THE LEGALIZATION OF MARIJUANA IN COLORADO: *THE IMPACT*

Volume 7

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Rocky Mountain High Intensity Drug Trafficking Area

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PREPARED BY THE ROCKY MOUNTAIN HIDTA
TRAINING AND INFORMATION CENTER
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Executive Summary

The Rocky Mountain High Intensity Drug Trafficking Area (RMHIDTA) program has published annual reports every year since 2013 tracking the impact of legalizing recreational marijuana in Colorado. The purpose is to provide data and information so that policy makers and citizens can make informed decisions on the issue of marijuana legalization.

Section I: Traffic Fatalities & Impaired Driving

- Since recreational marijuana was legalized in 2013, traffic deaths in which drivers tested positive for marijuana **increased 135%** while all Colorado traffic deaths **increased 24%.**
- Since recreational marijuana was legalized, traffic deaths involving drivers who tested positive for marijuana **more than doubled** from 55 in 2013 to 129 people killed in 2019.
    - This equates to one person killed every 3 1/2 days in 2019 compared to one person killed every 6 1/2 days in 2013.
- Since recreational marijuana was legalized, the percentage of all Colorado traffic deaths that were marijuana related **increased from 15%** in 2013 **to 25%** in 2019.

Section II: Marijuana Use

Since recreational marijuana was legalized in 2013:

- Past month marijuana use (ages 12 and older) **increased 30%** and is **76%** higher than the national average, currently ranked **3rd** in the nation.
- Past month adult marijuana use (ages 18 and older) **increased 19%** and is **73% higher** than the national average, currently ranked **3rd** in the nation.
- Past month college age marijuana (ages 18-25) use **increased 6%** and is **50% higher** than the national average, currently ranked **3rd** in the nation.
- Past month youth marijuana (ages 12-17) use **decreased 25%** and is **43% higher** than the national average, currently ranked **7th** in the nation.

Section III: Public Health

- Marijuana *only* exposures more than **quadrupled** in the seven-year average (2013-2019) since recreational marijuana was legalized compared to the seven-year average (2006-2012) prior to legalization.
- Treatment for marijuana use for all ages **decreased 21%** from 2009 to 2019.
- The percent of suicide incidents in which toxicology results were positive for marijuana has **increased** from **14%** in 2013 to **23%** in 2018.

Section IV: Black Market

- RMHIDTA Colorado Drug Task Forces (10) conducted **278 investigations** of black-market marijuana in Colorado resulting in:
    - 237 felony arrests
    - 7.49 tons of marijuana seized
    - 68,600 marijuana plants seized
    - 29 different states the marijuana was destined
- Seizures of marijuana reported to the El Paso Intelligence Center in Colorado **increased 17%** from an average of 242 parcels (2009-2012) to an average of 283 parcels (2013-2019) during the time recreational marijuana has been commercialized.

Section V: Societal Impact

- Marijuana tax revenue represent approximately **0.85%** of Colorado's FY 2019 budget.
- **67%** of local jurisdictions in Colorado have banned medical and recreational marijuana businesses.

Introduction

Purpose

The purpose of this annual report is to document the impact of the legalization of marijuana for medical and recreational use in Colorado. Colorado serves as an experimental lab for the nation to determine the impact of legalizing marijuana. This is an important opportunity to gather and examine meaningful data and identify trends. Citizens and policymakers nationwide may want to delay any decisions on this important issue until there is sufficient and accurate data to make informed decisions. Readers are encouraged to review previous volumes of this report for a comprehensive understanding of the topic. These reports were prepared to identify data and trends related to the legalization of marijuana so that informed decisions can be made regarding this issue.

Background

It is important to note that, for purposes of the debate on legalizing marijuana in Colorado, there are three distinct timeframes to consider: the early medical marijuana era (2000-2008), the medical marijuana commercialization era (2009–current) and the recreational marijuana era (2013–current).

- **2000 – 2008, Early Medical Marijuana Era:** In November 2000, Colorado voters passed Amendment 20 which permitted a qualifying patient, and/or caregiver of a patient, to possess up to 2 ounces of marijuana and grow 6 marijuana plants for medical purposes. During that time there were between 1,000 and 4,800 medical marijuana cardholders and no known dispensaries operating in the state.
- **2009 – Current, Medical Marijuana Commercialization Era:** Beginning in 2009 due to a number of events, marijuana became de facto legalized through the commercialization of the medical marijuana industry. By the end of 2012, there were over 100,000 medical marijuana cardholders and 500 licensed dispensaries operating in Colorado. There were also licensed cultivation operations and edible manufacturers.
- **2013 – Current, Recreational Marijuana Legalization Era:** In November 2012, Colorado voters passed Constitutional Amendment 64 which legalized marijuana for recreational purposes for anyone over the age of 21. The amendment also allowed for licensed marijuana retail stores, cultivation operations and edible manufacturers. Retail marijuana businesses became operational January 1, 2014.

NOTE:

Data, if available, will compare pre- and post-2009 when medical marijuana became commercialized and after 2013 when recreational marijuana became legalized.

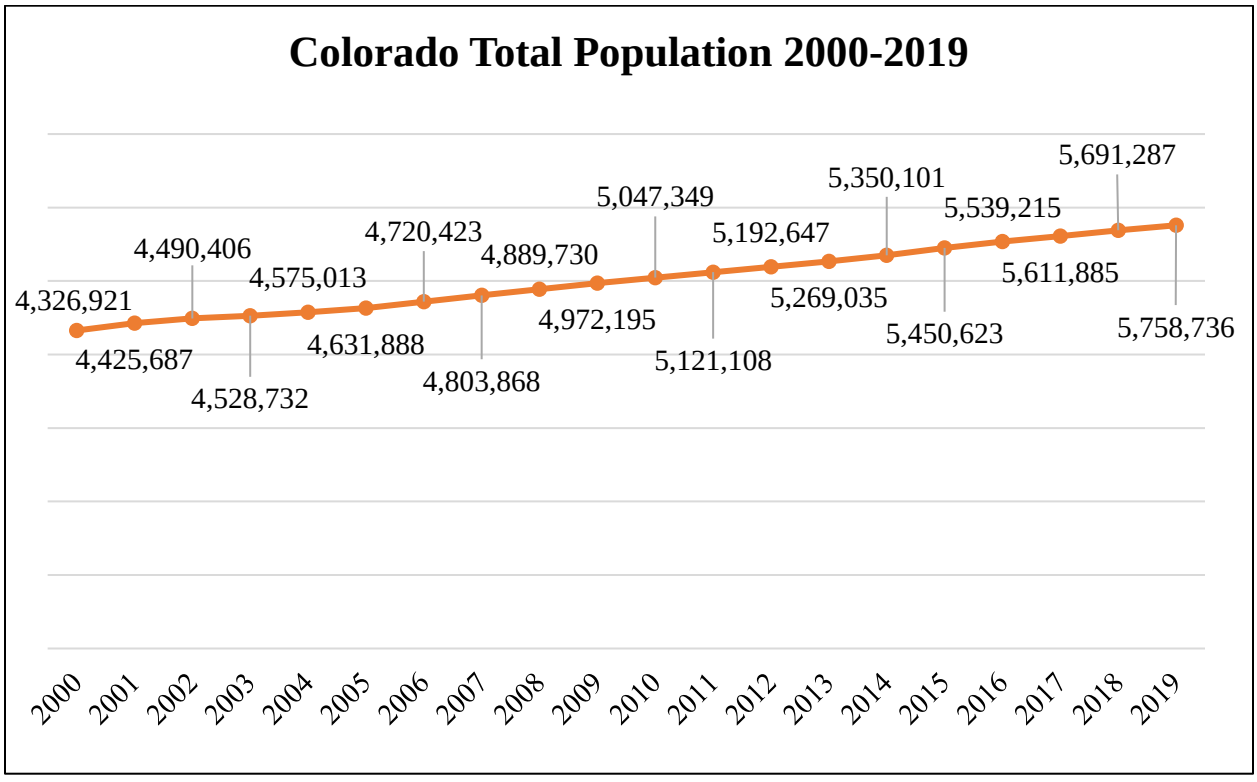
Multi-year comparisons are generally better indicators of trends. One-year fluctuations do not necessarily reflect a new trend.

Percentage comparisons may be rounded to the nearest whole number.

Percent changes found within graphs were calculated and added by RMHIDTA.

This report will cite datasets with terms such as “marijuana-related” or “tested positive for marijuana.” That does not necessarily prove that marijuana was the cause of the incident.

Throughout this report, rate per 100,000 is included to proportionately analyze various statistics. Below is Colorado’s total population from 2000 to 2019 for reference:



Section I: Traffic Fatalities & Impaired Driving

Some Findings

- Since recreational marijuana was legalized in 2013, traffic deaths where drivers tested positive for marijuana **increased 135%** while all Colorado traffic deaths **increased 24%.**
- Since recreational marijuana was legalized, traffic deaths involving drivers who tested positive for marijuana **more than doubled** from 55 in 2013 to 127 people killed in 2019.
    - This equates to one person killed every 3 1/2 days in 2019 compared to one person killed every 6 1/2 days in 2013.
- Since recreational marijuana was legalized, the percentage of all Colorado traffic deaths that were marijuana related **increased from 15%** in 2013 **to 25%** in 2019.

Definitions by Rocky Mountain HIDTA

Driving Under the Influence of Drugs (DUID): This term includes an individual under the influence of alcohol, marijuana, or other drugs along with any This is an important measurement since the driver's ability to operate a vehicle was sufficiently impaired that it brought his or her driving to the attention of law enforcement. The erratic driving and the subsequent evidence that the subject was under the influence of marijuana helps confirm the causation factor.

Marijuana-Related: Also called "marijuana mentions," is any time marijuana shows up in the toxicology report. It could be marijuana only or marijuana with other drugs and/or alcohol.

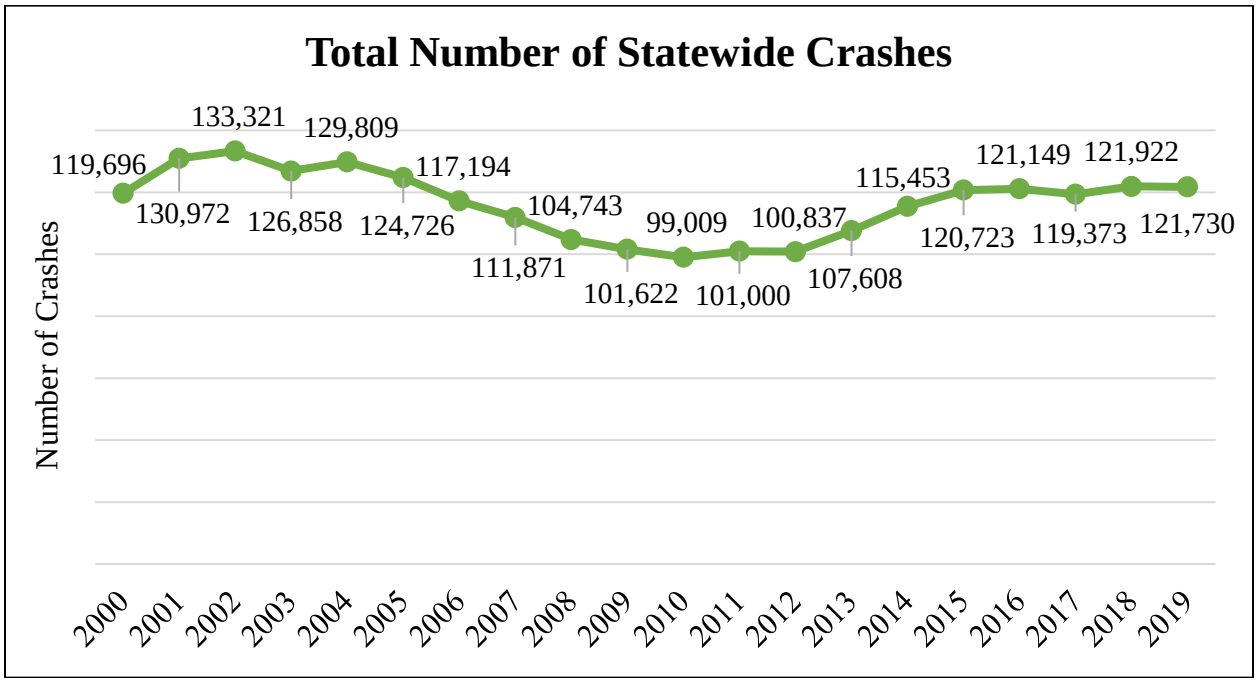
Marijuana Only: When toxicology results show marijuana and no other drugs or alcohol.

Fatalities: Any death resulting from a traffic crash involving a motor vehicle.

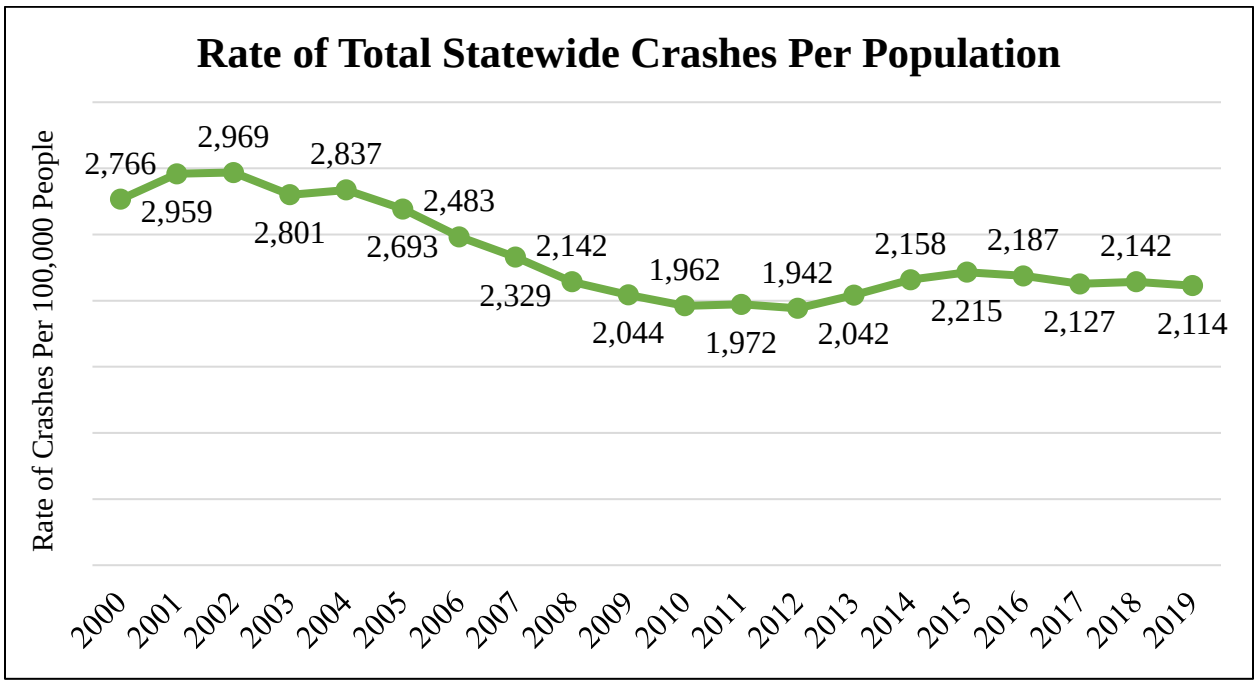
Operators: Anyone in control of their own movements such as a driver, pedestrian or bicyclist.

Drivers: An occupant who is in physical control of a transport vehicle. For an out-of-control vehicle, an occupant who was in control until control was lost.

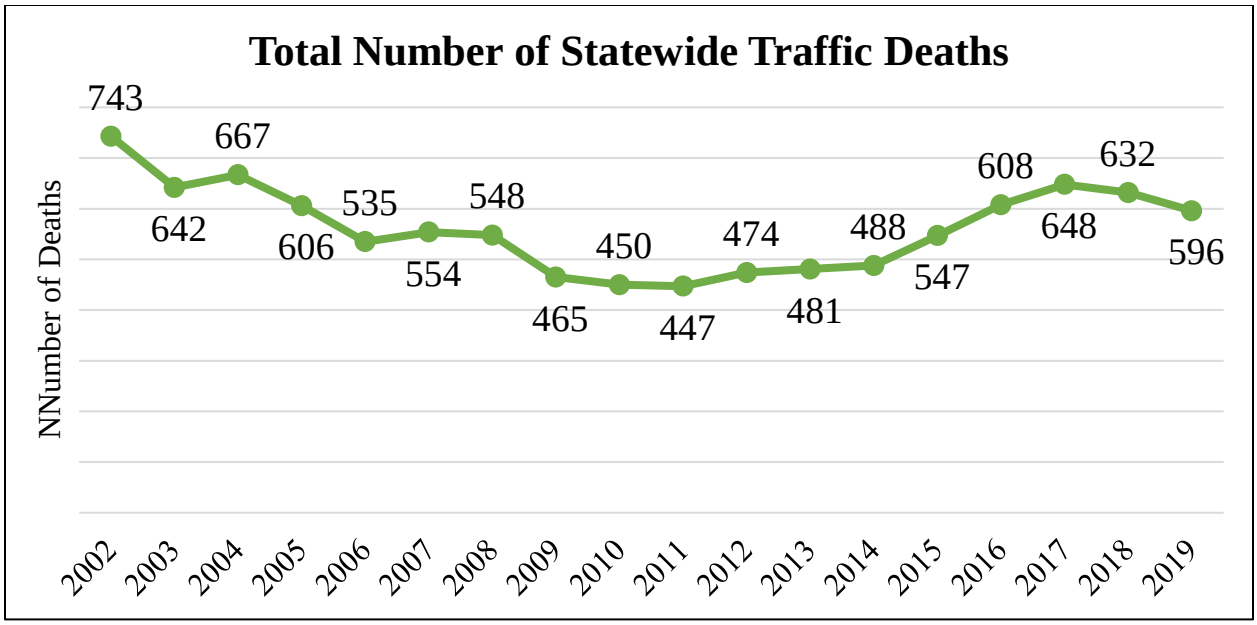
Traffic Fatalities



SOURCE: Colorado Department of Transportation (CDOT)

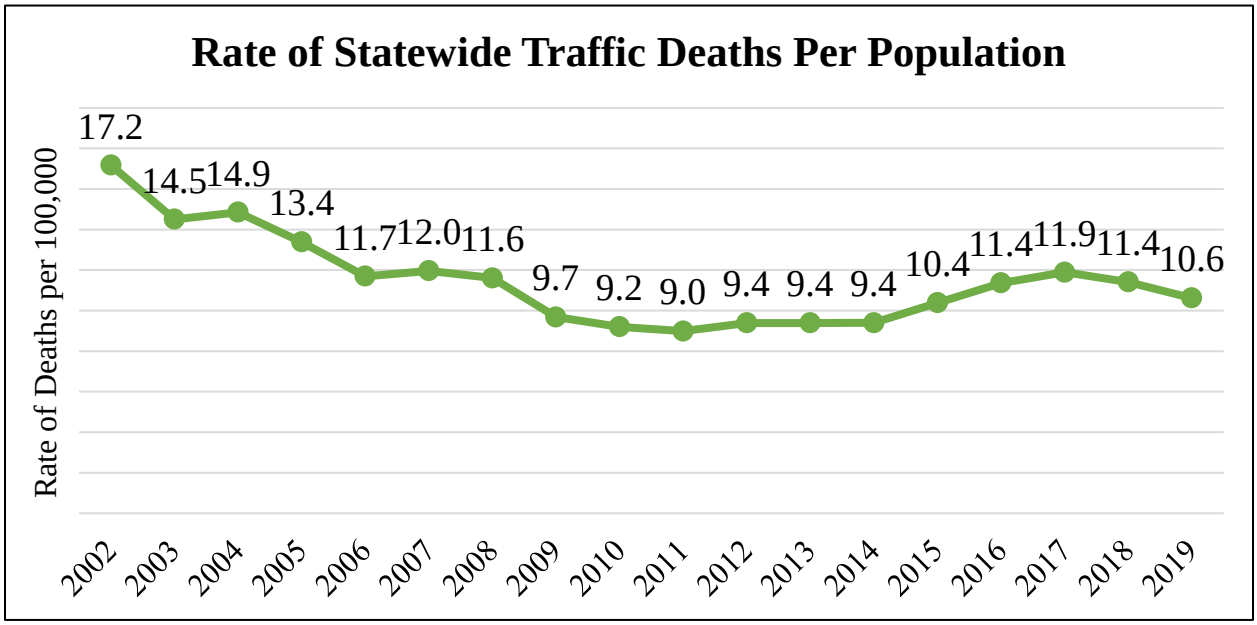


SOURCE: CDOT



- In 2019, there were a total of 596 traffic deaths. Of which:
  - 299 were drivers
  - 103 were motorcyclists
  - 98 were passengers
  - 76 were pedestrians
  - 20 were bicyclists

