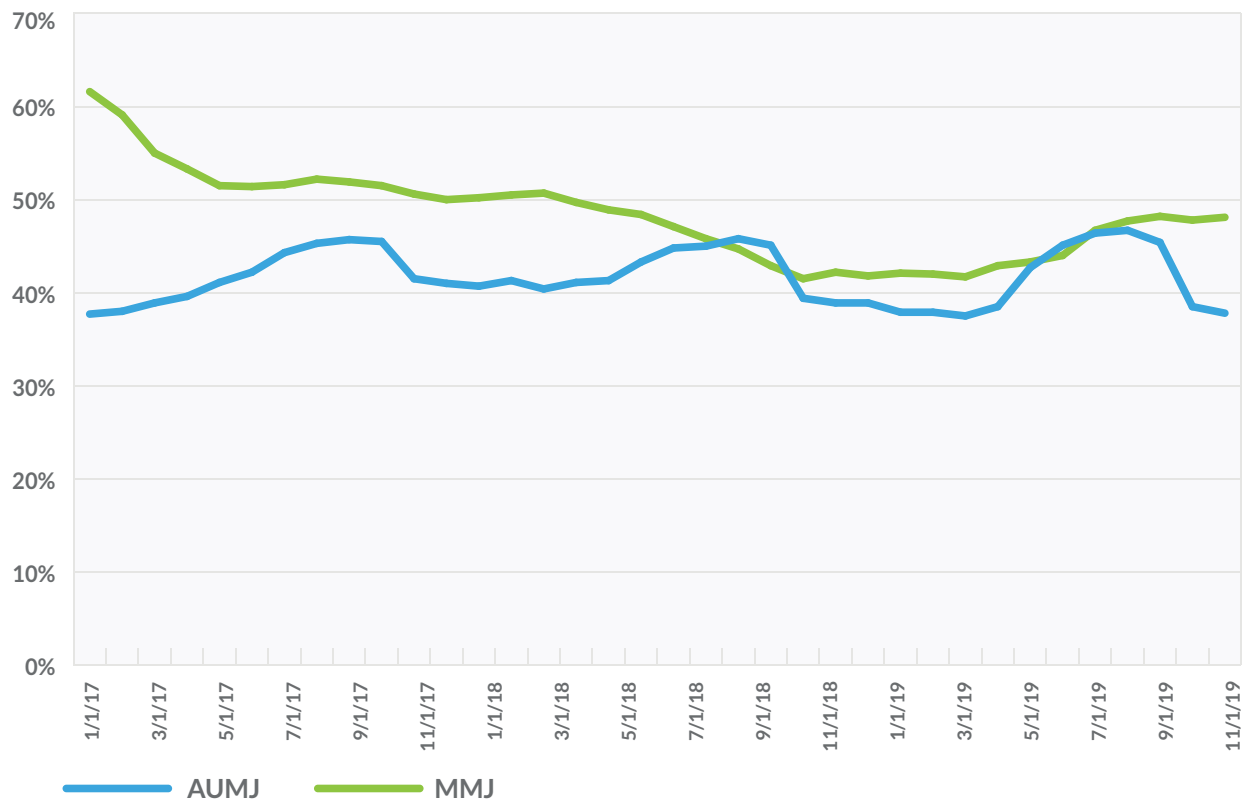
	AUMJ	MMJ
<b>2017 Average</b>	650,085	324,943
<i>% Change</i>	n/a	n/a
<b>2018 Average</b>	753,806	301,209
<i>% Change</i>	16.0%	-7.3%
<b>2019 Average</b>	800,988	294,995
<i>% Change</i>	6.3%	-2.1%