SOURCE: National Highway Traffic Safety Administration (NHTSA), Fatality Analysis Reporting System (FARS), 2006-2011 and CDOT 2012-2019



SOURCE: NHTSA, FARS, 2006-2011 and CDOT 2012-2019

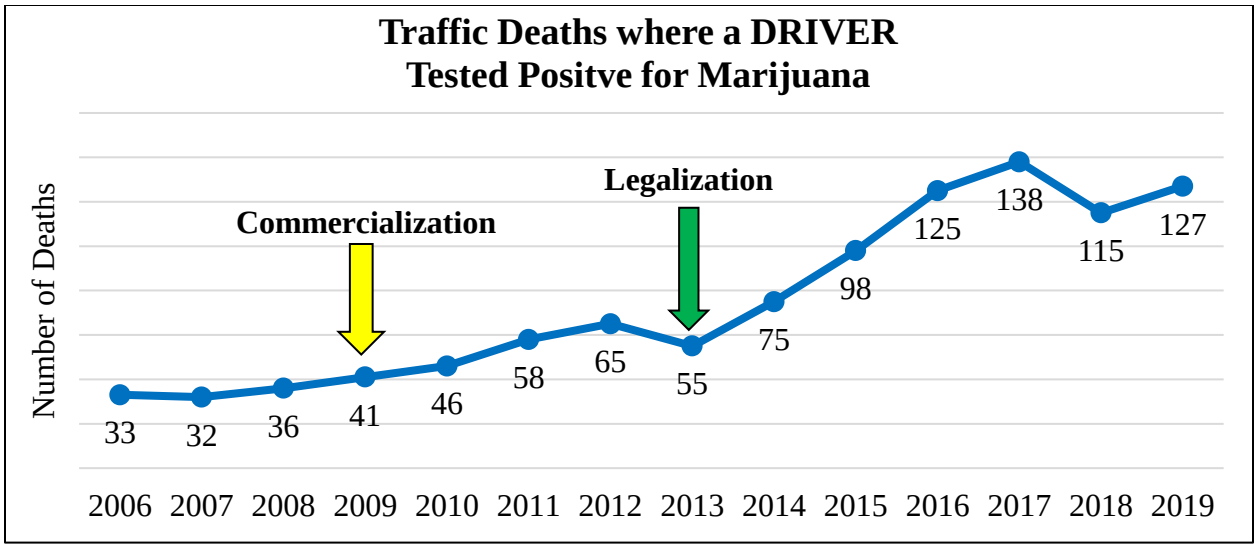
Traffic Deaths Related to Marijuana When a DRIVER Tested Positive for Marijuana			
Crash Year	**Total Statewide Fatalities**	**Fatalities with Drivers Testing Positive for Marijuana**	**Percentage Total Fatalities**
2006	535	33	6.2%
2007	554	32	5.8%
2008	548	36	6.6%
2009	465	41	8.8%
2010	450	46	10.2%
2011	447	58	13.0%
2012	472	65	13.8%
2013	481	55	11.4%
2014	488	75	15.4%
2015	547	98	17.9%
2016	608	125	20.6%
2017	648	138	21.3%
2018	632	115	18.2%
2019	596	127	21.3%

- In 2019, 127 marijuana-related traffic deaths:
  - 101 were drivers
  - 20 were passengers
  - 5 were pedestrians
  - 1 was a bicyclist

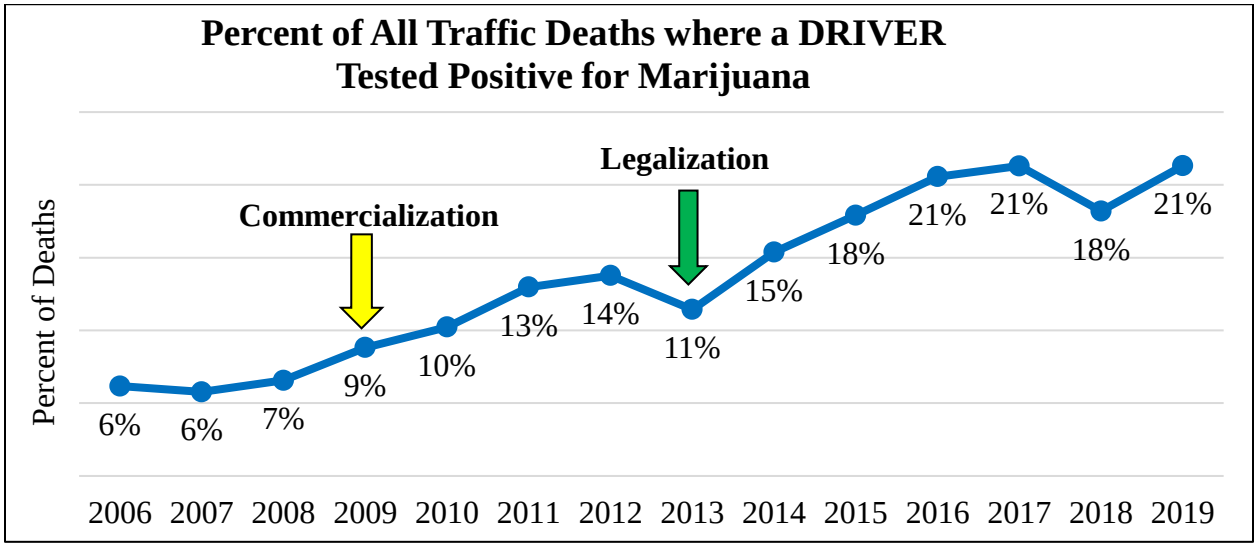
SOURCE: NHTSA, FARS, 2006-2011 and CDOT 2012-2019

NOTE: In 2019, 69% of drivers' blood was tested after being involved in a fatal crash.

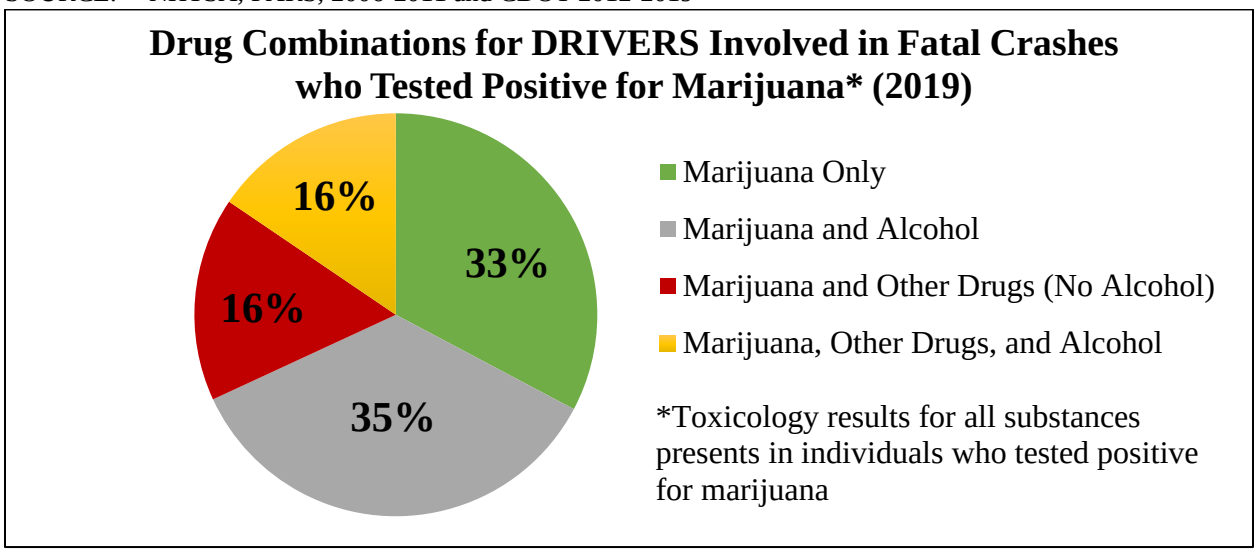
- In 2019, of the 116 drivers in fatal wrecks who tested positive for marijuana use, 113 were found to have Delta 9 tetrahydrocannabinol or THC, the psychoactive ingredient in marijuana, in their blood. This would indicate use within hours according to state data. Of those, 65% were over 5 nanograms per milliliter, the state permissible inference level for driving.
  - Similar to findings from the August 2017 article by David Migoya, "Exclusive: Traffic fatalities linked to marijuana are up sharply in Colorado. Is legalization to blame?" *The Denver Post*.



SOURCE: NHTSA, FARS, 2006-2011 and CDOT 2012-2019



SOURCE: NHTSA, FARS, 2006-2011 and CDOT 2012-2019



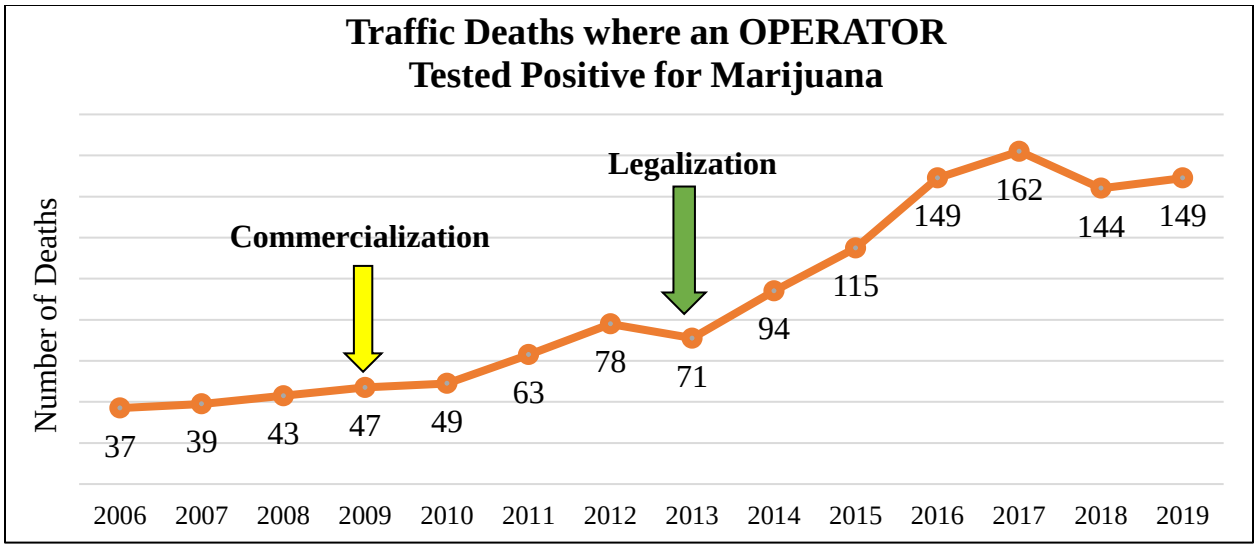
SOURCE: NHTSA, FARS, 2006-2011 and CDOT 2012-2019

Traffic Deaths Related to Marijuana Where an OPERATOR Tested Positive for Marijuana			
Crash Year	**Total Statewide Fatalities**	**Fatalities with Operators Testing Positive for Marijuana**	**Percentage Total Fatalities**
2006	535	37	6.9%
2007	554	39	7.0%
2008	548	43	7.9%
2009	465	47	10.1%
2010	450	49	10.9%
2011	447	63	14.1%
2012	472	78	16.5%
2013	481	71	14.8%
2014	488	94	19.3%
2015	547	115	21.0%
2016	608	149	24.5%
2017	648	162	25.0%
2018	632	144	23.0%
2019	596	149	25.0%

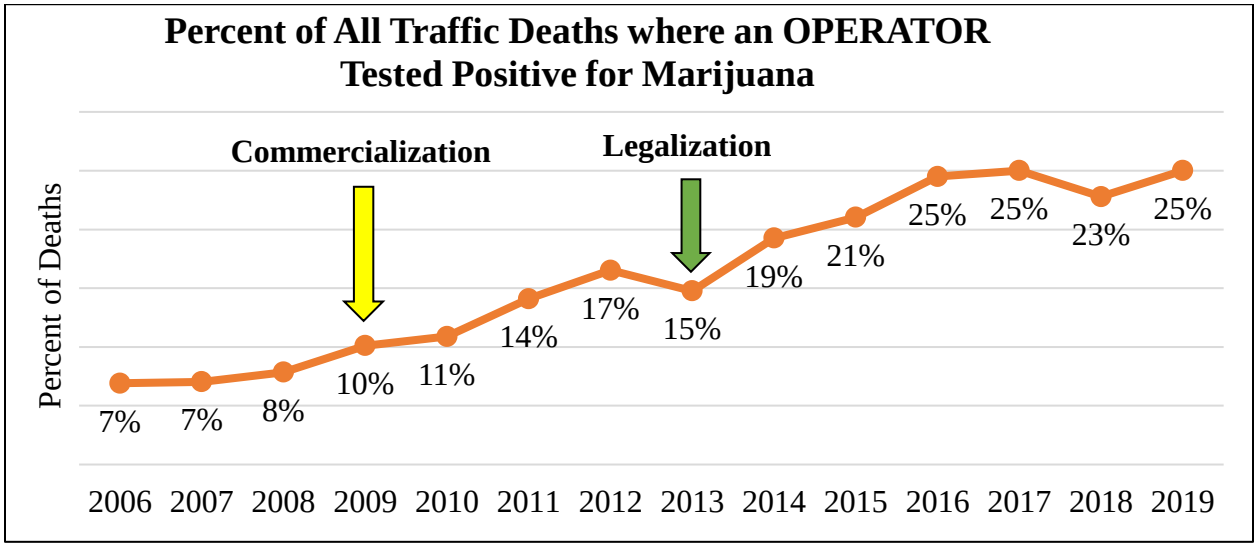
- Of the 149 marijuana-related traffic deaths:
  - 101 were drivers
  - 22 were pedestrians
  - 20 were passengers
  - 6 were bicyclists

SOURCE: NHTSA, FARS, 2006-2011 and CDOT 2012-2019

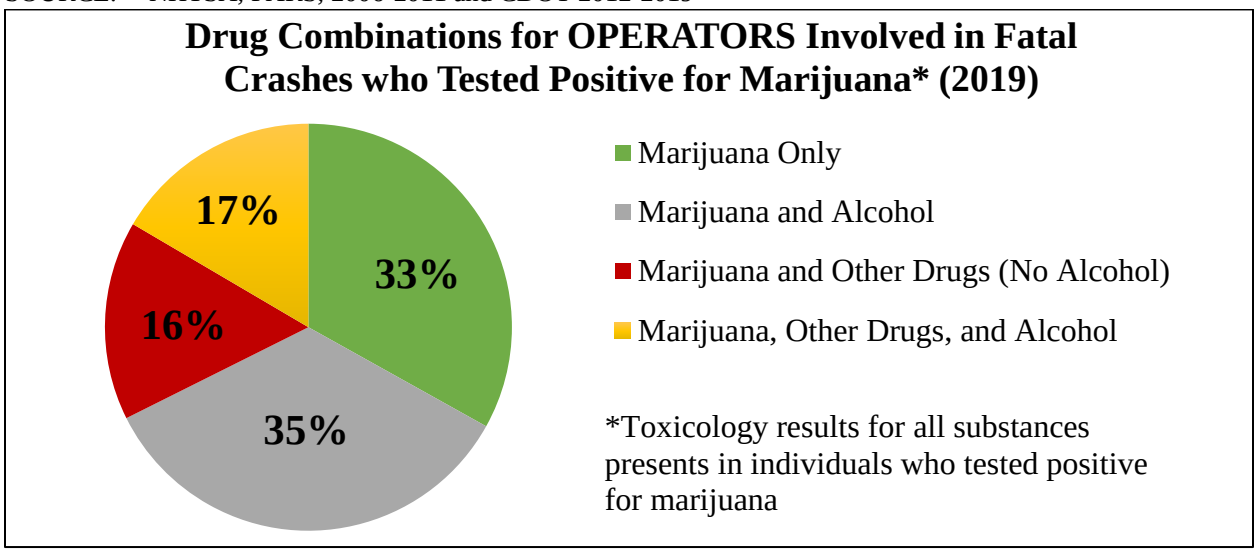
NOTE: In 2019, 66% of operators' blood was tested after being involved in a fatal crash.



SOURCE: NHTSA, FARS, 2006-2011 and CDOT 2012-2019



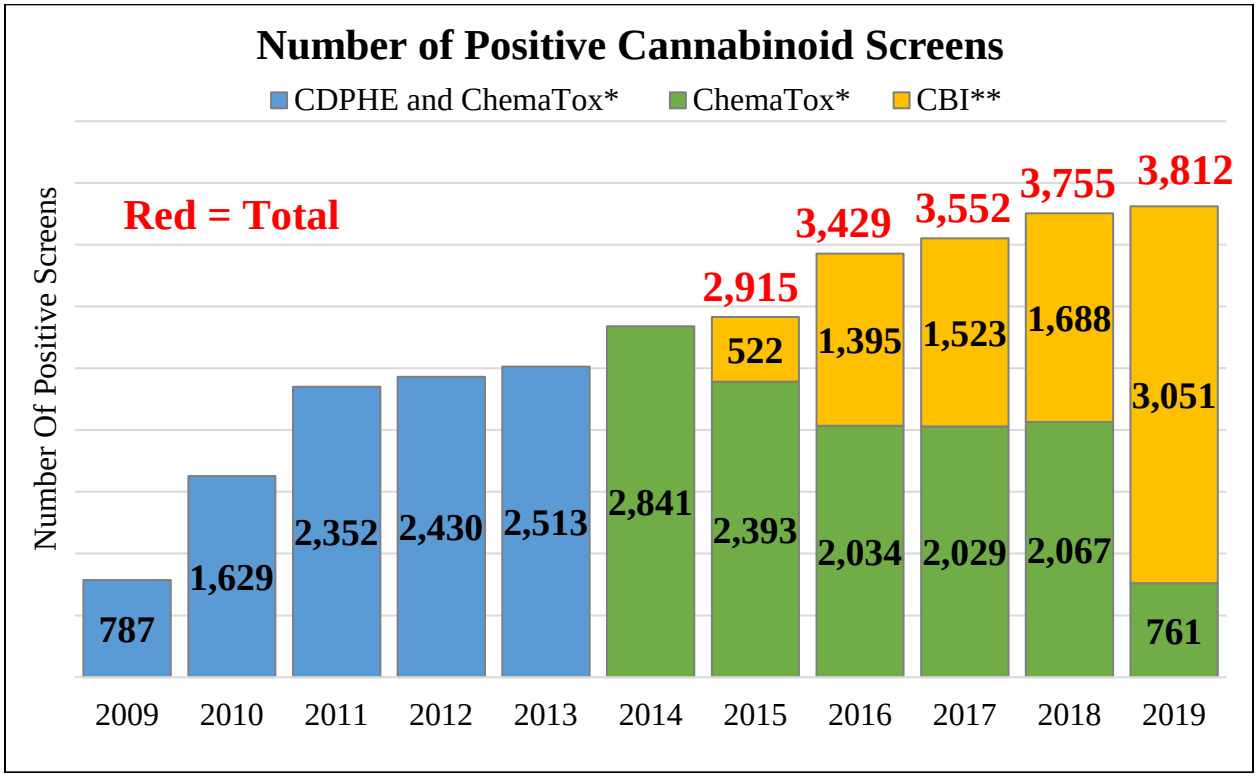
SOURCE: NHTSA, FARS, 2006-2011 and CDOT 2012-2019



SOURCE: NHTSA, FARS, 2006-2011 and CDOT 2012-2019

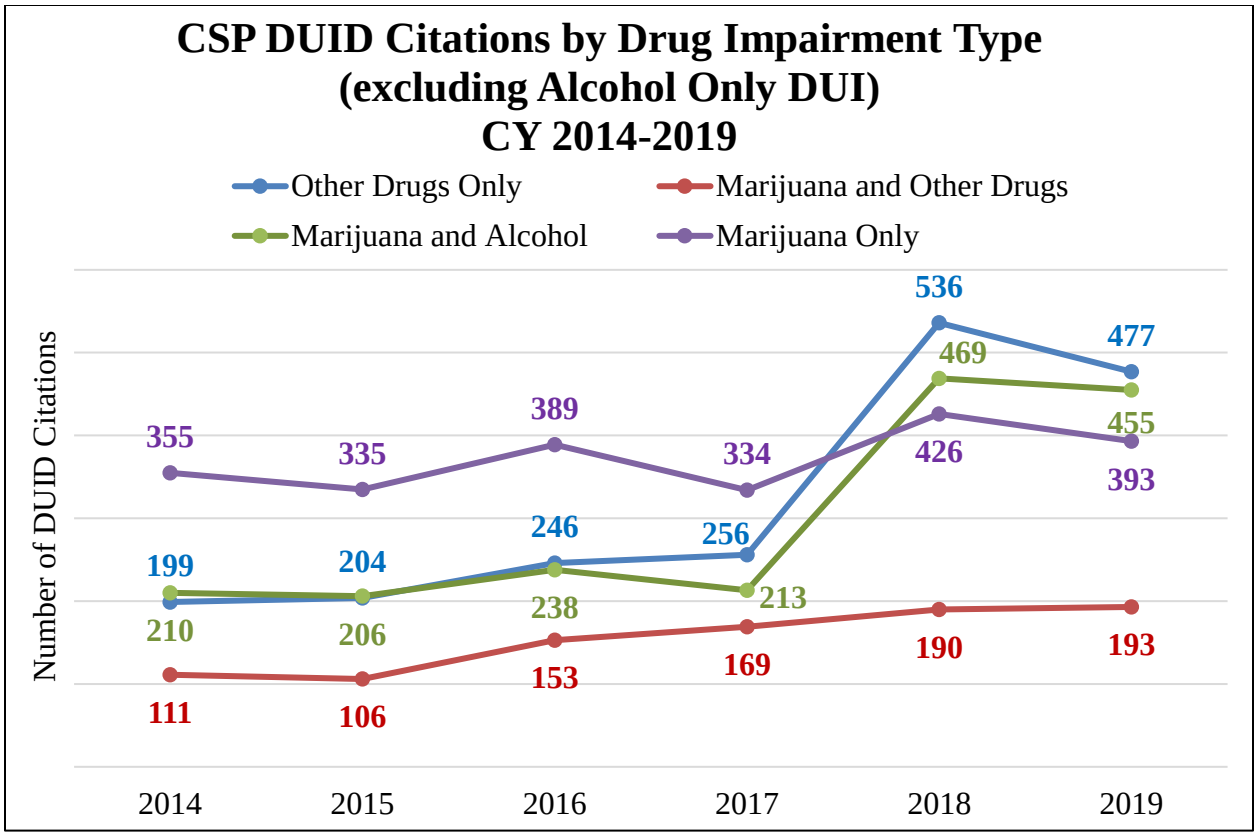
Impaired Driving

When a driver is arrested for impaired driving related to alcohol (usually 0.08 or higher blood alcohol content), typically tests for other drugs (including marijuana) are not requested since there is no additional punishment if the test comes back positive.



SOURCE: Colorado Bureau of Investigation, ChemaTox, and Rocky Mountain HIDTA

***NOTE:** Colorado Department of Public Health and Environment data was merged with ChemaTox data from 2009 to 2013. CDPHE discontinued testing July 2013 and ChemaTox discontinued testing July 2019.
****NOTE:** The Colorado Bureau of Investigation began toxicology operations July 1, 2015 and became the sole agency in the state to conduct toxicology reports July 1, 2019. The vast majority of the screens are DUID submissions from Colorado law enforcement.

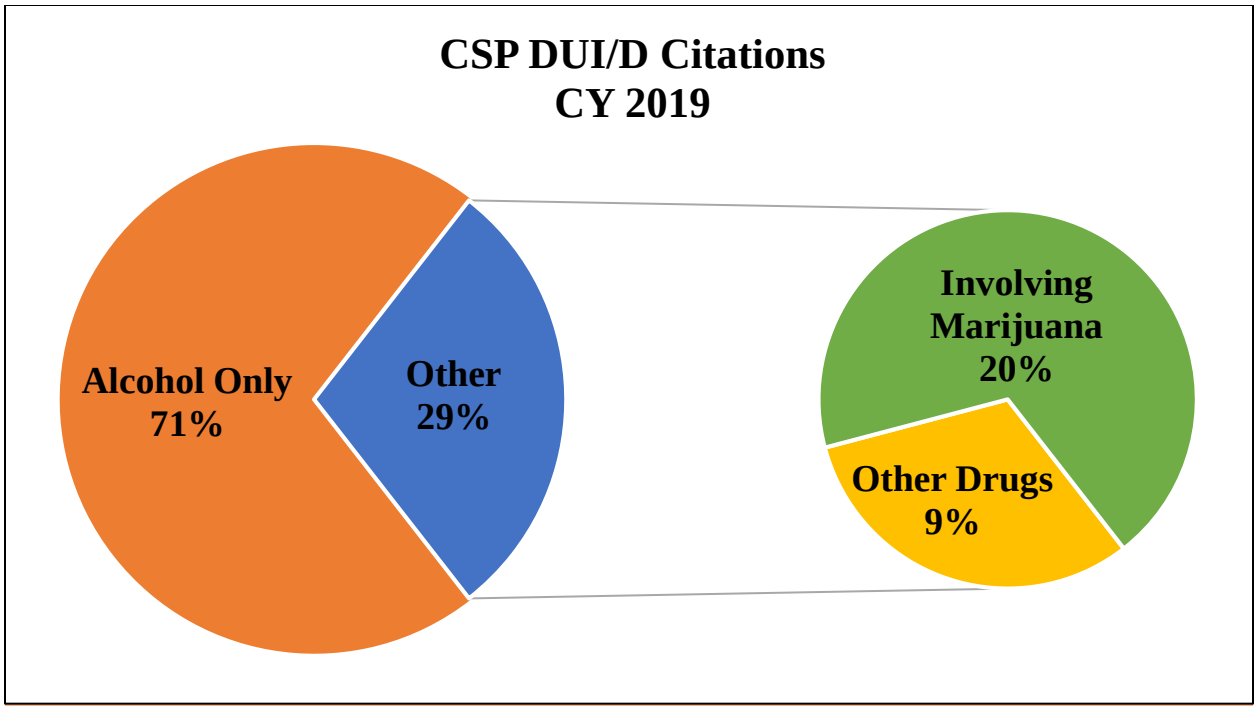


SOURCE: CSP RDW; only displaying data available as of 08/24/2020

DUI/D Citations by Drug Impairment Type						
	2014	**2015**	**2016**	**2017**	**2018**	**2019**
Alcohol Only	4620	3948	3528	3817	3541	3727
Other Drugs	199	204	246	256	536	477
Marijuana and Alcohol	210	206	238	213	469	455
Marijuana and Other Controlled Substances	111	106	153	169	190	193
Marijuana Only	355	335	389	334	426	393
Total Marijuana Involved Citations	**676**	**647**	**780**	**716**	**1085**	**1041**
Total DUI/D Citations	**5495**	**4799**	**4554**	**4789**	**5162**	**5245**

SOURCE: CSP RDW; only displaying data available as of 08/24/2020

NOTE: "Citations in the Colorado State Patrol (CSP) Reporting Data Warehouse (RDW) are defined as one per involved person when the involved person has at least one charge as denoted in the RDW (excluding oral and written warnings), that occurred during a traffic stop unique on date, time, location road, mile point round, and driver's license number. Impaired (DUI/D) citations were identified in the CSP RDW by the following common codes: 753, 754, 755, 765, 785, 800, 801, 802, 805, 806, 807, 808, 809, 810, 812, 813, 814, 815, 820, 821, or MPC." -Colorado State Patrol



SOURCE: CSP RDW; only displaying data available as of 08/24/2020

Impaired Driving Information

International Perceptive on Responding to Cannabis Impaired Driving

This article serves to summarize the key points from the Third International Symposium on Drug-Impaired Driving in Lisbon in October 2017:

- "Cannabis intoxication impairs performance in driving simulators and in on-road driving studies. Meta-analyses of epidemiological studies of biological indicators of cannabis and other drugs in the blood and urine of injured drivers and car crash fatalities suggest that recent cannabis use increases the risks of an accident from 1.5 to 2 times."
- "The proportion of fatalities attributed to cannabis has been much smaller than that are attributable to alcohol for two main reasons: the relative risk of having an accident is much smaller for cannabis-impaired than for alcohol-impaired drivers; the prevalence of cannabis-impaired driving is much lower than that of alcohol-impaired driving."
- One of the largest issues in reducing cannabis-impaired driving is the "absence of any equivalent to alcohol breath tests as a marker of driver impairment."
- Two of the approaches to cannabis impaired driving have been:
    - The use of "oral fluid testing to identify drivers who have recently used cannabis and measure THC in blood if they fail the oral fluid test."
    - Defining "cannabis-impaired driving as driving with higher than a legally specified level of THC in the blood"- greater than 5 ng/ml in the US
- "Critics of this approach have argued that these per se THC levels in blood do not measure impairment and are designed to discourage cannabis use rather than to protect public safety."
- "The meeting suggested that a high priority for research should be more rigorous evaluations of the effects of drug testing on: road fatalities and injuries in which alcohol, cannabis, and other drugs are detected postmortem; changes in public attitudes towards the acceptability of driving after using cannabis and changes in cannabis users' perceived risks of being detected if they drive after using cannabis."

Source: Hall, W. (2018). *How Should We Respond to Cannabis Impaired Driving?* Drug and Alcohol Review, 37(1), 3-5.

Medical Marijuana Use Related to Driving Under the Influence of Cannabis

While cannabis policies in the United States have expanded greatly in the past decade, the literature regarding driving under the influence of cannabis (DUIC) is mixed and there are still some large data gaps. The authors highlight this issue with some studies finding the presence of THC, particularly delta-9-tetrahydrocannabinol, is associated with impaired driving. Other studies have concluded that cannabis use does not largely impact "unfavorable traffic events." These authors focused on medical cannabis patients due to "their high frequency of use" and the lack of current studies on how and if they contribute to DUIC at a large scale.

The results of this study in Michigan were that "the majority (73%) reported using cannabis daily or almost daily in the past 6 months." Then the results of the users who were DUIC ten or more time in the past six months were: "21.6% of the sample drove within 2 h[ours] of cannabis use,

18.7% drove a little high, and 7.2% drove while very high." The measures of "a little high" and "very high" were assessed by the respondents with no set definitions. The authors also focused on the lack of a standard dose for medical cannabis users, emphasizing the need for greater research. Additionally, there is a lack of knowledge regarding the relationship of DUIC and alcohol consumption for medical marijuana users.

Source: Bonar, E., Cranford, J., Arteberry, B., Walton, M., Bohnert, K., and Ilgen, M. (2019). *Driving Under the Influence of Cannabis among Medical Cannabis Patients with Chronic Pain*. Drug and Alcohol Dependence, 195, 193-197. https://doi.org/10.1016/j.drugalcdep.2018.11.016

Colorado Department of Transportation Campaign on Decreasing Driving Under the Influence of Marijuana

In the summer of 2017, the Colorado Department of Transportation created a campaign to learn from cannabis users in the state, engage the public, and discover new areas for research. The results for the campaign were a need to better understand:

- "Why some people drive under the influence of cannabis"
- "What the public perceives as the dangers of driving while cannabis impaired"
- "What would convince people not to drive high"
- "Norms and opinions around driving high from multiple perspectives"
- "Reactions to past campaigns to reduce high driving"
- "Reactions to new campaigns ideas to reduce high driving "

The key findings were:

- "People who consume cannabis more often consider driving under the influence of marijuana to be less dangerous."
    - The top considerations for users before driving are travel conditions, feeling alert enough, and how recently they consumed cannabis
- "Many cannabis users are highly skeptical of the laws, policies and enforcement regarding driving under the influence of cannabis — and want credible, nuanced information"
    - The largest issues for respondents were:
        - "The current legal limit of active THC in the bloodstream is not based on sufficient evidence"
        - "Bloodstream THC is an inaccurate measure of impairment because tolerance varies widely based on individual characteristics"
        - "THC stays in a person's system for a much longer time than alcohol—several weeks or months, depending on how much or how frequently someone uses"
- The key to reaching some skeptics is to lead with feelings and follow with facts.
    - Respondents felt a future, effective campaign would not include negative stereotypes, scare tactics, or threats and instead focused on how the choice to drive under the influence puts others at risk.

Source: Colorado Department of Transportation, (2020). *The Cannabis Conversation.* Retrieved from https://www.codot.gov/safety/alcohol-and-impaired-driving/druggeddriving/assets/2020/cannabis-conversation-report_april-2020.pdf

Cannabis Use in Older Drivers in Colorado

From August 2015 to March 2017, 600 Colorado drivers aged 65 to 79 participated in a study to understand if cannabis had an impact on their driving. Since 2001, the prevalence of marijuana use by this demographic has increased as more states legalized medical marijuana. The eligibility criteria included driving on average at least once a week, living in Colorado ten months out of the year, and "without significant cognitive impairment based on medical record review and a Six-Item Screener score." The main focus areas of the study were if they ever used cannabis, how many times in the past 12 months, how many times they drove a motor vehicle within an hour of use in the past year, and how many times they drove under these circumstances in the past 30 days. This resulted in four main self-reported driving-related outcomes: "self-rated abilities for safe driving; lapses, errors and violations; drinking and driving; and crashes and citations."

The results were 41% of participants reported having ever used cannabis and 9% (54 participants) reported using in the past year. Of those 54 that used in the past year, 50% used cannabis less than once a month, 17% used one to three times a month, 20% used one to five times per week, and 13% used more than once a day. Less than one percent of all participants and 9% of past-year users reported driving within an hour of using cannabis and almost half of those had done this in the past 30 days. Those in the older age group (closer to 79) were significantly less likely to use cannabis. There was not found to be any correlation between past-year cannabis use and "self-reported involvement in a crash or receipt of a citation in the past year." Conversely, "cannabis users were significantly more likely than non-users to have reduced their driving in the past year due to self-regulation." Ultimately, the authors concluded that "driving under the influence of cannabis does not appear likely to have an important impact on crash rates among older drivers currently."

Source: DiGuiseppi, C., Smith, A., Betz, M., Hill, L., Lum, H., Andrews, H., Leu, C., Hyde, H., Eby, D., and Li, G. (2019). *Cannabis use in older drivers in Colorado: The LongROAD Study.* Accident Analysis and Prevention, 132.

Section II: Marijuana Use

Some Findings

Since recreational marijuana was legalized in 2013:

- Past month marijuana use for ages 12 and older **increased 30%** and is **76%** higher than the national average, currently ranked **3rd** in the nation.
- Past month adult marijuana use (ages 18 and older) **increased 19%** and is **73% higher** than the national average, currently ranked **3rd** in the nation.
- Past month college age marijuana (ages 18-25) use **increased 6%** and is **50% higher** than the national average, currently ranked **3rd** in the nation.
- Past month youth marijuana (ages 12-17) use **decreased 25%** and is **43% higher** than the national average, currently ranked **7th** in the nation.

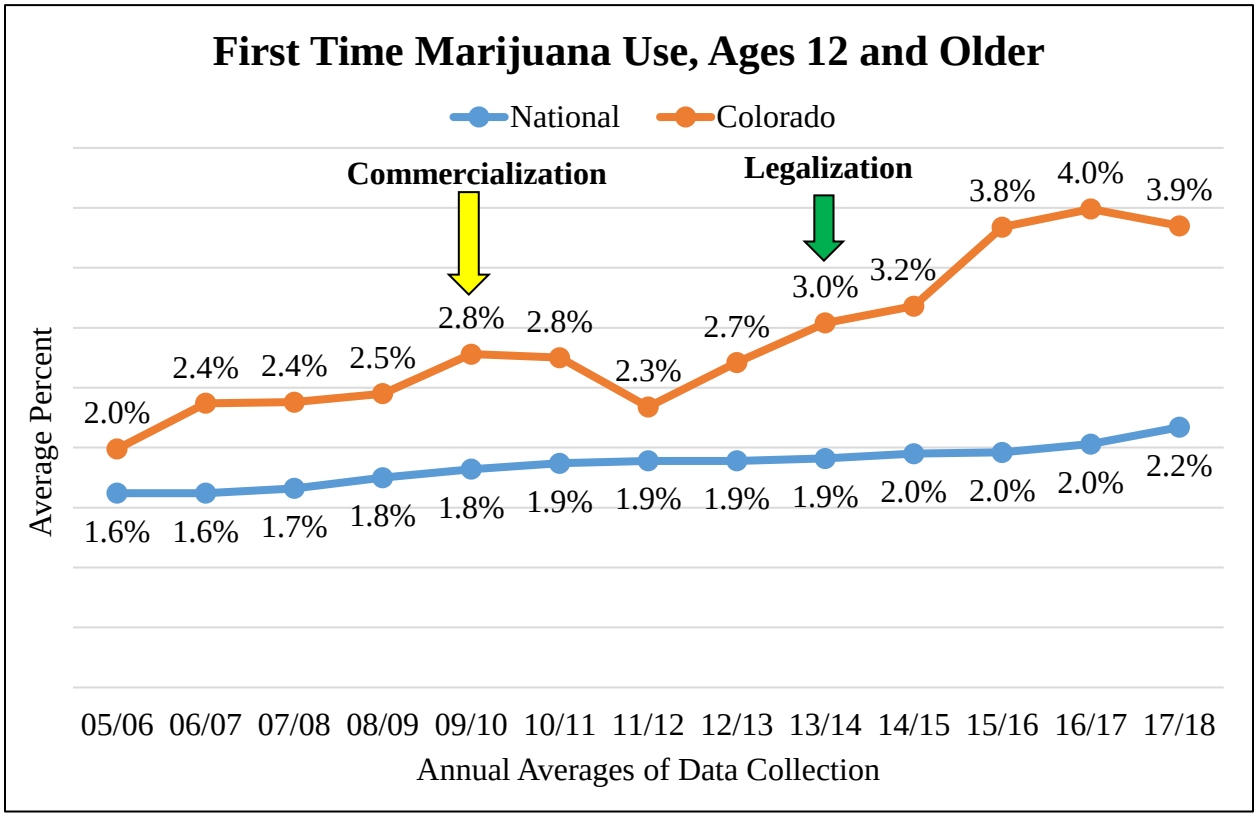
National Survey on Drug Use and Health (NSDUH) Data