## Supply - Plant Count (PART 2)



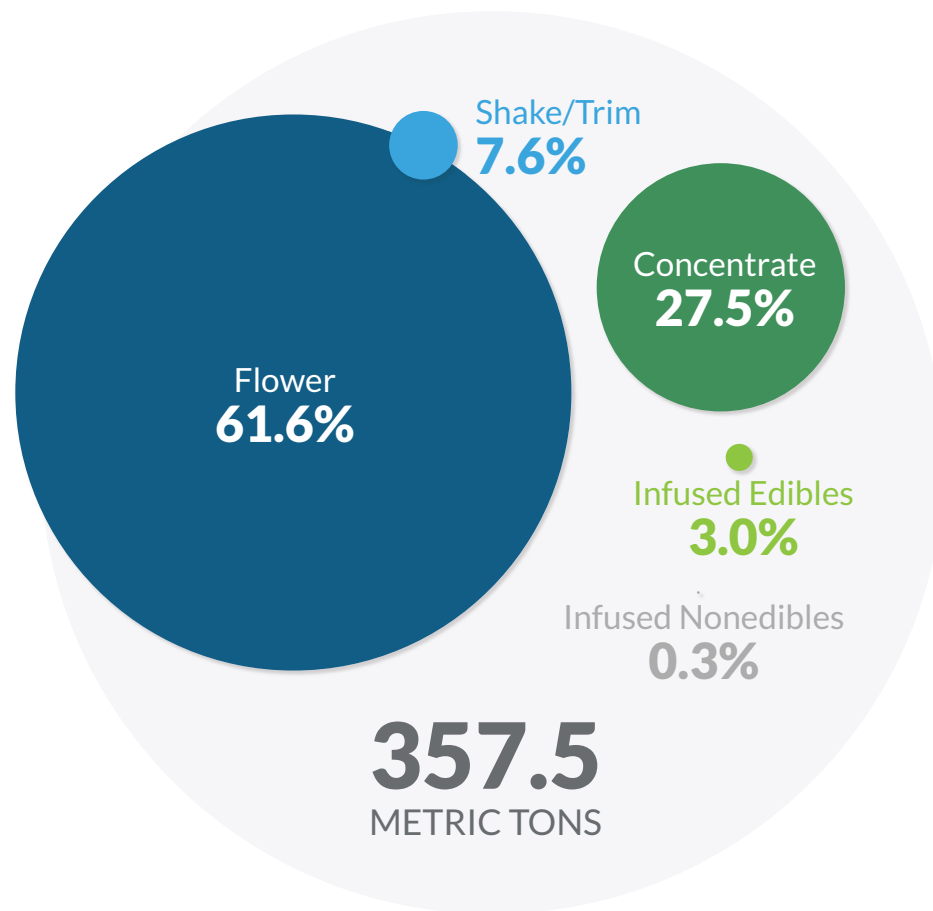
- This Figure presents the year-over-year total plant count, illustrating annual growth in AUMJ and a consistent trend in MMJ.
- AUMJ seasonality is becoming more pronounced as outdoor grows increase capacity.
- MMJ patient counts remain stable and medical demand is stable throughout the year.

## Supply - Plant Count Utilization Rate



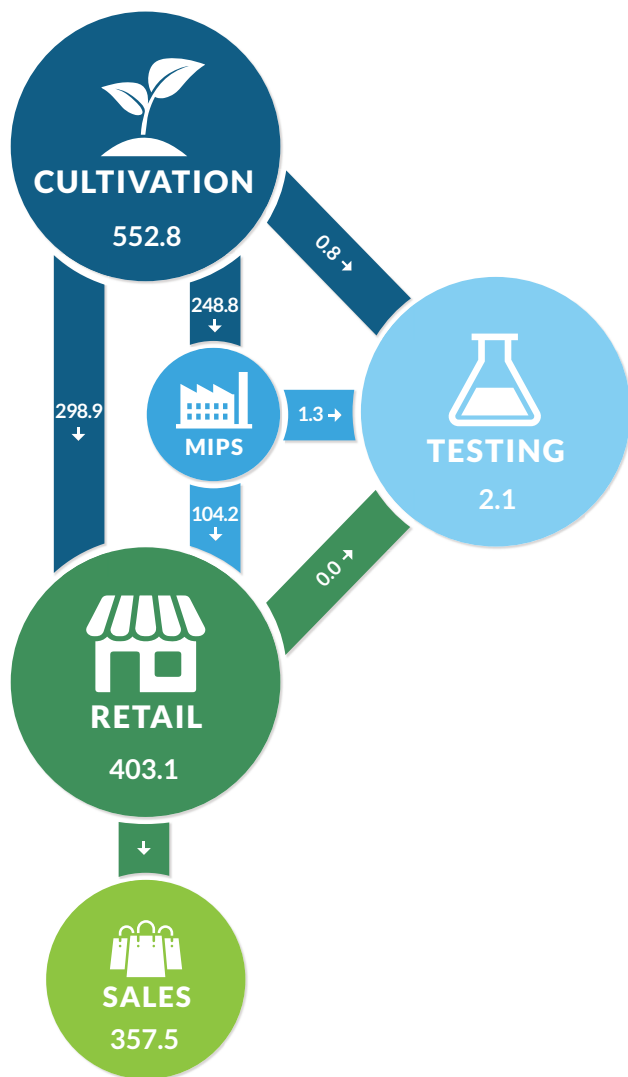
- The plant allocation utilization rate shows the portion of the total market plant allocation being utilized over time.
- The MMJ industry has historically utilized 40-60 percent of the possible allocations, declining from 60 percent in 2017 to 42 percent in mid-2019, but then slowly increasing to 48 percent by the end of 2019.
- The AUMJ industry has utilized 38-45 percent of the available allocations, with seasonal influxes likely driven by outdoor cultivations during the growing season.
- In both markets, there is significant room for licensed businesses to dramatically increase marijuana cultivation production under the current plant allocations.