Colorado Averages Compared to National Averages, Ages 12 and Older (NSDUH 2017/2018)		
	Colorado	**United States**
Marijuana Past Month Use	17.3%	9.8%
Perceptions of Risk for Smoking Marijuana	16.8%	25.5%
Illicit Drug Use Other than Marijuana Past Month	4.7%	3.3%
Alcohol Past Month Use	61.5%	51.4%
Cigarette Past Month Use	17.1%	17.5%
Perceptions of Risk for Smoking Cigarettes	73.6%	71.7%

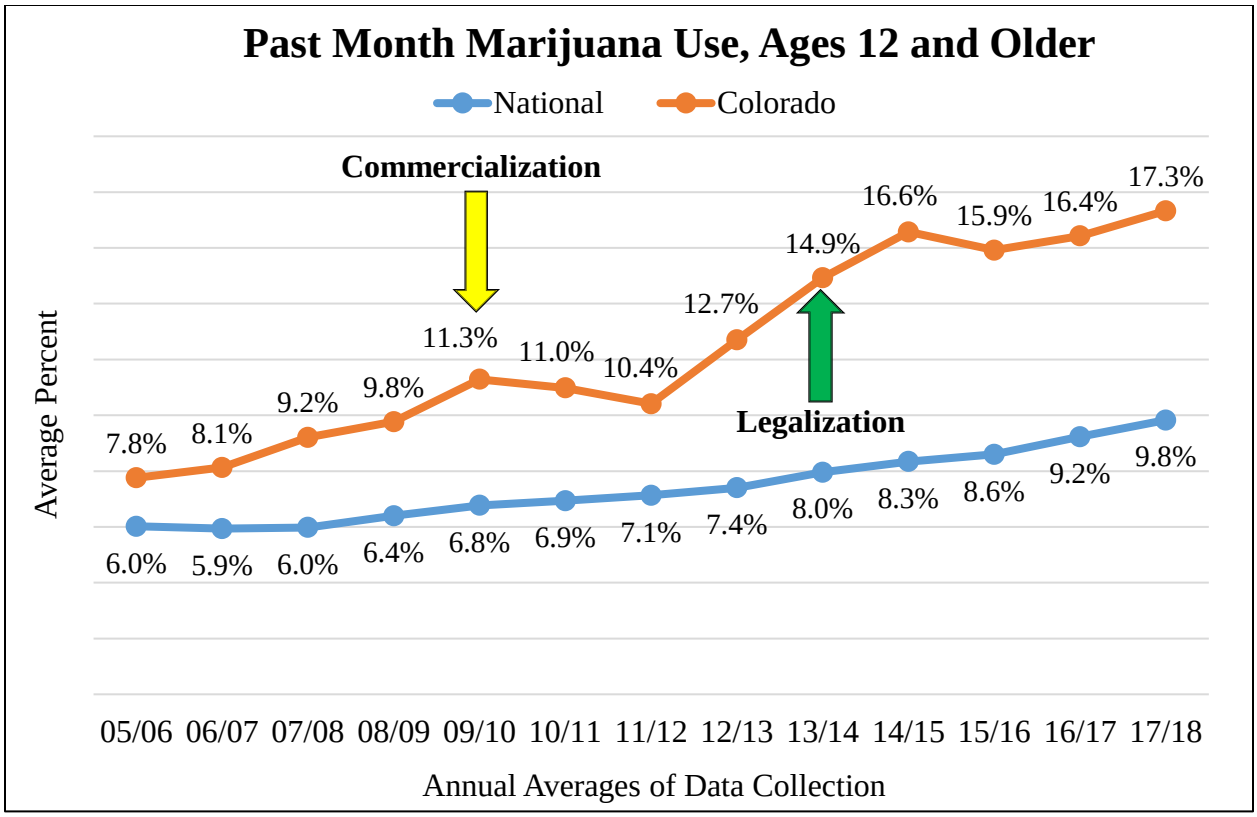
SOURCE: Substance Abuse and Mental Health Services Administration (SAMHSA), Center for Behavioral Health Statistics and Quality, NSDUH, 2017 and 2018

Marijuana First Time Use			
Age	**Colorado %**	**Colorado U.S. Ranking**	**National %**
12 years +	3.9%	3rd	2.8%
12 – 17	7.7%	7th	5.5%
18 years +	3.0%	5th	1.6%
18 – 25	13.1%	6th	8.3%
26+	1.3%	5th	0.5%

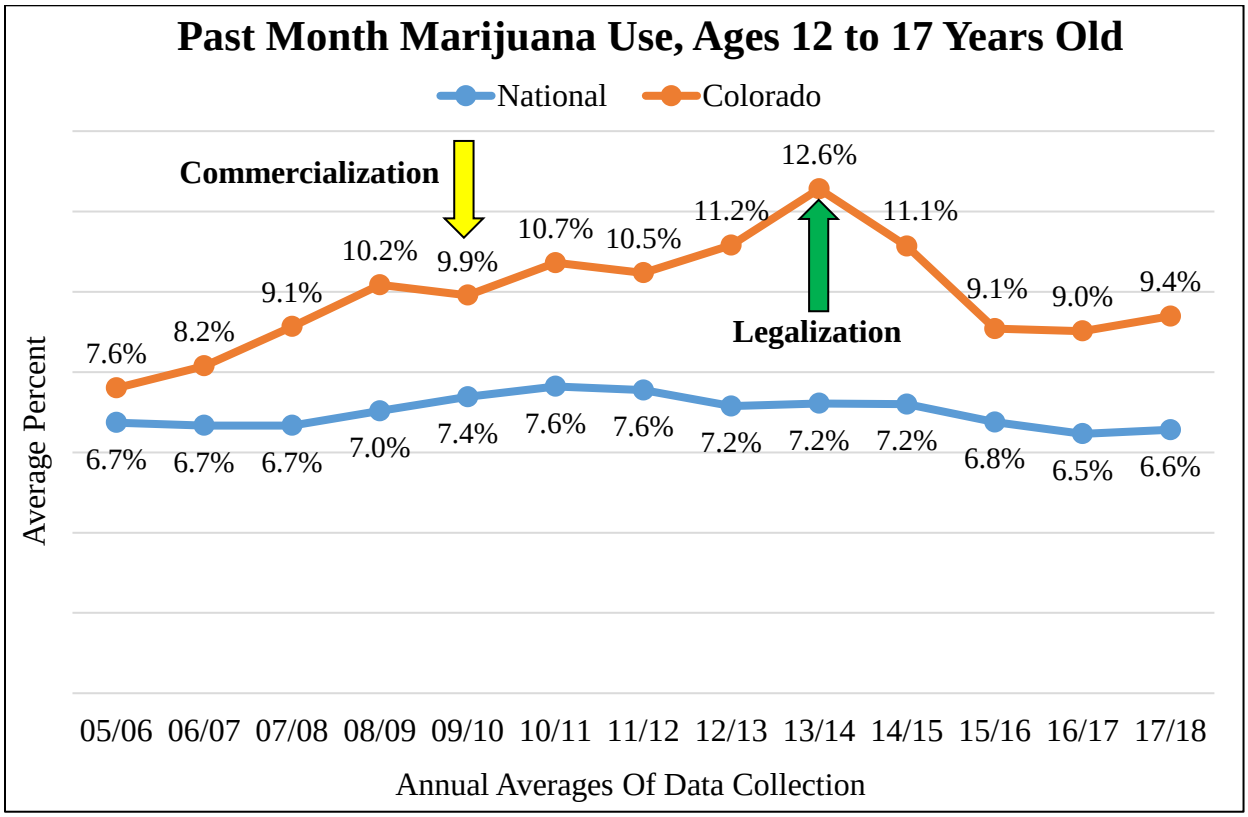
SOURCE: SAMHSA, Center for Behavioral Health Statistics and Quality, NSDUH, 2017 and 2018



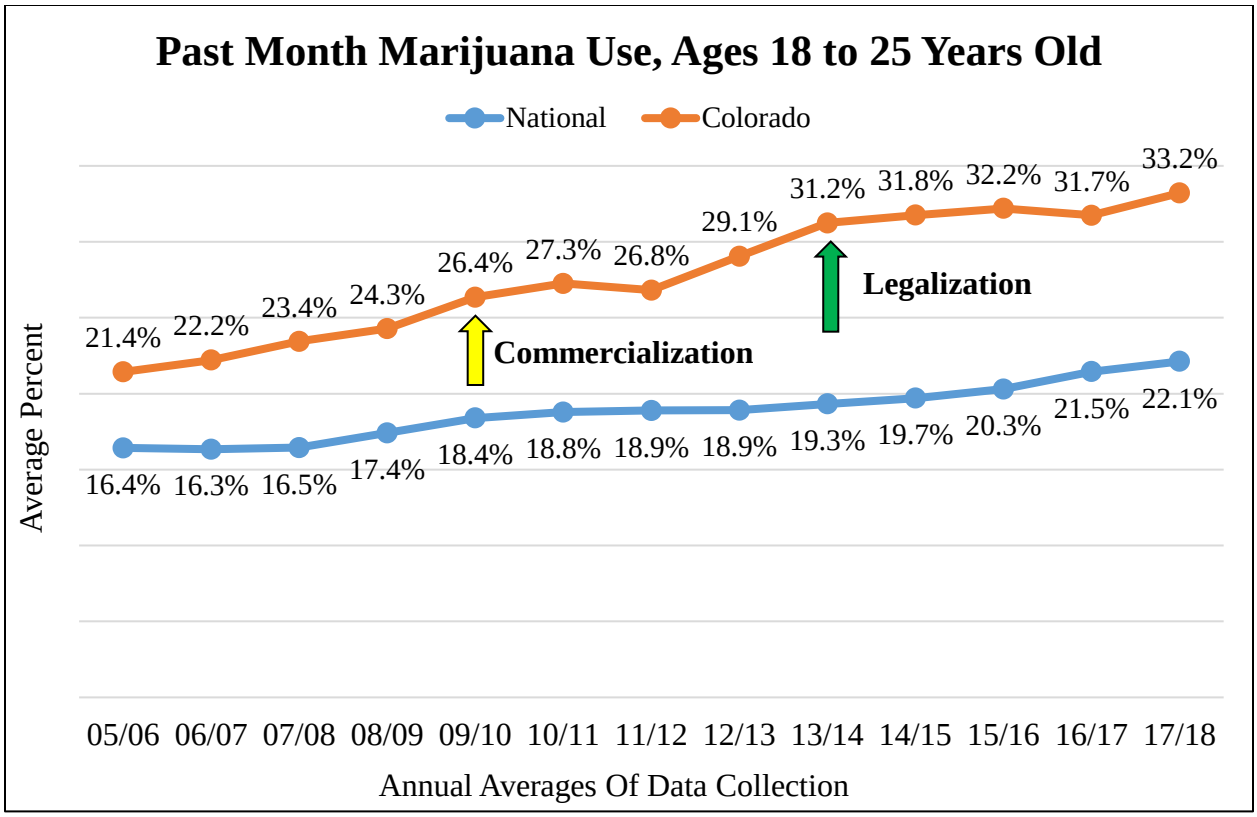
SOURCE: SAMHSA, Center for Behavioral Health Statistics and Quality, NSDUH, 2017 and 2018



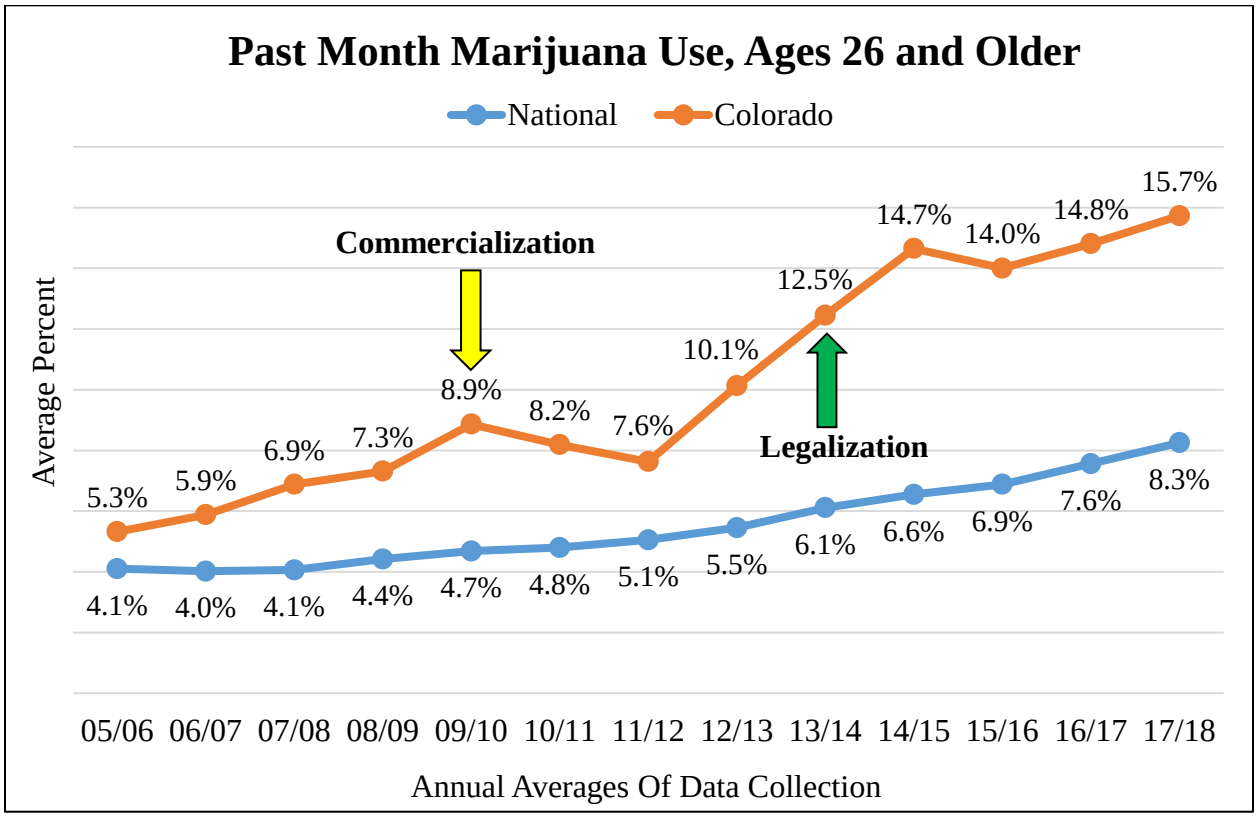
Source: SAMHSA, Center for Behavioral Health Statistics and Quality, NSDUH, 2017 and 2018



Source: SAMHSA, Center for Behavioral Health Statistics and Quality, NSDUH, 2017 and 2018



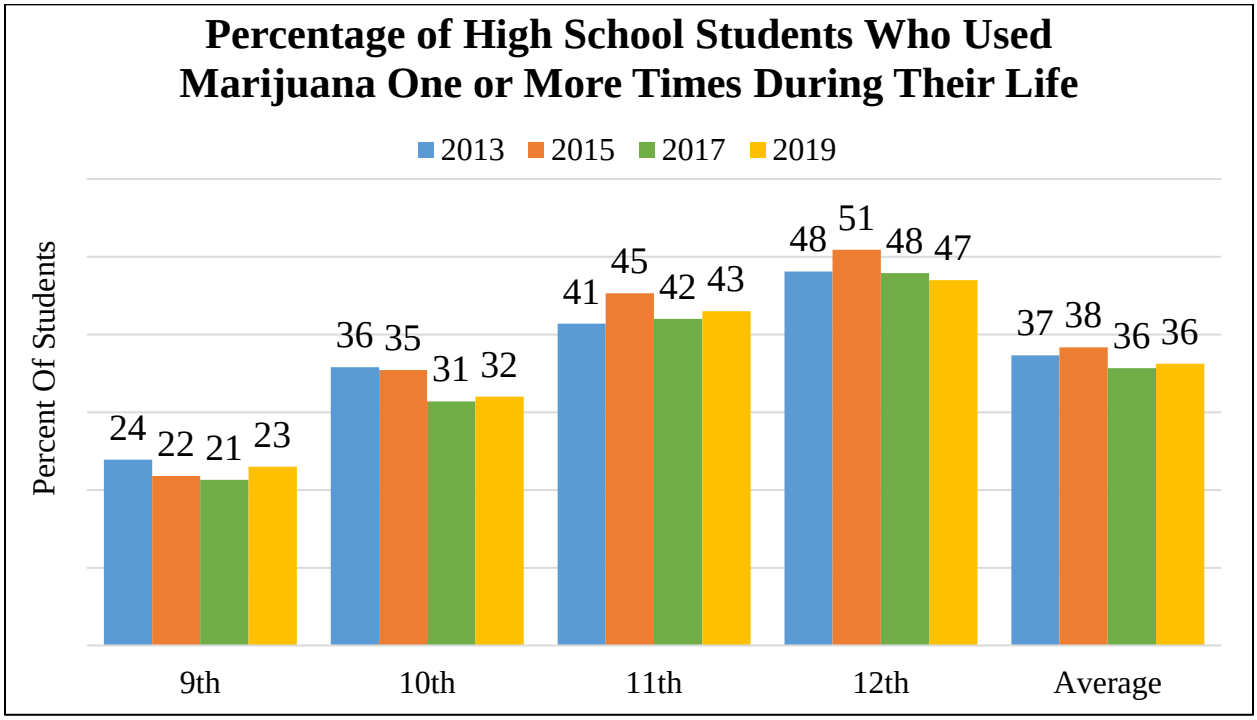
Source: SAMHSA, Center for Behavioral Health Statistics and Quality, NSDUH, 2017 and 2018



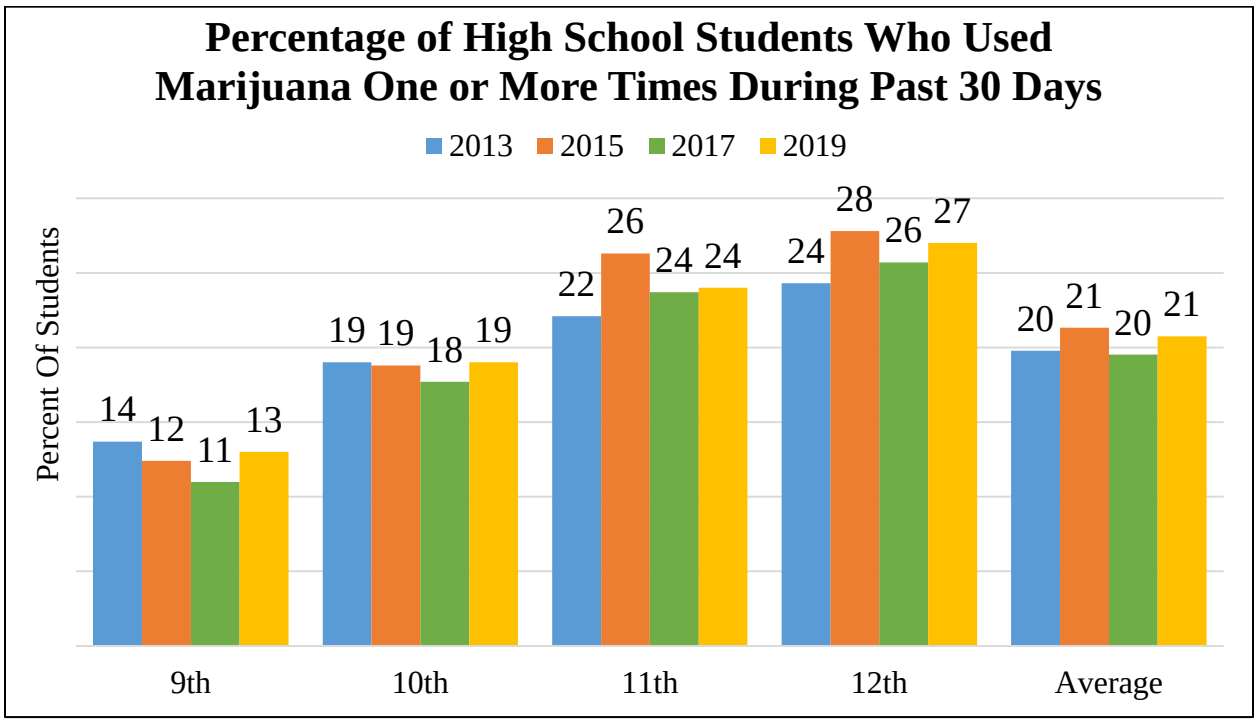
Source: SAMHSA, Center for Behavioral Health Statistics and Quality, NSDUH, 2017 and 2018

Healthy Kids Colorado Survey (HKCS) Data

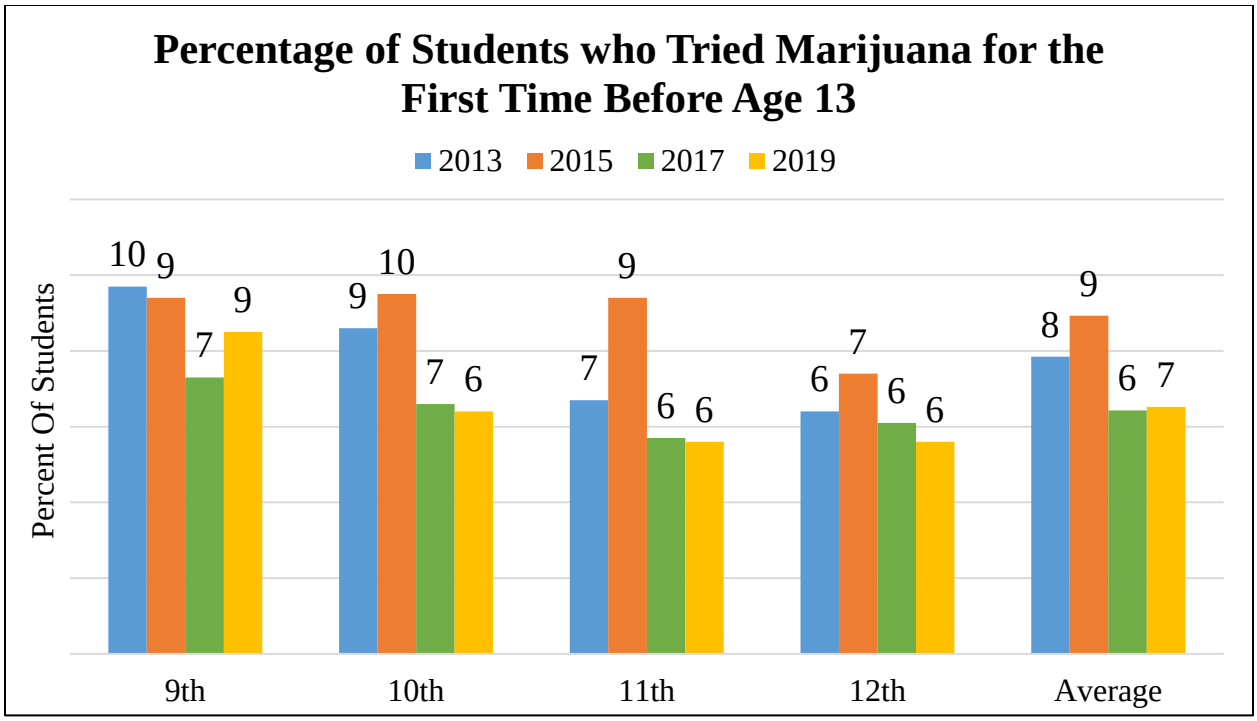
Data is collected in the odd years and released in even years, resulting in only 2013, 2015, 2017, and 2019 included for trend analysis.



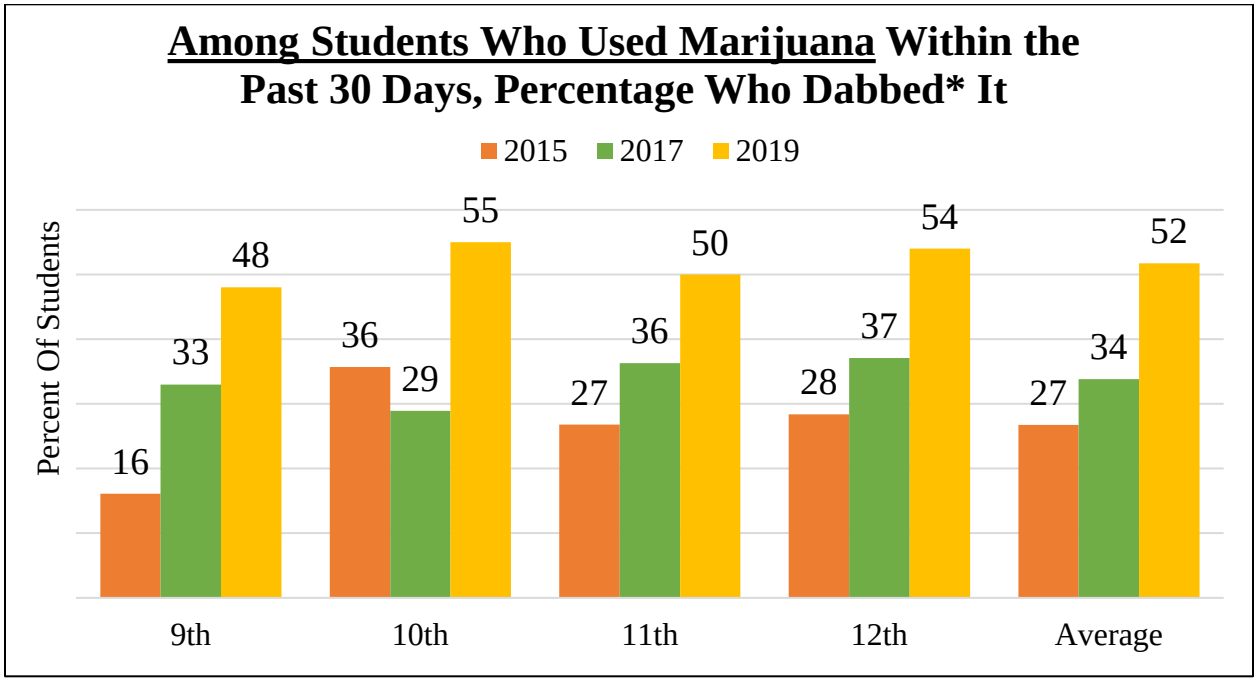
SOURCE: Colorado Department of Public Health and Environment (CDPHE), HKCS



SOURCE: CDPHE, HKCS



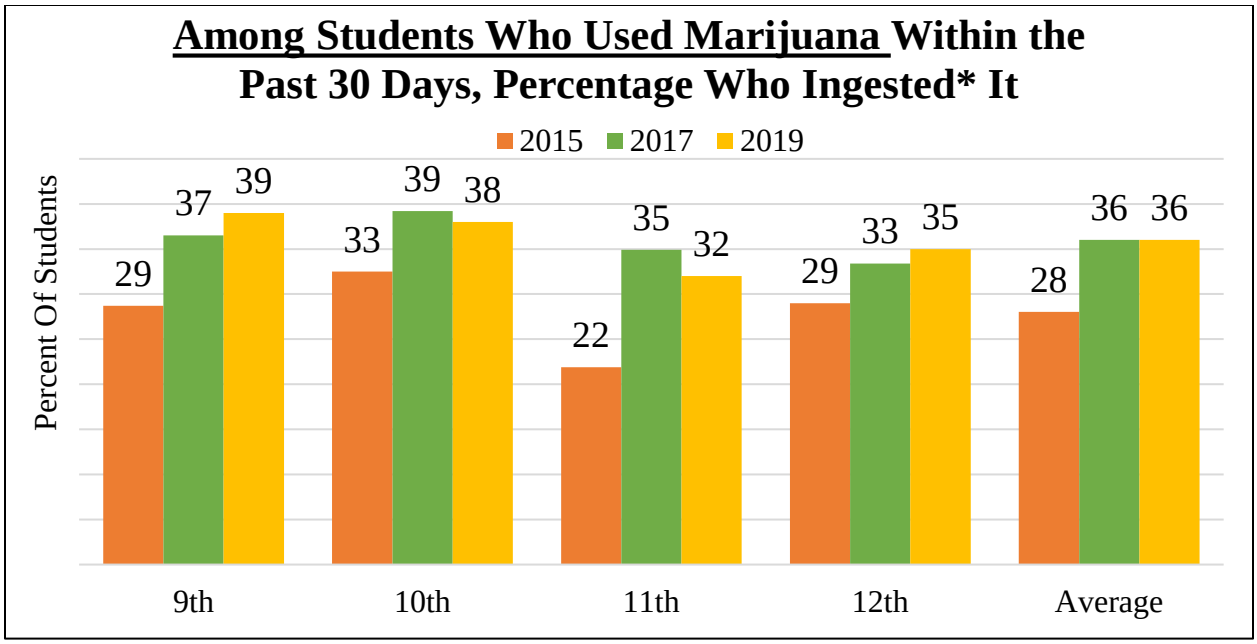
SOURCE: CDPHE, HKCS



SOURCE: CDPHE, HKCS

*Dabbing is the process of vaporizing concentrated marijuana, usually in the form of wax or resin, by placing it on a heated piece of metal and inhaling the vapors. Concentrated marijuana is known to often contain 70 percent or higher levels of THC, the psychoactive component of marijuana.

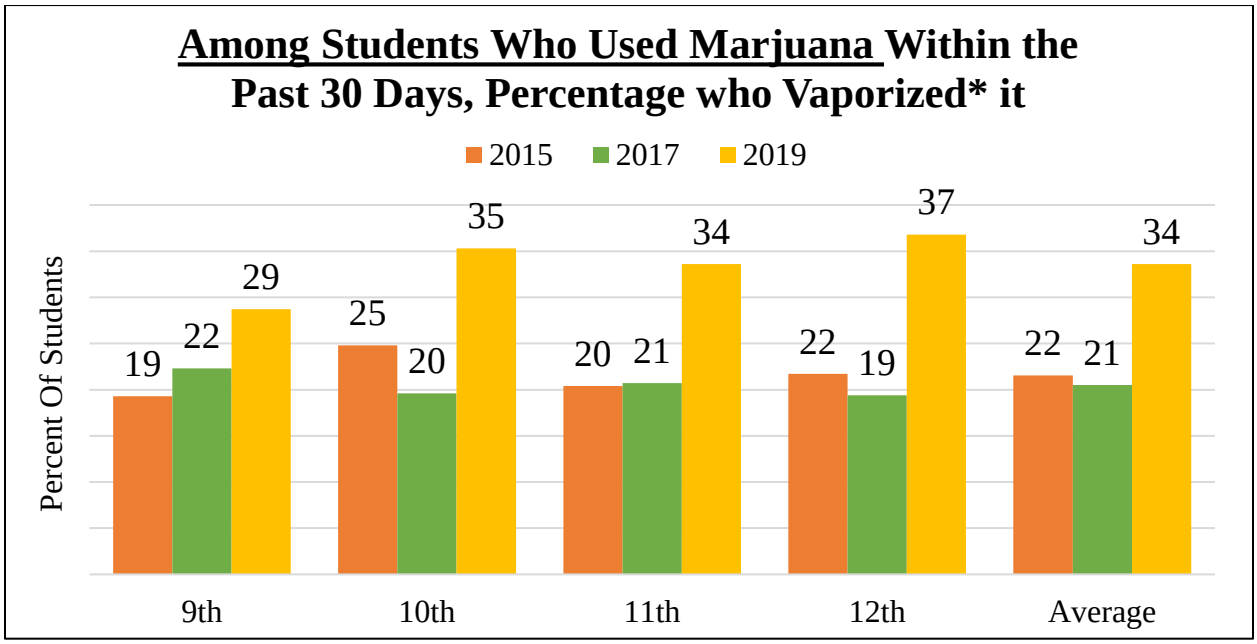
NOTE: Data was not gathered on this topic in 2013.



SOURCE: CDPHE, HKCS

*Eating marijuana most commonly refers to edible products. Edible products contain marijuana concentrates and extracts that have been made for the use of being mixed with food or other products.

NOTE: Data was not gathered on this topic in 2013.

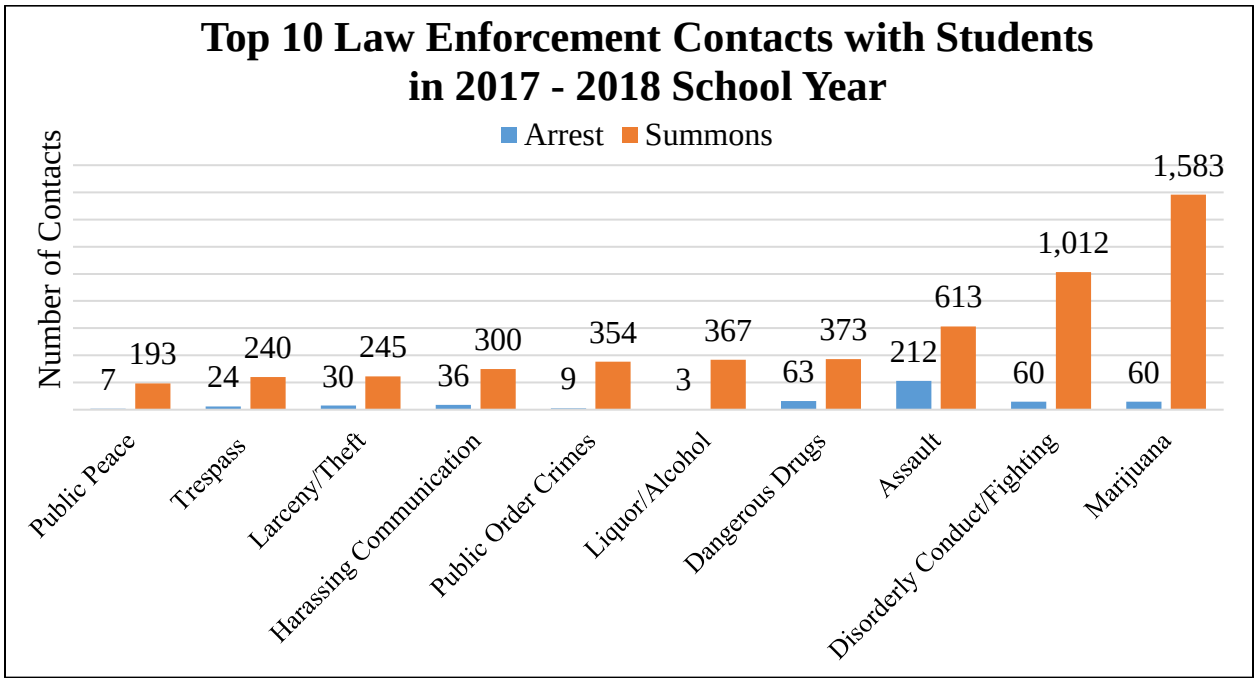


SOURCE: CDPHE, HKCS

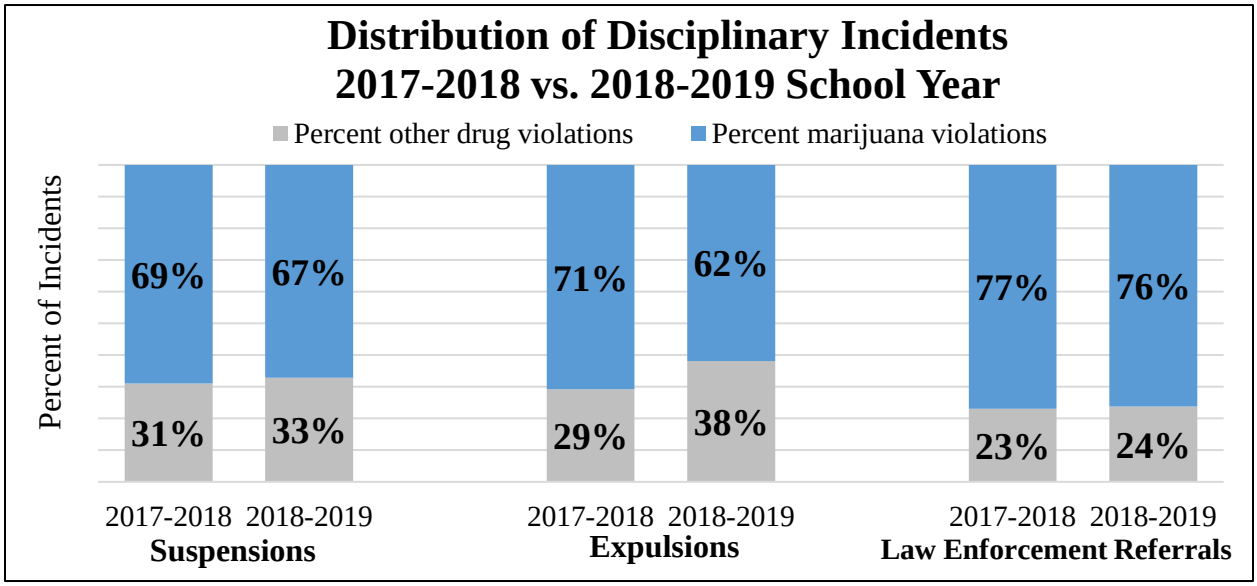
*"Vaporizing" marijuana most commonly refers to inhaling vapor through the mouth typically from a battery-operated electronic device that heats up and vaporizes a liquid or solid.

NOTE: Data was not gathered on this topic in 2013.

Marijuana in Schools



SOURCE: Colorado Division of Criminal Justice



SOURCE: Colorado Department of Education

NOTE: Law Enforcement Referrals may or may not have been in addition to another reported action taken (suspension, expulsion, or other).

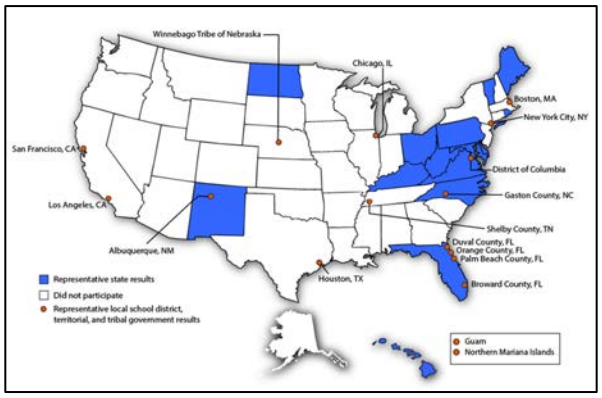
- For additional information regarding schools and incidents with marijuana, see "The Legalization of Marijuana in Colorado: *The Impact* Volume 5", at www.rmhidta.org for statements made by Colorado school resource officers.

Youth Risk Behavior Surveillance System (YRBSS) Data

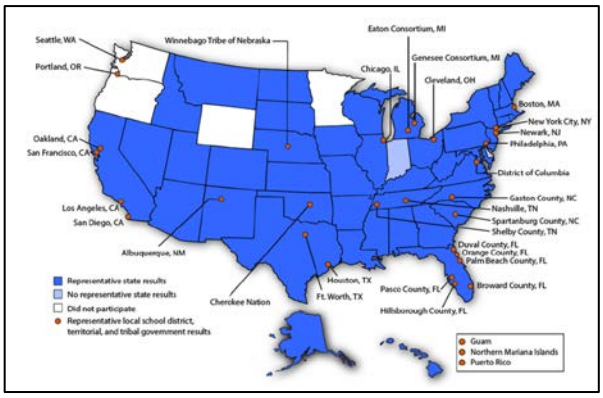
Typically, Colorado has fallen short of the required 60% participation rate and in some years, was not included with weighted data. In 2017 and 2019, the participation rate was high enough for high school, but Colorado still does not participate at a high enough level, if at all, for middle school. Additionally, states that meet the minimum participation requirements for inclusion with weighted data varies from year to year. As a result, comparisons of Colorado to the national averages will not be conducted until all states participate, especially all states that have legalized marijuana for an accurate portrayal. States that participated in the 2019 Middle School and High School YRBSS surveys are represented in dark blue in the below maps.