## Demand, 2019 Actual Sales, Metric Tons of Flower Equivalent



- Based on 2019 inventory tracking data, sales are:
  - 220.1 metric tons of Flower,
  - 27.1 metric tons of Shake/Trim,
  - 18.3 metric tons of Concentrate material,
  - 11.9 million units of packaged Concentrates,
  - 14.3 million Infused Edible units, and
  - 1.1 million units of Infused non-Edible products.
- Together, 27.3 million units were sold of different non-Flower marijuana products.
- Using Flower Equivalent measures specific to each product category, 2019 demand is 357.5 metric tons.
- About one-third of demand by weight is for Concentrates (98.4 MT), Edibles (10.8 MT) and other Infused products (1.1 MT).

## Transfer Flows of Flower Equivalent, 2019 (PART 1)



- Transfer data from the Inventory Tracking System allows us to examine the transfer of all products between license types for the entire regulated marijuana industry in 2019. It is important to note that the figure to the left represents the sum of all downstream transfers during 2019, rather than a snapshot at a single point in time.
- We convert all product types to Flower Equivalent (FE), measured in metric tons. In order to create a uniform flow diagram. For example, if an average gram of Flower has 18.7 percent THC, then a gram of Concentrate with 37.4 percent THC would count as two grams of Flower Equivalent, etc.
- In this chart, the arrows represent downstream transfers between license types.
- 552.8 metric tons of FE transfers originated from Cultivation licenses.
  - 298.9 MT were transferred directly to Retailers
  - 248.8 MT were transferred to Manufacturers (MIPs)
  - 0.8 MT were transferred to Testing facilities
- Manufacturers transfer originations include:
  - 104.2 MT to Retailers
  - 1.3 MT to Testing facilities
- Retail licensees received a total of 403.1 MT of FE as incoming Transfers.
- Data from the Inventory Tracking System sales tables indicated a total of 357.5 MT of FE sold to end consumers.

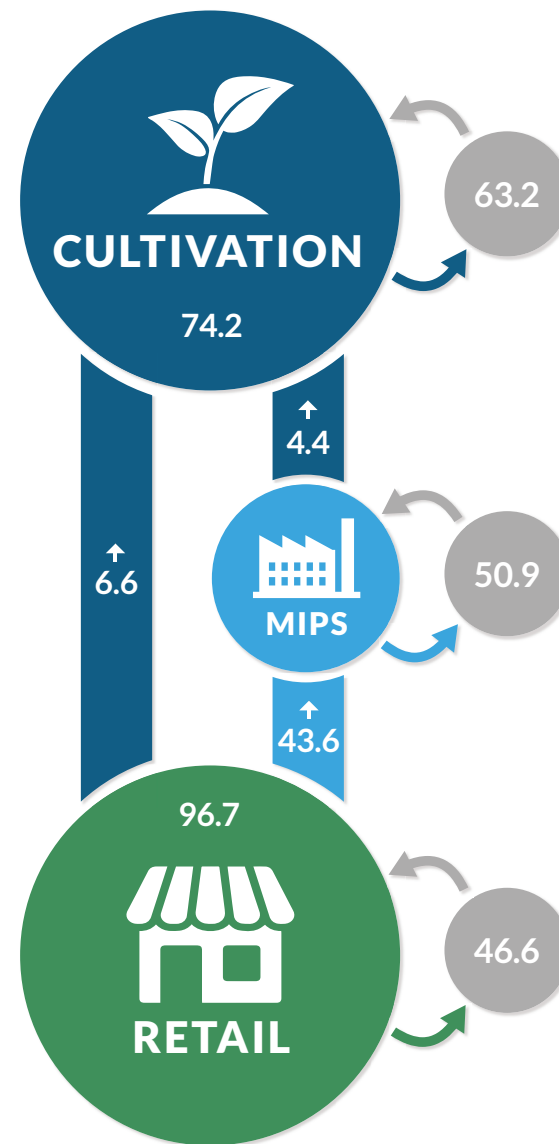
## Transfer Flows of Flower Equivalent, 2019 (PART 2)

The numbers in this chart with arrows pointing upward represent upstream transfers, which include the following transfer types:

- Transfers among vertically integrated businesses for inventory management; and
- Products sent by Retailers to Manufacturers for processing into other product types:
  - 43.6 MT of FE were transferred from Retail to Manufacturer licensees
  - 6.6 MT were sent from Retailers to Cultivation licensees
  - 4.4 MT were sent from Manufacturers to Cultivation licensees

The lateral arrows represent lateral transfers. Lateral transfers occur between two entities of the same license type.

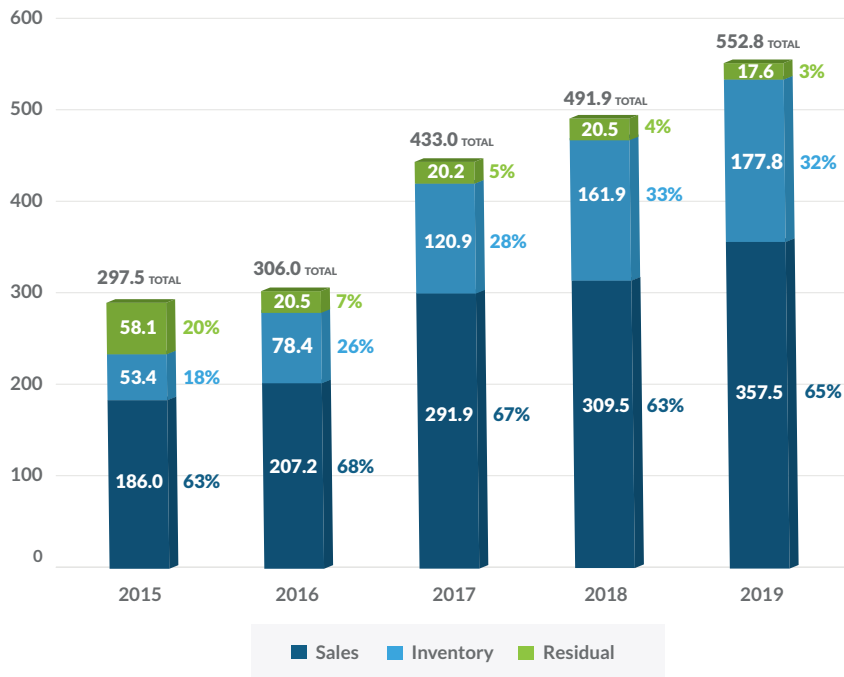
- **Cultivation:** Cultivation licensees transferred 63.2 MT to other cultivation facilities, mostly for inventory management purposes among vertically integrated organizations. An example would be two cultivation licenses under common ownership, transferring all production to one license for consolidated outgoing transfers.
- **Manufacturers:** Manufacturers transferred 50.9 MT to other Manufacturers. These transfers largely represent secondary processing stages. For example, one Manufacturer would extract THC and oils from raw Flower, and then transfer them to a second Manufacturer to process the THC into Edibles.
- **Retailers:** Retail licensees transferred 46.6 MT to other retail locations, most often for inventory management purposes among vertically integrated organizations. For instance, one Retailer under common ownership might send or receive transfers of a product from another Retailer to replenish depleted inventory.