2019 YRBSS Participation Map

Middle Schools



High Schools

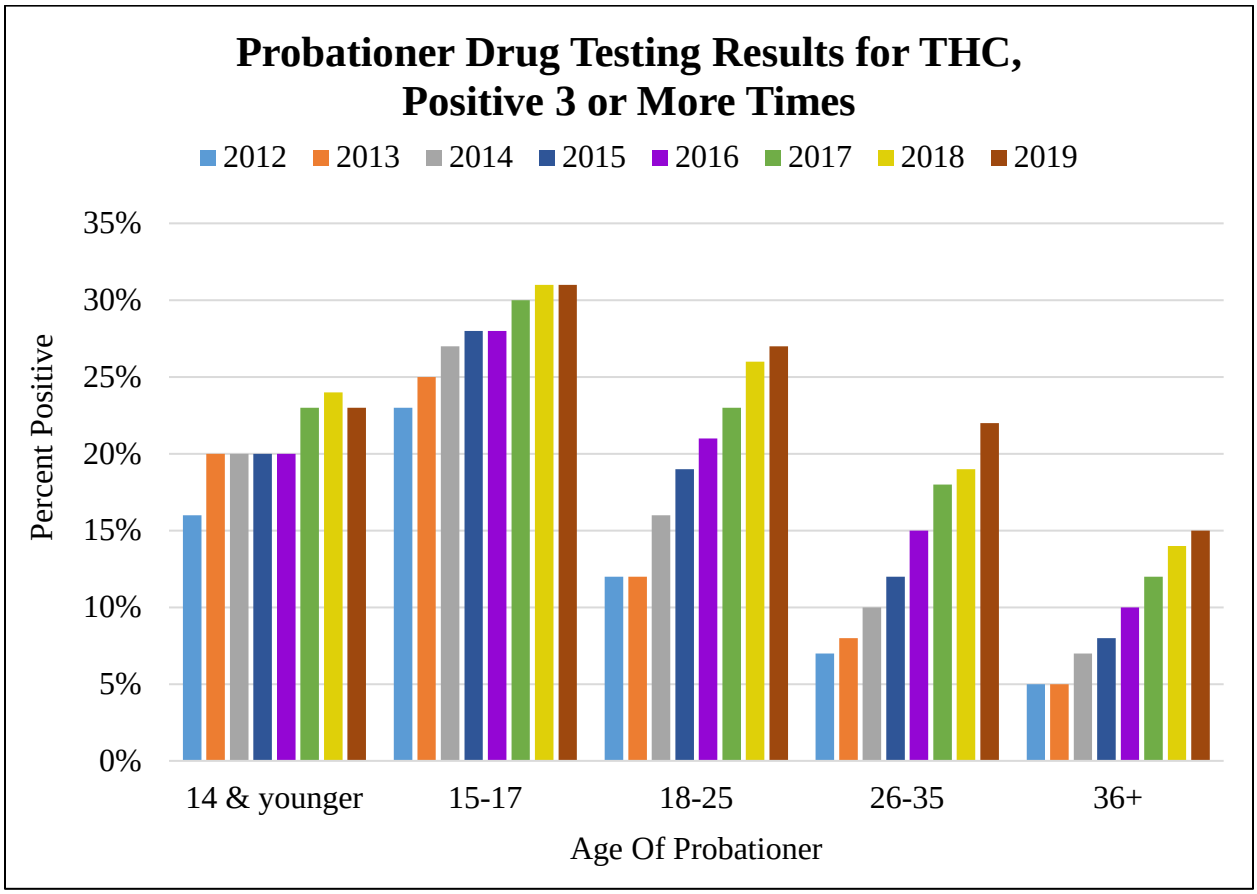


Marijuana First Time Use of Colorado High Schoolers (9-12th Grade)					
	2005	**2009**	**2011**	**2017**	**2019**
Ever Used Marijuana	42.4%	42.6%	39.5%	35.5%	35.4%
Tried Marijuana for the First Time Before Age 13	9.9%	8.3%	9.0%	5.9%	7.6%
Currently Use Marijuana	22.7%	24.8%	22.0%	19.6%	20.1%

SOURCE: YRBSS

NOTE: These five years were the only years that Colorado met the 60% participation rate.

Probationer Marijuana Use



SOURCE: Colorado State Judicial Branch, Division of Probation Services

NOTE: Data reflects drug test results for probationers required to undergo drug testing. This does not reflect all probationers in Colorado. Probationers who have a medical marijuana card are not prohibited from using marijuana while on probation. It is possible that some positive results may come from probationers using marijuana for medical reasons.

Marijuana Use Information

Comparing Marijuana Use in Youth in Colorado in 2013 to 2015

Through the use of the HKCS and YRBSS, the authors compared the marijuana use by youth in 2013 (pre-legalization) and 2015 (post-legalization). The measurements were marijuana use, marijuana-related perceptions, other substance use, demographic characteristics, and school characteristics. The parameters for school characteristics were: "(1) level of family poverty among students, (2) racial composition of students, (3) urbanicity of the school's municipality, and (4) whether the school's municipality permitted retail marijuana sales in 2015."

The results were a lack of a statistically significant change in both lifetime and thirty-day use of marijuana when comparing 2013 to 2015 for the Colorado high school students. Conversely, there was a decrease in 2015 of frequent use, which is defined as using over twenty times in the past thirty days. The two other significant decreases in 2015 were cigarette smoking and perceived harmfulness of marijuana. There was no significant change based on the four school characteristics defined above. Finally, the authors found "local retail sales may reflect both local norms about marijuana use as well as the prevalence of use, unrelated to the policy change."

Source: Brooks-Russell, A., Ma, M., Levinson, A., Kattari, L., Kirchner, T., Anderson Goodell, E., and Johnson, R. (2018). *Adolescent Marijuana Use, Marijuana-Related Perceptions, and Use of Other Substances Before and After Initiation of Retail Marijuana Sales in Colorado (2013–2015).* Prevention Science, 20, 185-193.

Youth Use in the Three Types of Cannabis Markets in the United States

This study compared youth use in established non-medial cannabis markets (Colorado, Washington, Alaska, Oregon) with new non-medical cannabis markets (California, Maine, Massachusetts, Nevada) and prohibited non-medical cannabis markets (NCM). The results were:

- Cannabis use for youth in the last month was significantly less in the prohibited states.
- For modes of use in the past 30 days, youth in established states were more likely to use an e-cigarette to vape cannabis.
- Both new and established NCM youth were more likely to have eaten or drank cannabis and using cannabis extracts.
- Youth in prohibited NCM were significantly less likely to have easy access to cannabis.
- The perception of harm was not significantly different between the three groups.
- The youth in prohibited and established NCMs were more likely to have driven a car within two hours of cannabis used.

Source: Wadsworth, E., Hammond, D. (2018). *Differences in Patterns of Cannabis Use Among Youth: Prevalence, Perceptions of Harm and Driving Under the Influence in the USA where Non-Medical Cannabis Markets Have Been Established, Proposed and Prohibited.* Drug and Alcohol Review, 37(7), 903-911.

School Nurses Permitted to Give Medical Marijuana at School

In 2018, a new law was created in Colorado that allowed school nurses to administer medical marijuana to students, an expansion from a previous law which allowed only a primary caregiver to administer it. This law requires a written plan, the need for a locked storage container at the

school and restricts students from handling the medical marijuana. In 2019, individuals under the age of 18 with autism spectrum disorders were included in the law as well
Some nurses have expressed concern due to no federal mandate protecting them for distributing the drug. The event that prompted the new law was an elementary student in Eagle County, Colorado with epilepsy and Tourette's syndrome who needed a dose of CBD oil during the school day to minimize symptoms. While there is difficulty in finding updated statistics, it appears that Eagle County is the only school district that has adopted this law. Though Colorado approved the use of nurses administering medical marijuana, school districts have to vote whether to enact it.

Source: Brusie, Chaunie (2019). *New Law Allows School Nurse to Give Medical Marijuana to Students in Colorado.* Retrieved from https://nurse.org/articles/school-nurses-give-marijuana-cbd-to-kids-colorado/

Walton v. People Expands Probationer Permitted Use of Medical Marijuana

In 2019, the Colorado Supreme Court overturned a district court's ruling, placing a greater burden on the prosecution to prove individuals should not be permitted to use medical marijuana while on probation. This ruling resulted from a case in Colorado Springs where an individual was found guilty of driving under the influence of alcohol. Even though they presented a medical marijuana registry identification card, the individual did not "provide a medical professional [in court] to testify regarding her authorization to use medical marijuana," so as a result, they were prohibited from using medical marijuana while on probation.

The previous law did not acknowledge any supporting documentation for the authorization of medical marijuana and required a medical professional to present in court. The Colorado Supreme Court found emphasis on a medical professional was "misplaced" as it "imposed a burden greater than that created by the legislature." Additionally, the Colorado Supreme Court did not agree with a blanket policy regarding prohibiting medical marijuana as the original intention of the law was considering defendants' individual circumstances. The main outcome of this ruling "requires the court to make particularized findings, based on material evidence, that prohibiting this defendant's otherwise-authorized medical marijuana use is necessary and appropriate to promote statutory sentencing goals."

Source: *Walton v. People*, 2019 CO 95 (2019)

Relationship between E-Cigarette Users and Vaporizing Cannabis

The primary concerns regarding portable, battery powered cannabis vaporizers are an increased potency of combustible cannabis possibly by four to thirty times and the greater concealment methods with a less conspicuous odor. This study focused on the likelihood of nicotine e-cigarette users to transition to the cannabis vaporizers. The typical users of cannabis vaporizers are young males with an early age of onset of e-cigarette use.

The results showed half of the sample reported trying any form of cannabis and 17.8% had lifetime use of an e-cigarette or vape pen to vaporize cannabis. Additionally, "cannabis vapers reported that, relative to smoking cannabis, vaping tastes better, is healthier, is easier to conceal/hide, does not smell as strong, is more convenient, and produces a stronger/better high." Some of the qualities that resulted in a higher likelihood of vaping cannabis at some point were being male, impulsive,

and having poor self-control. Impulsivity was associated with lifetime use, past-month use, and frequency of using a cannabis vaporizer, while poor self-control was associated with lifetime and past-month use. Finally, the findings showed using e-cigarettes increases the likelihood to consume cannabis through vaporizers.

Source: Morean, M. Lipshie, N., Josephson, M., and Foster, D. (2017). *Predictors of Adult E-Cigarette Users Vaporizing Cannabis Using E-Cigarettes and Vape-Pens*. Substance Use and Misuse, 52(8), 974-981.

Impact of Cigarette Use on Increased Risk of COVID-19

Due to the concerns of preexisting conditions, particularly prior respiratory damage, this article examines the relationship of cigarette and e-cigarette use with the risk of contracting COVID-19. Early studies in China found "smokers were at elevated risk of COVID-19 progression compared with non-smokers." One particular focus of this relationship is if the risk for youth increases in contracting COVID-19 if they use e-cigarettes. This study focused on young adults from 13 to 24 years old for a week in May 2020 in an online survey.

The findings showed "past 30-day dual-users were 4.7 times more likely to experience COVID-19 related symptoms." This was compounded with a higher risk of COVID-19 for racial minorities (African Americans, Hispanic, multiracial/other), preexisting conditions (under or overweight), and LGBTQ. Additionally, not complying with stay-at-home/shelter-in-place resulted in a higher risk. "Surprisingly, exclusive ever-use of combustible cigarettes was only associated with COVID-19 related testing, whereas both past 30-day use and ever-use of e-cigarettes and dual use were associated with COVID-19 testing and positive diagnosis." Some of the suggested explanations for this increased risk of COVID-19 for cigarette and e-cigarette users was existing lung damage, sharing of devices with others, and repeating touching of one's hands to face. The authors suggested more education is needed in schools and communities of this increased risk.

Source: Gaiha, S., Cheng, J., and Halpern-Felsher, B. (2020). *Association Between Youth Smoking, Electronic Cigarette Use, and Coronavirus Disease*. Journal of Adolescent Health, 1-5. Retrieved from https://www.sciencedirect.com/science/article/pii/S1054139X20303992

Drug Testing Positivity in the Workplace in the United States

Quest Diagnostics, the world's leading provider of diagnostic information services, reported "the rate of workforce drug positivity hit a sixteen-year high in 2019" at 4.5% positivity rates from urine drug tests in the combined U.S. workforce. From 2010-2012, Quest Diagnostics reported a thirty-year low of 3.5% positive and the highest percentage in 1988 at 13.6%. The increase in drug positivity in 2019 aligned with a 5% increase in drug deaths in 2019, "largely driven by methamphetamine, cocaine, and fentanyl." Additionally, "during the first few months of 2020, drug deaths increased about 13% compared with last year, attributable partly to social isolation and other disruptions caused by COVID-19."

From 2015 to 2019, methamphetamine positivity increased 12%, particularly in the Midwest. Cocaine positivity in Colorado increased 58% in the same timeframe. Nationwide, opiates positivity decreased 49%, while marijuana positivity increased 29%. "Marijuana continues to top the list of the most commonly detected illicit substances across all workforce categories (general

U.S. workforce; federally mandated, safety-sensitive workforce; and combined U.S. workforce, which includes the prior two populations) and specimen types (urine, oral fluid, and hair)."

Source: Quest Diagnostics. (2020). *Workforce Drug Testing Positivity Climbed to Highest Rate in 16 Years, New Quest Diagnostics Drug Testing Index™ Analysis Finds.* Retrieved from https://www.questdiagnostics.com/home/physicians/health-trends/drug-testing/

Marijuana Use Associated with Suicidal Ideation and Behavior Among US Adolescents

Even though suicide is the second leading cause of death for adolescents (10 to 24-years-old), the problem lies not only in deaths but suicide attempts. In 2018, there were over 208,000 attempts by adolescents treated in emergency departments, likely lower than the actual amount since not all lead to emergency department visits. While tobacco, alcohol, and marijuana have been associated with adolescent suicides, few studies have been conducted to better understand the relationship.

Data used in this study was collected from the Youth Risk Behavior Surveillance Survey from 2011 to 2017. (*It should be noted that all states are not included in this survey unless they met the 60% participation rate and the results are only analyzed every other year.*) "The overall response rates for 2011, 2013, 2015, and 2017, respectively, were 71%, 68%, 60%, and 60%." The results showed an association between marijuana, tobacco, and alcohol use, all independent of each other, with suicide-related outcomes (ideation, plans, attempts, and attempts requiring medical attention). Additionally, "high levels of substance use were at greater risk of suicide attempts than classes with lower levels of use," similar to results found in other studies. Finally, recent data gathered on electronic vaping in 2015 and 2017 were associated with suicidal behaviors.

Source: Kahn, G. and Wilcox, H. (2020). *Marijuana Use Is Associated with Suicidal Ideation and Behavior Among US Adolescents at Rates Similar to Tobacco and Alcohol*, Archives of Suicide Research, DOI: 10.1080/13811118.2020.1804025

College Students' Perspectives on Marijuana Legalization

Over 7,000 college students across the country were surveyed to evaluate the impact of marijuana legalization on the "perception of risk, frequency, and formulations used". The focus was on undergraduates and the states were categorized as recreational, medical, and non-legal. Only 3% of these students were in recreational states (CO and WA), 35% of students were in medical states (18 states, including Washington DC), and 62% were in non-legal states (31 states).

No statistical difference was found for the risk to user's mental and physical health as well as financial well-being in all states. Students in recreational marijuana states endorsed marijuana use in the past three months at a higher rate. While consuming manufactured marijuana edibles was higher in students from recreational and medical states. There was not found to be a statistically significant difference in "the prevalence of smoking, vaporizing/e-cigarette, homemade edibles, or beverage consumption." Ultimately, the conclusion was college students in medical and recreational states reported using marijuana more frequently than non-legal states.

Source: Wang, G., Haynes, C., Besharat, A., Lait, M., Green, J., Dart, R., and Roosevelt, G. (2019). *Characterization of Marijuana Use in US College Students by State Marijuana Legalization Status as Reported to an Online Survey*. The American Journal on Addictions, 28(4), 266-269.

Section III: Public Health

Some Findings

- Marijuana *only* exposures more than **quadrupled** in the seven-year average (2013-2019) since recreational marijuana was legalized compared to the seven-year average (2006-2012) prior to legalization.
- Treatment for marijuana use for all ages **decreased 21%** from 2009 to 2019.
- The percent of suicide incidents in which toxicology results were positive for marijuana has **increased** from **14%** in 2013 to **23%** in 2018.

Definitions by Rocky Mountain HIDTA

Marijuana-Related: Also referred to as "marijuana mentions." Data could be obtained from lab tests, patient self-admission or some other form of validation obtained by the provider. Being marijuana-related does not necessarily prove marijuana was the cause of the emergency department admission or hospitalization.

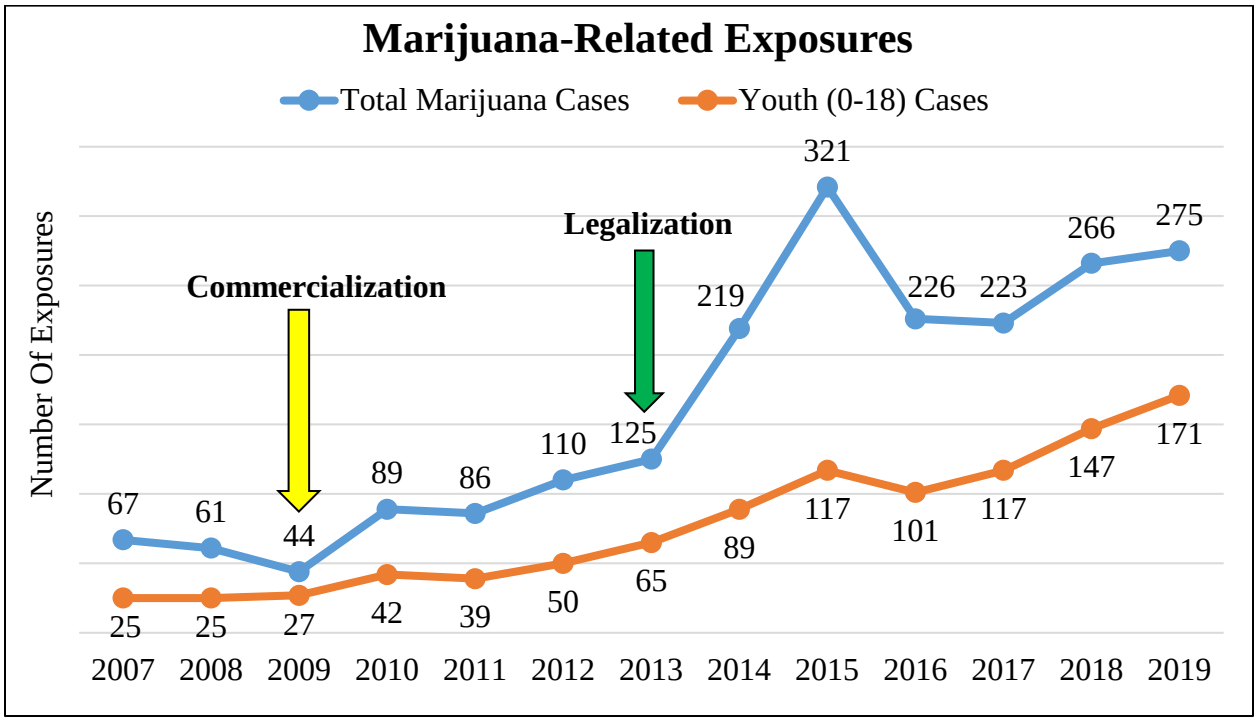
International Classification of Disease (ICD): A medical coding system used to classify diseases and related health problems.

**In 2015, ICD-10 (the tenth modification) was implemented in place of ICD-9. Although ICD-10 will allow for better analysis of disease patterns and treatment outcomes for the advancement of medical care, comparison of trends before and after the conversion can be made difficult and/or impossible. The number of codes increased from approximately 13,600 codes to approximately 69,000 codes. For the above reasons, hospitalization and emergency department data was only provided pre-conversion to ICD-10 for the 2017, Volume 5 report. However, some preliminary data for rates per 100,000 individuals was provided by the Colorado Department of Public Health and Environment (CDPHE) for this update.

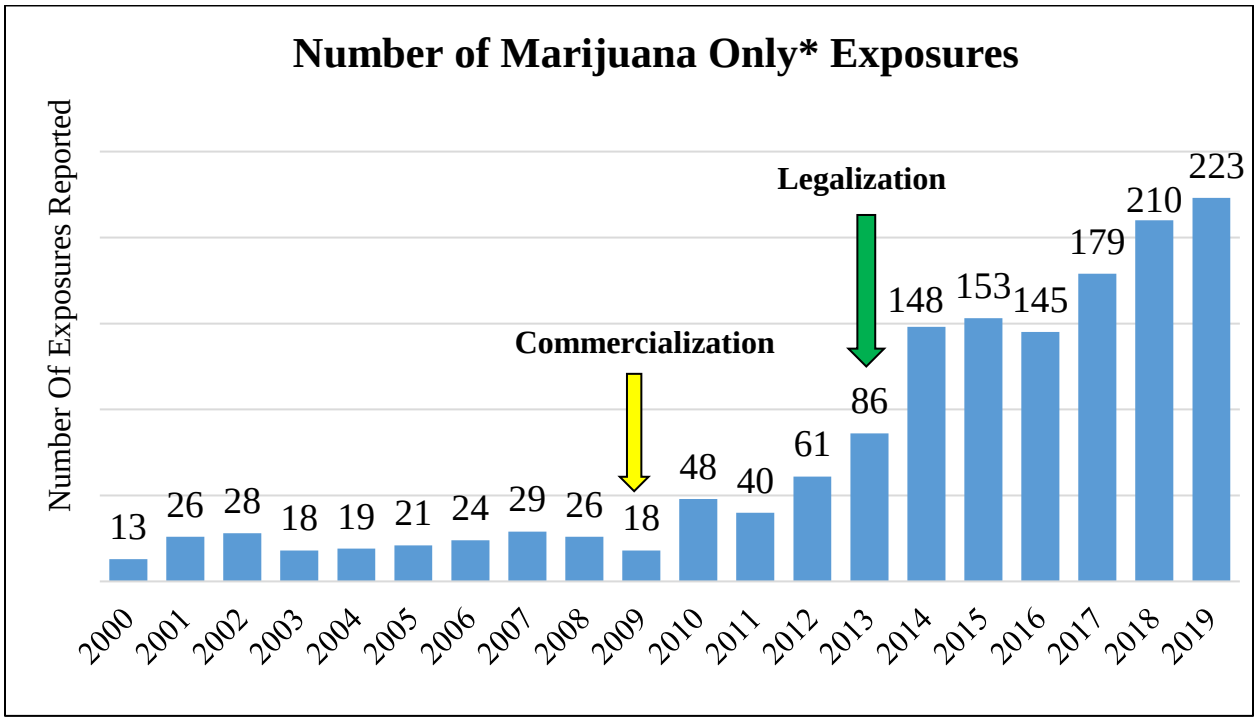
For more information regarding public health research gaps and data quality issues, please visit https://marijuanahealthinfo.colorado.gov/research-gaps.

2018 and 2019 Colorado Hospitalization Association data was unavailable at the time of publishing this report. Please refer to Volume 6 for the most recent numbers.

Poison Control/Marijuana Exposure Data

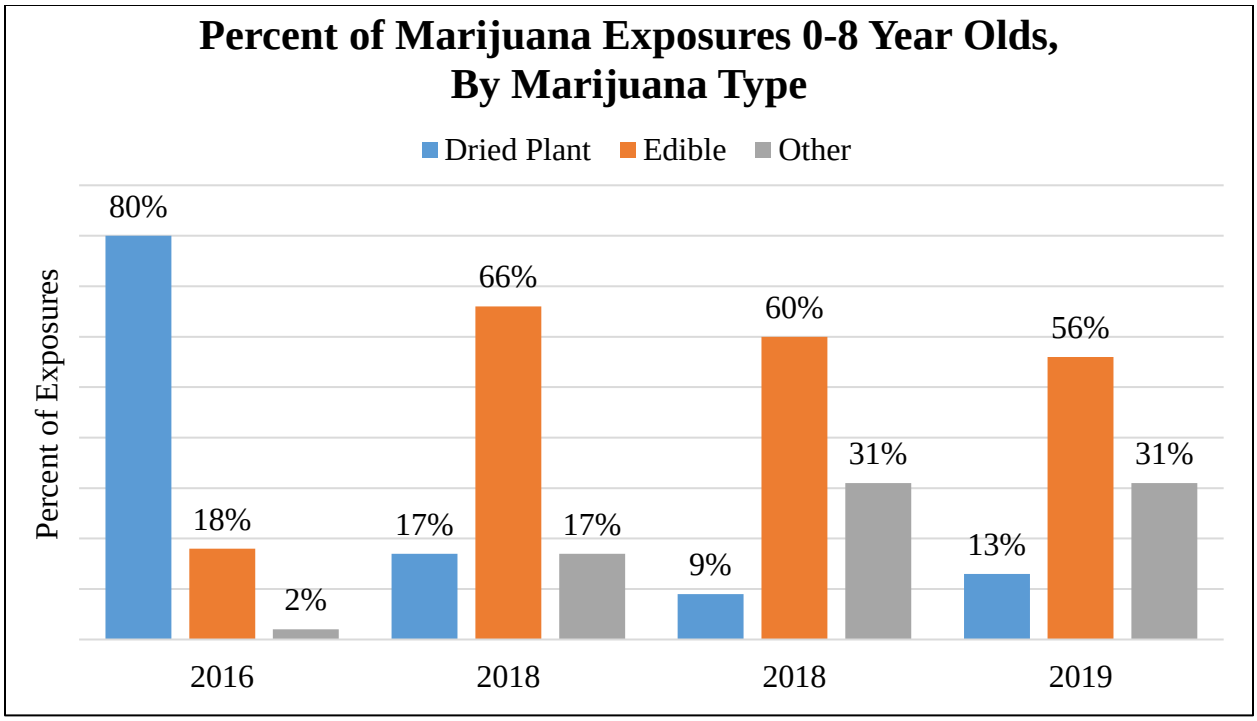


SOURCE: Rocky Mountain Poison and Drug Center



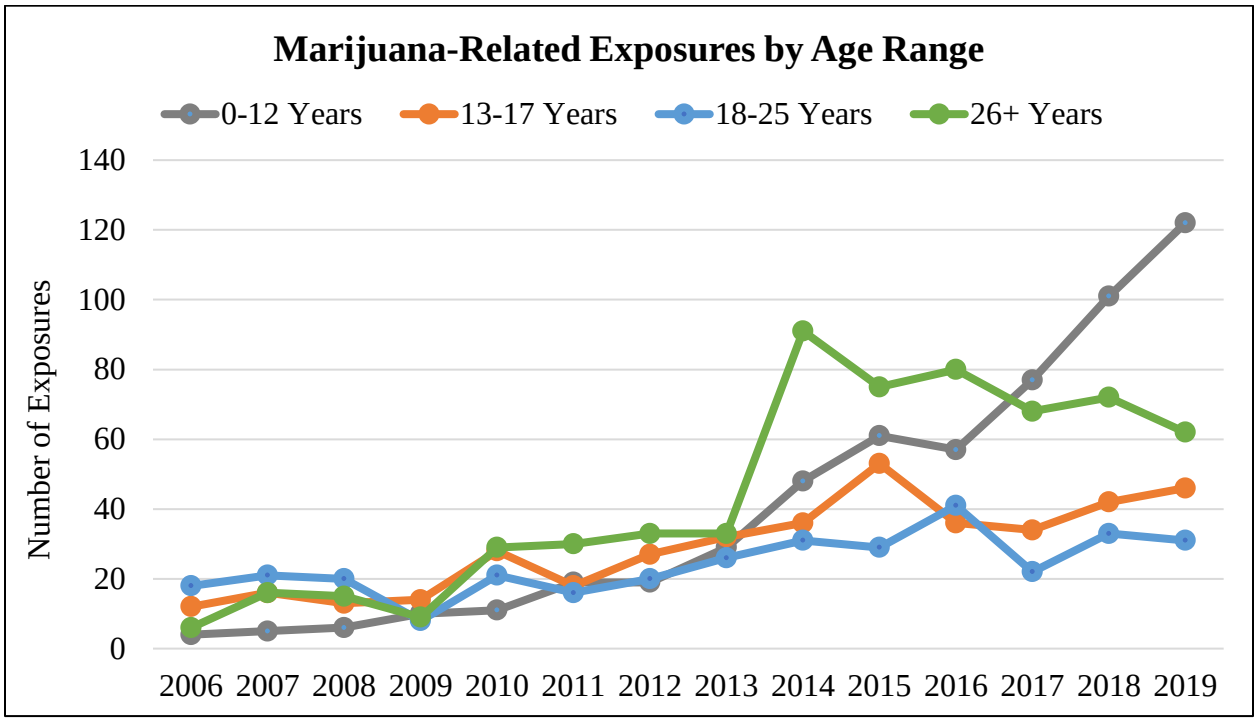
SOURCE: Rocky Mountain Poison and Drug Center

***NOTE:** Marijuana was the only substance referenced in the call to the poison and drug center.



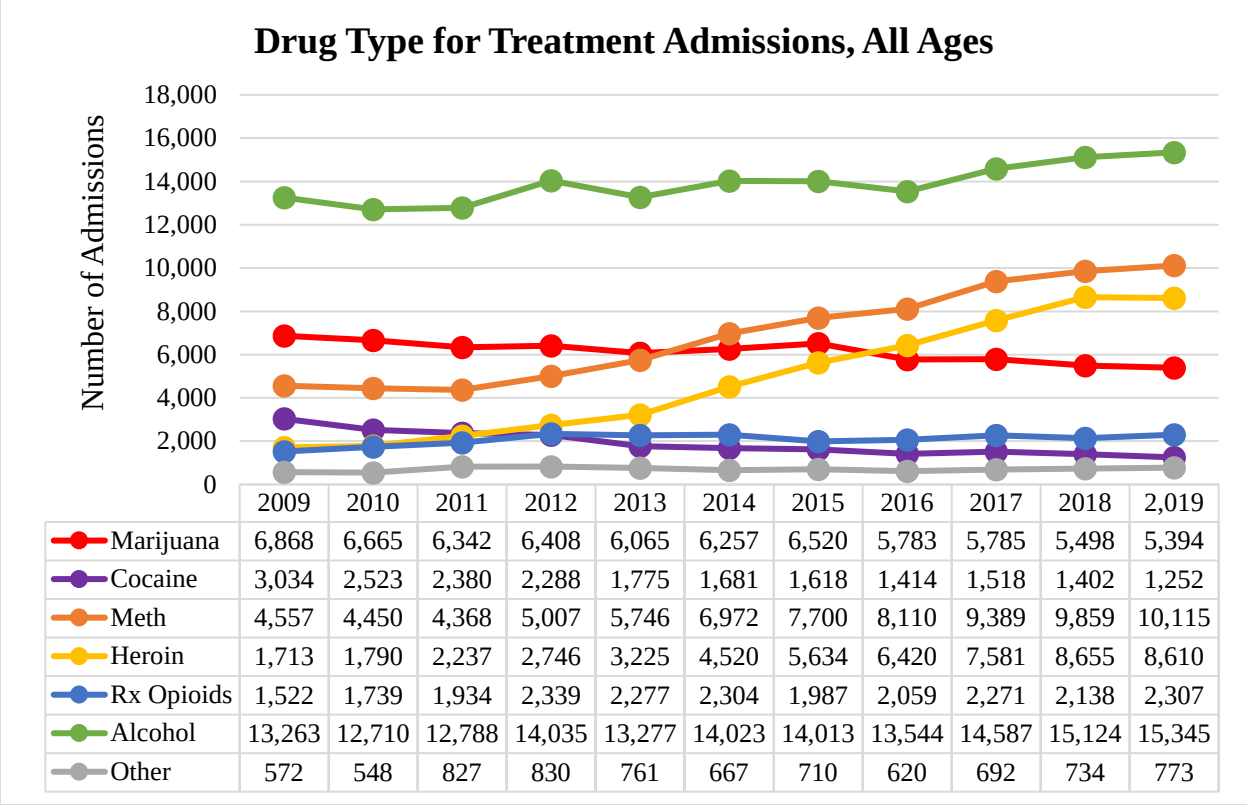
SOURCE: Rocky Mountain Poison and Drug Center

NOTE: The code for marijuana edibles did not go into effect until 2016. Therefore, any cases of edible marijuana exposure which occurred prior to 2016 were coded under "dry plant." Other marijuana includes oral pills/capsules, concentrated extracts (to include oils and tinctures), topical preparations, marijuana devices, and unknown/other forms of mariiuana.



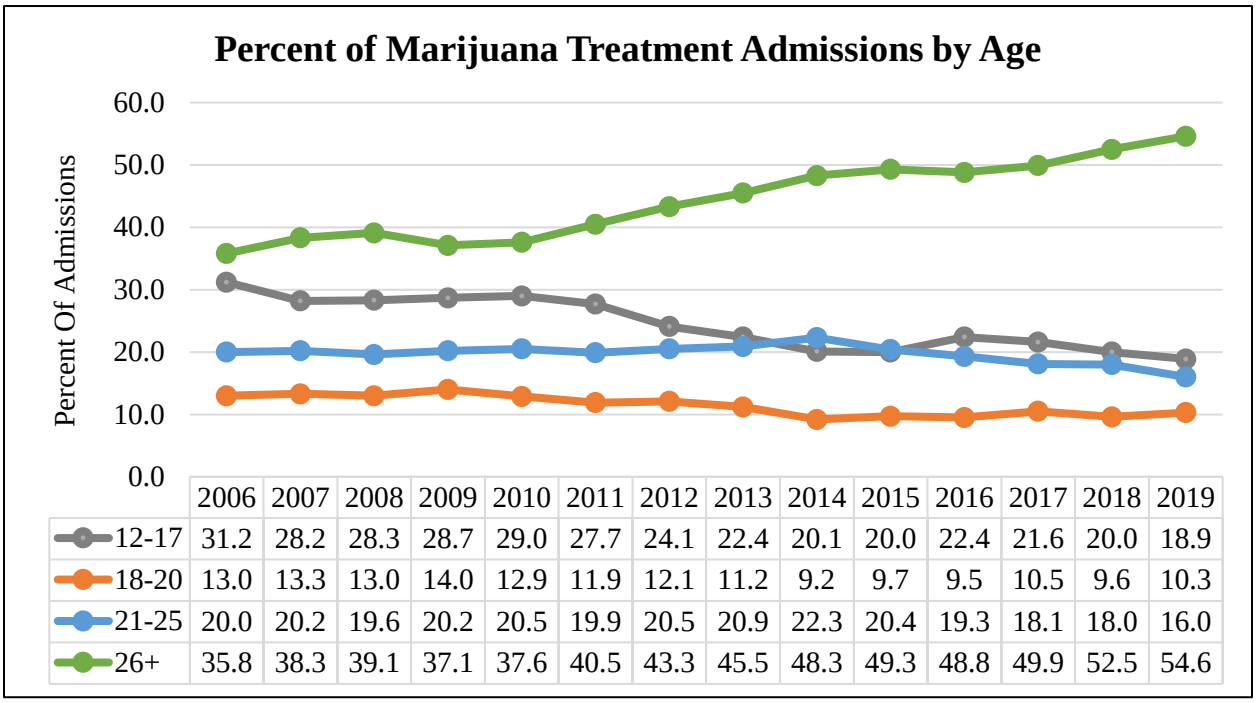
SOURCE: Rocky Mountain Poison and Drug Center

Treatment Data



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2,019
Marijuana	6,868	6,665	6,342	6,408	6,065	6,257	6,520	5,783	5,785	5,498	5,394
Cocaine	3,034	2,523	2,380	2,288	1,775	1,681	1,618	1,414	1,518	1,402	1,252
Meth	4,557	4,450	4,368	5,007	5,746	6,972	7,700	8,110	9,389	9,859	10,115
Heroin	1,713	1,790	2,237	2,746	3,225	4,520	5,634	6,420	7,581	8,655	8,610
Rx Opioids	1,522	1,739	1,934	2,339	2,277	2,304	1,987	2,059	2,271	2,138	2,307
Alcohol	13,263	12,710	12,788	14,035	13,277	14,023	14,013	13,544	14,587	15,124	15,345
Other	572	548	827	830	761	667	710	620	692	734	773

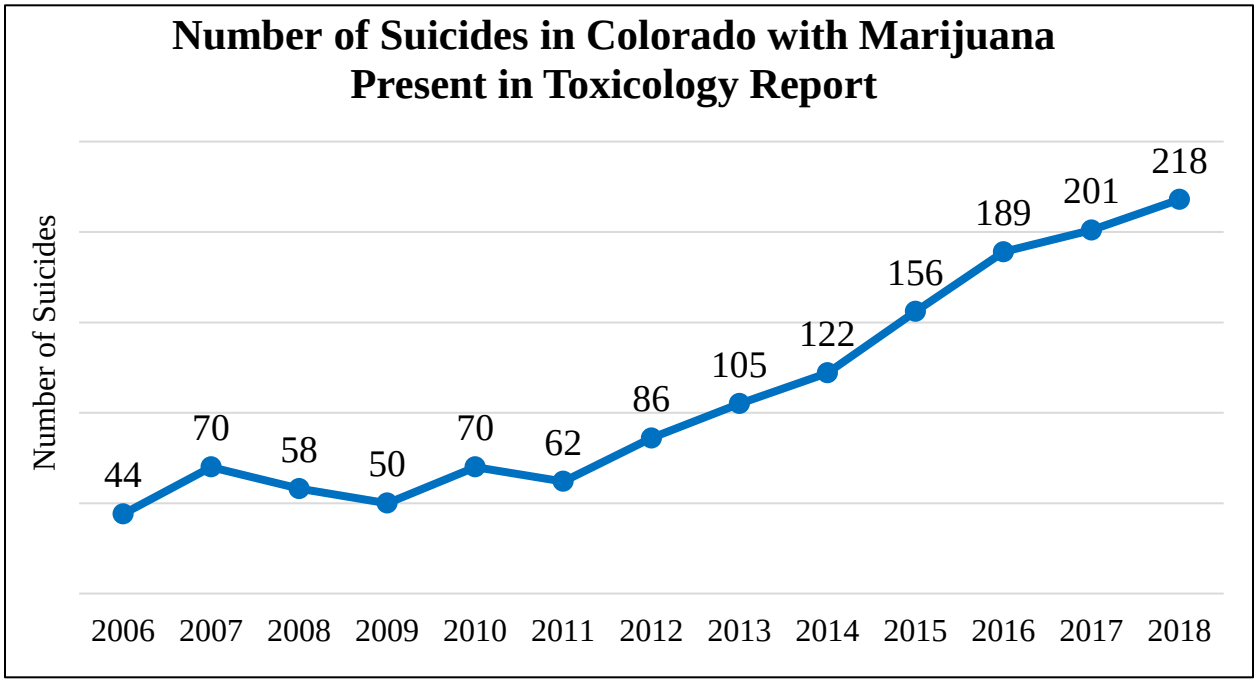
SOURCE: Colorado Department of Health Services, Office of Behavioral Health