## Transfer Flow Inventory & Residuals, 2019



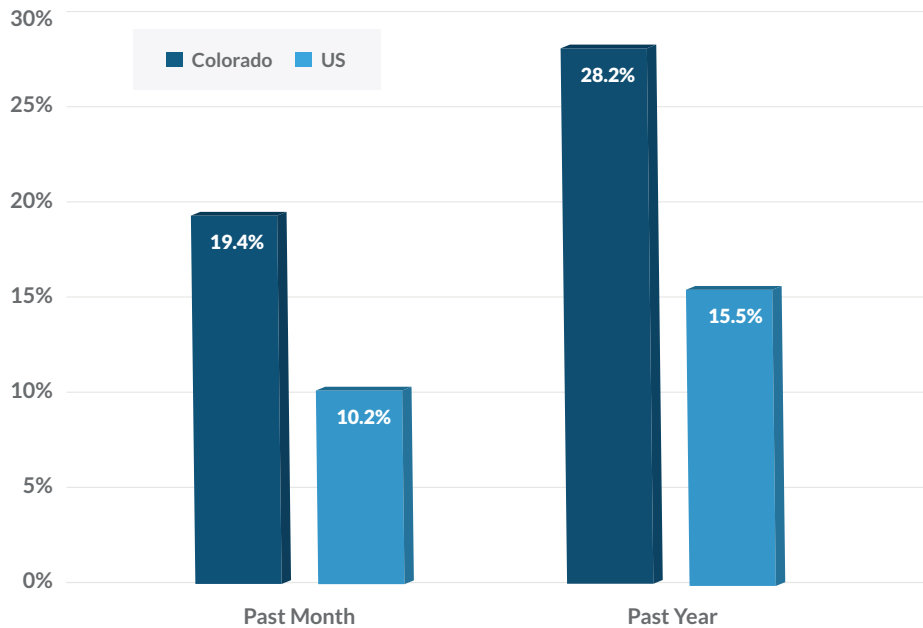
- Combining transfer, sales, and inventory data at the end of year, we calculate the residual amount of produced marijuana products that cannot be accounted for as sales or inventory. In this analysis we compare the sum of all 2019 transfers to the total on-hand inventory on January 1st, 2020 to calculate the end-of-year balance in Flower equivalent.
- As indicated at left, 552.8 MT of FE were transferred from cultivation licenses, and 357.5 MT of FE were sold to end users. Inventory data from January 1st, 2020 indicates that a total of 177.8 MT of FE in inventory by cultivation, manufacturer, and retail licenses. The remaining 17.6 MT of FE represent the residual, which consists of:
  - Seizure or destruction of product by law enforcement
  - Wet versus dry weight entries — post-harvest curing and drying
  - Entry errors in the inventory tracking system database
  - Extraction yield inefficiencies
  - Removal of product for quality assurance purposes
  - Supply chain product loss
  - Retail inventory shrinkage
  - Potential diversion of product outside regulated market
- The 2019 residual of 17.6 MT of FE represents 3.2 percent of total supply. The general trend has been a decreasing residual as a percent of total production volume over time, down from 6.7 percent in 2016. The bar graph to the left illustrates the evolution of total supply (top number) and its components over time, in metric tons of Flower equivalent. (Residual and end-of-year inventory calculation methodology is new for this edition and retroactively applied to prior years for comparison).





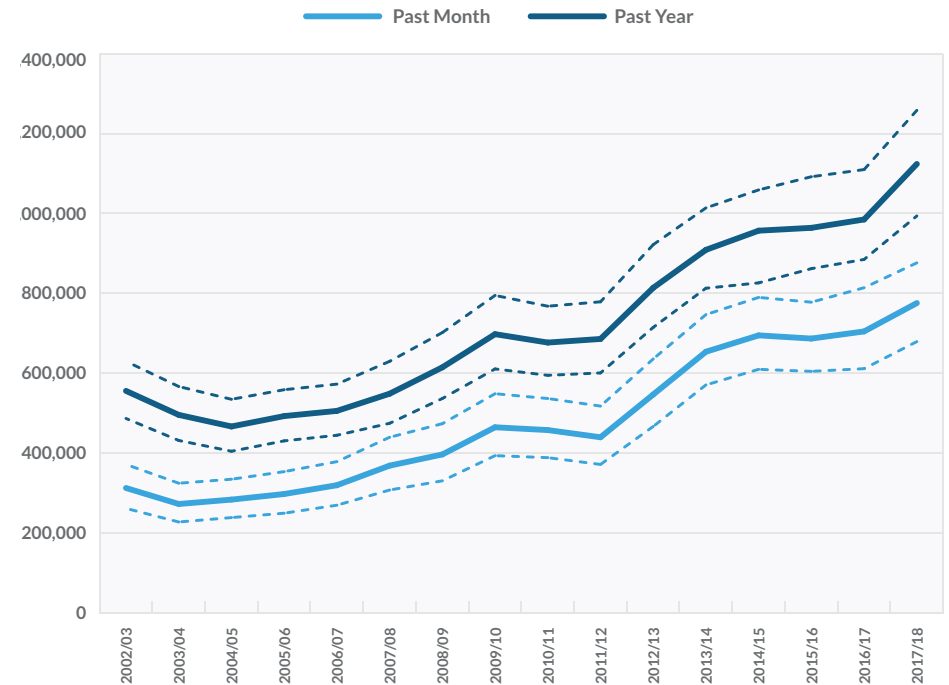
## Marijuana Use Prevalence (PART 1)

**PAST MONTH AND PAST YEAR MARIJUANA USE AMONG ADULT COLORADO AND US POPULATION, 2019**



Source: NSDUH; Study team calculations.

**COLORADO PAST-YEAR AND PAST-MONTH ADULT MARIJUANA CONSUMERS**

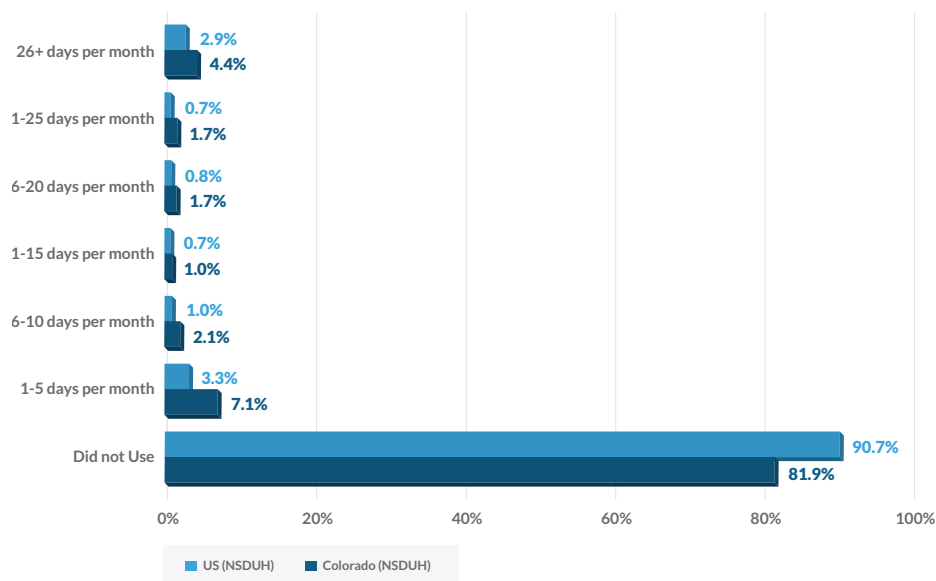


Source: NSDUH; Colorado Demography Office.

- In 2018, an estimated 1,203,253 Colorado residents age 21 and over have consumed marijuana in the past year, which represents about 28.2 percent of the state’s total 21 and over population. In comparison, an estimated 15.5 percent of U.S. adults have consumed marijuana in the past year.
- Approximately 827,248, or 19.4 percent of the adult Colorado population consumed marijuana at least once a month in 2018, which is up from 16.6 percent in 2017. In comparison, an estimated 10.2 percent of U.S. adults have consumed marijuana in the past year.

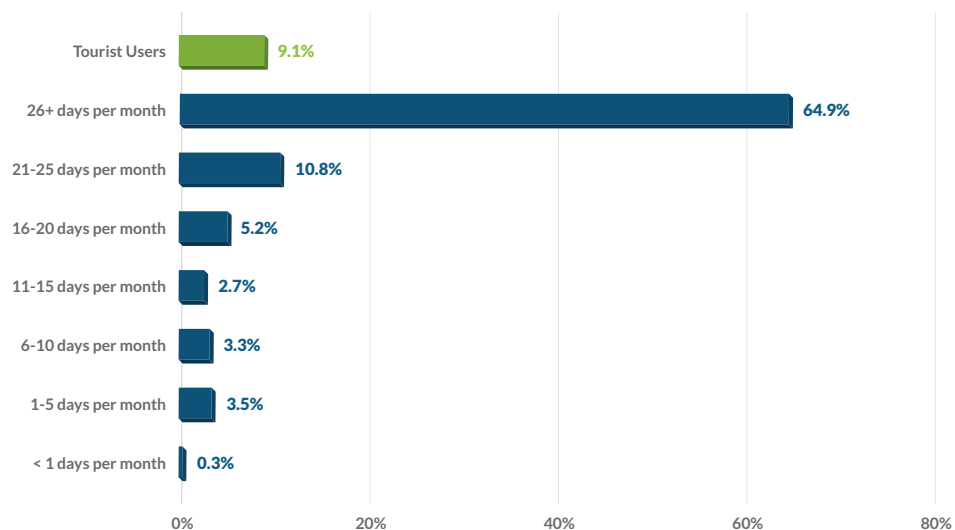
## Marijuana Use Prevalence (PART 2)

### FREQUENCY OF MARIJUANA USE AMONG COLORADO AND US POPULATION OVER THE PAST MONTH, 2018



Source: NSDUH

### SHARE OF MARIJUANA DEMAND, 2019



Sources: NSDUH; Longwoods International; Study team calculations.

- The chart to the left shows the frequency of marijuana use by Colorado and U.S. consumers from SAMHDA NSDUH. Colorado has a much higher share of “heavy” marijuana consumers compared to the national average. An estimated 4.4 percent of Colorado’s population uses marijuana 26 or more days per month, compared to 2.9 percent nationwide.
- The chart to the right shows the share of total marijuana demand by user group. The chart includes tourist demand and resident demand broken out into frequency of use.
- Marijuana users who used 26-31 days per month represented the largest share of demand (64.9 percent), followed by users who used 21-25 days per month (10.8 percent), and tourist users (9.1 percent).

# SUPPLY, DEMAND, & CONSUMPTION

## COLORADO RESIDENT AND VISITOR MARIJUANA CONSUMPTION ESTIMATES, 2014-2019 (METRIC TONS)



## 2018 RESIDENT AND VISITOR MARIJUANA USE DAYS AND CONSUMPTION QUANTITY

	Residents	Visitors	Total
Adult Marijuana Users	1,125,360	5,701,287	<b>6,826,648</b>
Annual Marijuana Use Days	149,781,345	20,435,204	<b>170,216,549</b>
Annual Demand (Metric Tons)	193.8	20.4	<b>214.2</b>
Annual Demand (Range)	(152.1 - 237.8)	(15.3 - 25.5)	<b>(167.4 - 263.3)</b>

## 2019 RESIDENT AND VISITOR MARIJUANA USE DAYS AND CONSUMPTION QUANTITY

	Residents	Visitors	Total
Adult Marijuana Users	1,203,004	5,716,150	<b>6,919,154</b>
Annual Marijuana Use Days	157,636,733	20,453,121	<b>178,089,853</b>
Annual Demand (Metric Tons)	203.1	20.5	<b>223.5</b>
Annual Demand (Range)	(159.2 - 249.4)	(15.3 - 25.6)	<b>(174.5 - 275)</b>

- In 2019, we estimate total annual resident to be 203.1 metric tons and total out-of-state visitor consumption is estimated to be 20.5 metric tons for a total consumption of 223.5 metric tons, an increase of 4.3 percent from 2018. Estimates for 2019 were calculated using population estimates from the Colorado Demography office for 2019, out-of-state visitor growth of 1 percent, and the average 5-year marijuana user growth. The increase in consumption can be linked to different factors, including higher consumer prevalence and an increase in the state population.
- In 2019, there were over 1.2 million Colorado residents who were adult marijuana users, representing 157.6 million marijuana use days, an increase of 6.9 percent and 5.2 percent, respectively, from 2018.
- Colorado welcomed approximately 16.8 million out-of-state day visitors and 26.5 million out-of-state business and leisure overnight visitors, with an average length of stay of 4.4 days in 2019. Based on the data, approximately 5.7 million out-of-state visitors had 20.5 million marijuana use days in 2019.

# APPENDICES

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## Appendix A: Consumption Calculation

### Available Data

Several data sources were utilized to estimate the resident marijuana consumption in Colorado. The primary source of data on marijuana use patterns comes from two well established and widely utilized surveys, the National Survey on Drug Use and Health (NSDUH) and the Behavioral Risk Factor Surveillance System (BRFSS).

The NSDUH collects representative state-level data on Colorado marijuana use prevalence, as well as estimates of the frequency of use among current marijuana consumers. NSDUH has been administered each year since 2002, allowing for trend and comparative analysis with other states and the U.S.

The Behavioral Risk Factor Surveillance System (BRFSS) is a nationwide telephone survey that collects state-level data regarding health-related risk behaviors. In 2014, the Colorado BRFSS began collecting data about marijuana use, following the legalization of adult use marijuana in Colorado.

The final survey incorporated in this study is the 2014 Colorado Marijuana Use Survey, completed by the study team. This survey asked Colorado marijuana consumers about their frequency of marijuana consumption, as well as the average quantity consumed on a typical use day. In addition to survey data, this study is the first to utilize transaction-level data from the state inventory tracking system.

These sources are combined with state- and county-level population and demographic data from the American Community Survey and the U.S. Census Bureau.

### Resident Consumption Estimation:

Total resident consumption in Colorado includes consumption by state residents, and visitors. We consider these market segments separately, first estimating the resident consumption and then the visitor consumption. The total Colorado resident consumption is computed using the following formula:

$$D_r = \sum_{r=1}^7 \frac{\text{days}_t \times g_t \times n_t}{1,000,000}$$

#### Where:

$D_r$  = total consumption by adult residents, measured in metric tons of marijuana  
 $\text{days}_t$  = average number of use days per year for each consumer type 't' (1-365)  
 $g_t$  = average number of grams consumed per day for each consumer type 't'  
 $n_t$  = total number of people included in each marijuana consumer classification 't'

This approach is the most straightforward method to estimate resident consumption since estimates are available (or can be calculated) for each component. The number of marijuana consumers is estimated by combining prevalence data from NSDUH with population data from the ACS. NSDUH also provides estimates of marijuana consumers by type, based on their frequency of consumption, in days. Finally, the average daily consumption quantity for each consumer type is estimated using a combination of recent literature and primary survey data from Colorado residents.

## Appendix B: Flower Equivalent Calculation

Marijuana consumption, demand and supply quantities are estimated using different methods. Consumption is based upon demographics, consumer responses to surveys, and upon pre-existing literature on use. In other words, it must be estimated. In contrast, legal marijuana supply and demand do not need to be estimated – the measures can be counted using official, verified data. In order to standardize different products back into grams of Flower Equivalent, the study team constructed a generalized equivalency approach. The general formula is written. This approach can be used to convert different products – such as Edibles, Concentrates, or processed Flower, back into the weight of plant material needed to produce the product. The formula is below:

$$W_{it} = f(n, mg, \pi_t, \sigma_t, L, \varphi_i)$$

### Where each component is defined as follows:

- $W_{it}$  is the equivalent weight of Flower or Shake/Trim needed as an input for each product type.
- The index " $i$ " is the type of plant material (Flower or Shake/Trim).
- The index " $t$ " denotes the type of non-Flower product (wax, vaporizer cartridge, Infused Edible, Infused non-Edible, etc.) being considered.
- The function,  $f(n, mg, \pi_t, \sigma_t, L, \varphi_i)$ , depends upon the following input parameters:
  - $n$  is the number of units produced or sold. For example,  $n$  equals 2.7 million units in 2017 in the case of Edible marijuana products for Colorado.
  - $mg$  is the weight of the product, in milligrams or grams, of the product sold. For example, "wax" type Concentrates are typically sold in units of 1 gram. Vaporizer cartridges are sold in units of 250 milligrams or 500 milligrams. For Edibles, this weight is set to be the official THC weight itself (e.g., 10 or 100 milligrams).
  - $\pi_t$  represents the potency of the product, as a percentage of the product weight, using official laboratory test data. If a Concentrate batch test equals 65 percent, then 0.65 is used for  $\pi_t$ .
  - $\sigma_t$  represents the share of total sales by product type,  $t$ .  $\sigma_t$  can be used to compute systemwide supply equivalencies, or it can be omitted from the formula, if only a specific product type is under consideration.
  - $L$  is the loss rate between plant-based input THC and the output THC. The loss rate can vary between 20 percent for Concentrates up to 40 percent for Edibles, if more than one chemical transaction is enacted.
  - $\varphi_i$  is the THC potency of the input material, based upon official test data. For example, average potency testing for Flower in 2017 suggests potency during that year of 19.6 percent combined THC-A and THC. Shake/Trim potencies were 17.2 percent THC, on average, in 2017.

Formula estimates for legal jurisdictions outside of Colorado may differ based upon relative potencies, plant yields, and other factors that affect production.

# CONCLUSION

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