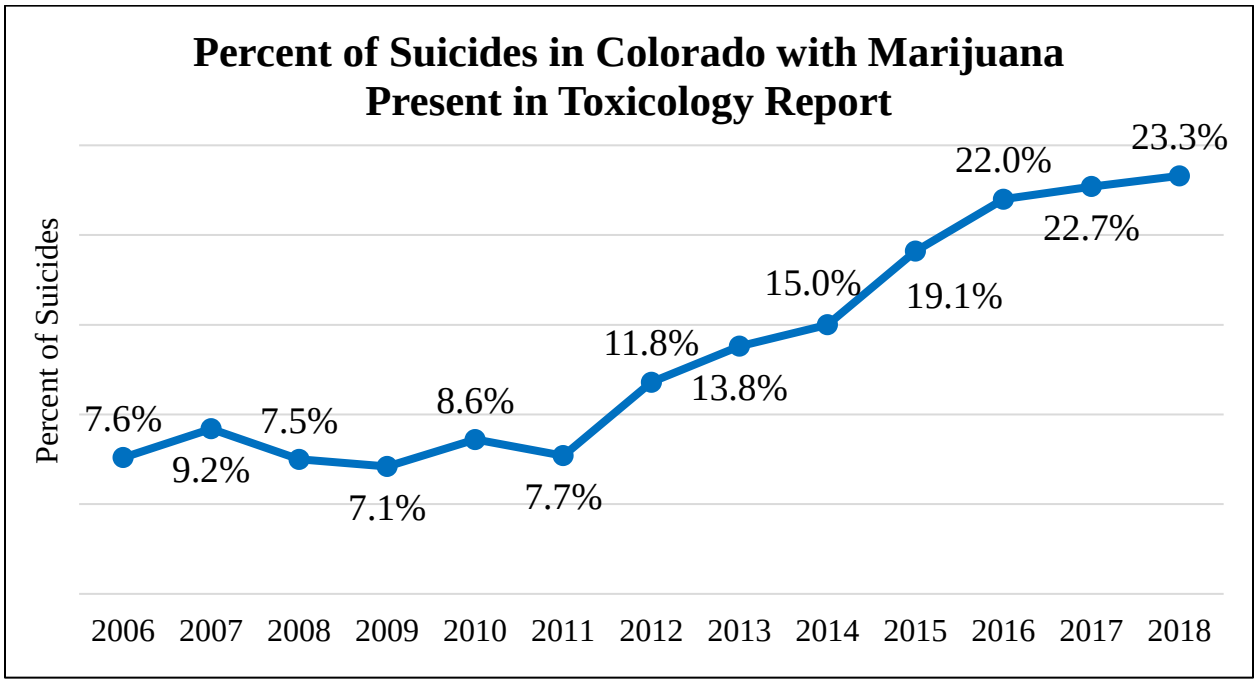
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
12-17	31.2	28.2	28.3	28.7	29.0	27.7	24.1	22.4	20.1	20.0	22.4	21.6	20.0	18.9
18-20	13.0	13.3	13.0	14.0	12.9	11.9	12.1	11.2	9.2	9.7	9.5	10.5	9.6	10.3
21-25	20.0	20.2	19.6	20.2	20.5	19.9	20.5	20.9	22.3	20.4	19.3	18.1	18.0	16.0
26+	35.8	38.3	39.1	37.1	37.6	40.5	43.3	45.5	48.3	49.3	48.8	49.9	52.5	54.6

SOURCE: Center for Behavioral Health Statistics and Quality, SAMHSA, Treatment Episode Data Set (TEDS). Based on administrative data reported by states to TEDS through April 1, 2020.

Suicide Data

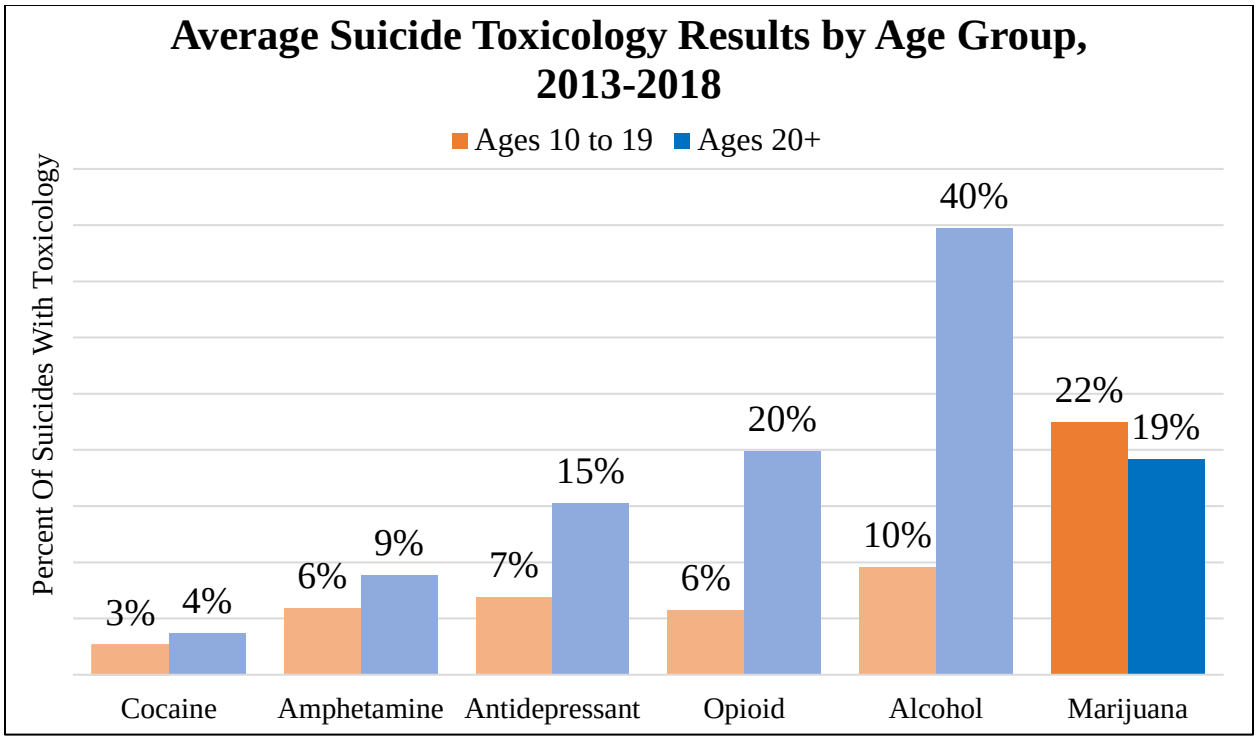


SOURCE: CDPHE, Colorado Violent Death Reporting System



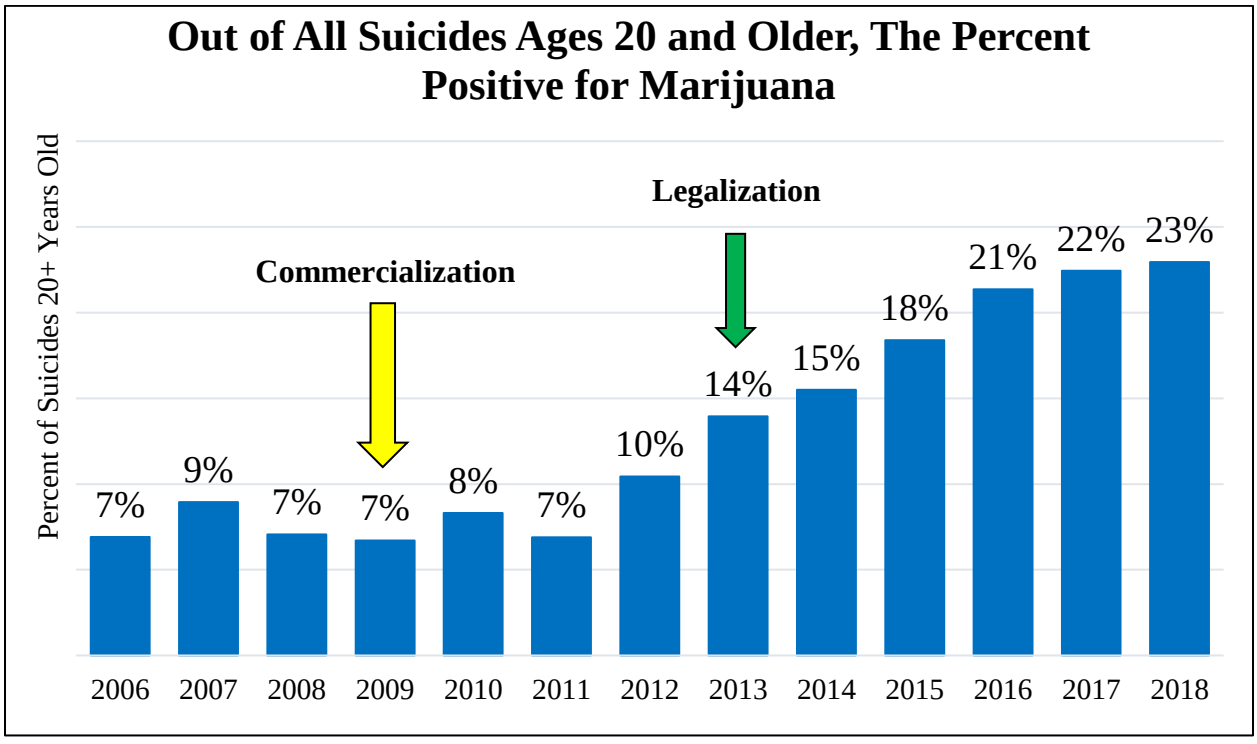
SOURCE: CDPHE, Colorado Violent Death Reporting System

NOTE: Toxicology is not available for every suicide. Only those suicides with toxicology available are represented above. Due to an 18-month lap in detailed suicide circumstances and toxicology information from coroner and law enforcement records, 2018 is the most recent year available.



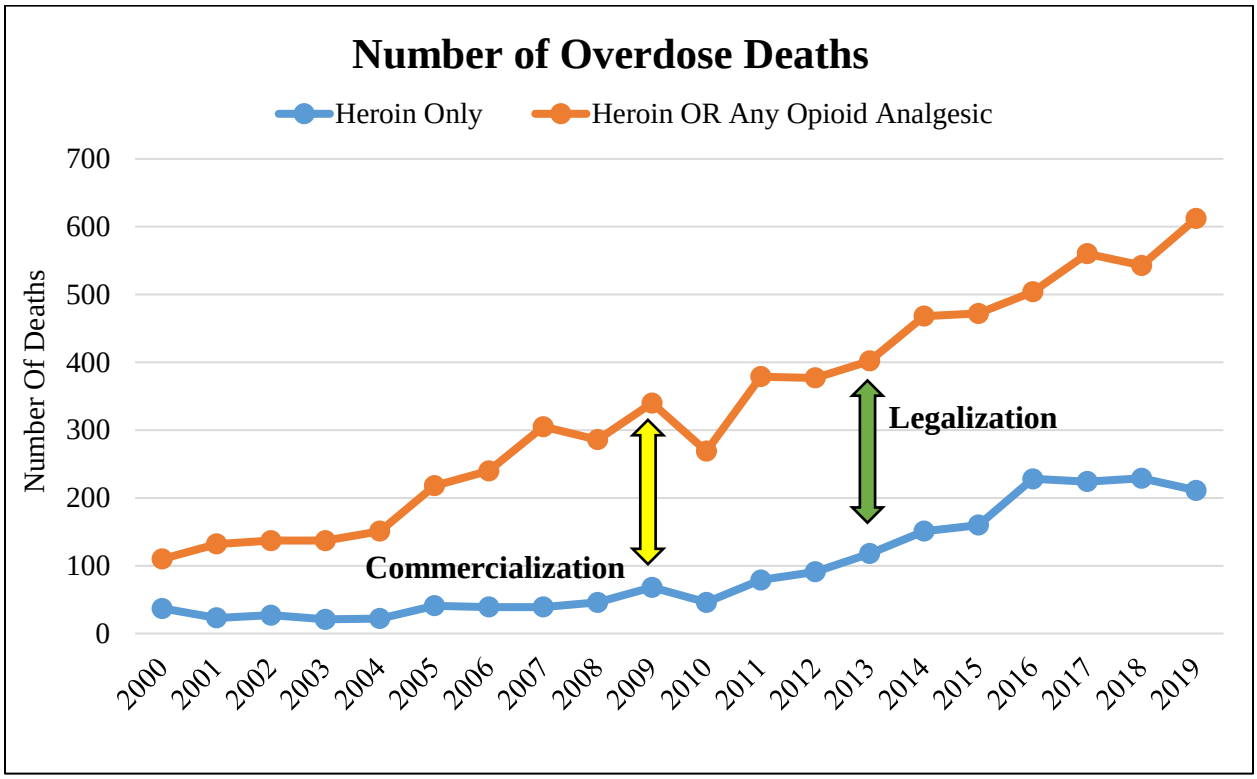
SOURCE: CDPHE, Colorado Violent Death Reporting System

NOTE: The average percent was taken out of all suicides with toxicology results. The average covers a six-year time span from 2013 – 2018.



SOURCE: CDPHE, Colorado Violent Death Reporting System

Colorado Opioid Overdose Deaths



Source: CDPHE, Vital Statistics Program

This data is included in response to reports of declining opioid overdose deaths post-marijuana legalization.

NOTE: Heroin cause of death codes include T40.1. Any Opioid Analgesic OR Heroin cause of death codes include T40.1-T40.4

Public Health Information

Relationship between Depression and Cannabis Use in the Past Month

Over 17 million adults in the United States experience depression and many believe marijuana is beneficial for some individuals for treating depression. Around 25% of adults with mood or anxiety disorders claimed to use marijuana to self-medicate. This study focused on analyzing both past month and near-daily marijuana use as well as probable depression. Over 16,000 US adults from 20 to 50 years old took the survey and most respondents were white, some college educated, middle class, and were married or living together.

The results were a statistically significant increase from 2005 to 2016 in the prevalence of any past month and daily or near-daily past month cannabis use. "Overall, there were 3 major findings, as follows: (1) the prevalence of any past-month cannabis use and daily or near daily cannabis use increased from 2005 to 2016, while the prevalence of depression remained stable; (2) individuals with depression had approximately double the odds of using cannabis compared with people without depression; and (3) the association between depression and cannabis use strengthened from 2005 to 2016." The authors highlighted that the results matched findings from the NSDUH while emphasizing the need to understand preexisting conditions before beginning cannabis use. "Individuals with depression who use cannabis may represent a high-risk group for cannabis-involved adverse consequences."

Source: Gorfinkel, L., Stohl, M., and Hasin, D. (2020). *Association of Depression with Past-Month Cannabis Use Among US Adults Aged 20 to 59 Years, 2005 to 2016*. JAMA Network Open, 3(8), 1-11. Retrieved from https://www.thenmi.org/wp-content/uploads/2020/08/JAMA_Association-of-Depression-With-Past-Month-Cannabis-Use-Among-US-Adults-Aged-20-to-59-Years-2005-to-2016.pdf

Impact of Marijuana on Hearts

The main concerns regarding smoking or vaping of any substance are harm to the heart, lungs, and blood vessels according to the deputy chief science and medical officer for the American Heart Association. Individuals are advised to talk with their doctor before using marijuana to understand their preexisting risk factors as well if marijuana would interfere with any medications. In some studies, "heart rhythm abnormalities, such as tachycardia and atrial fibrillation, could occur within the hour after weed containing THC is smoked." THC can have a physical impact on a user's body by causing "a faster heart rate, increase the heart's need for oxygen, disrupt the walls of arteries and contribute to higher blood pressure while prone." On the other hand, CBD has not been found to have the possibility of harm to the heart. The authors highlight the need for more long-term studies in order to confirm findings found in short-term studies similar to these findings.

Source: LaMotte, S. (2020). *Marijuana is not good for your heart, studies say*. The Mercury News. Retrieved from https://www.mercurynews.com/2020/08/05/marijuana-is-not-good-for-your-heart-studies-say/

THC Concentration in Colorado Marijuana

In 2019, the General Assembly of the Colorado Legislative session requested further research on "tetrahydrocannabinol (THC) potency," or more specifically the concentration of THC in marijuana, as well as any health effects. The roles of the state and local government regarding marijuana are:

- Colorado Department of Revenue's Marijuana Enforcement Division (MED)- authority over the production, distribution and sale of marijuana
- Marijuana Health Monitoring Program at Colorado Department of Public Health and Environment (CDPHE)- monitoring marijuana use trends across the state and the emerging scientific evidence of health effects related to marijuana use
- Local level- authority to require additional licenses and may enact laws that build upon rules and regulations set at the state level to protect public health and safety

In concentrate products, the average percentage of THC in 2017 was 69% with some stores advertising up to 95% THC. In terms of the public health, "THC, a component of marijuana, can cause acute psychotic symptoms such as hallucinations, paranoia, delusional beliefs, and feeling emotionally unresponsive during intoxication. These symptoms are worse with higher doses." Additionally, some studies suggest a high THC concentration in marijuana products can result in higher risk of mental health issues like psychotic experiences, depression, general anxiety disorder, and substance use as a result of adolescent and adult use.

Source: Colorado Department of Public Health and Environment (2020). *THC Concentration in Colorado Marijuana.* Retrieved from https://www.thenmi.org/wp-content/uploads/2020/08/THC-Concentration-in-Colorado-Marijuana-_CDPHE-8.3.2020.pdf

Trends in Opioid Misuse among Marijuana Users and Non-Users in the U.S. from 2007–2017

While the opioid crisis became a public health emergency, marijuana use continued to grow as more states legalized medical marijuana. The authors examined if there was any relationship between opioid misuse and medical marijuana use. Past studies have shown conflicting results with some claiming an increase in cannabis use resulted in fewer opioid related deaths while others have found no impact or have been unable to replicate these findings with a larger sample. The 2007 to 2017 NSDUH data was used with particular focus on prescription-opioid misuse and marijuana use. While marijuana use increased in ever use, past year use, and past month use, prescription-opioid misuse decreased in all three categories. The results are not necessarily correlated however as the perception of risk of marijuana use has decreased in the past ten years and great efforts have been placed to reducing opioid use by health officials. Despite this, "individuals who are addicted to marijuana are also three times more likely than non-users to be addicted to heroin, and almost 80% of heroin users started with prescription opioids."

Source: Azagba, S., Shan, L., Manizone, L., Qeadan, F., and Wolfson, M. (2019). *Trends in Opioid Misuse among Marijuana Users and Non-Users in the U.S. from 2007–2017*. International Journal of Environmental Research and Public Health, 16(22). doi: 10.3390/ijerph16224585

Adolescent Treatment Admissions for Marijuana Following Recreational Legalization in Colorado and Washington

Since the legalization of marijuana in Colorado and Washington, cannabis use disorder (CUD) has become a greater concern, especially with adolescents. The authors studied 2008 to 2017 SAMHSA's TED-Admissions to examine if there was a relationship with recreational marijuana legalization increasing CUD among youth and therefore adolescents seeking treatment. Colorado and Washington treatment admissions were compared to states that did not enact recreational marijuana legalization (RML) during this timeframe. Additionally, the data only included first time admissions "to calculate the annual admissions rates of unique new clients (per 10,000 adolescent population) for each state."

While the admission rate in Colorado/Washington was significantly higher than non-RML states in 2008, it was much lower than non-RML states in 2017 due to a rapid decline after legalization. The authors "speculate that the growing social acceptance and the decline in perceived risk of marijuana use nationally may have led to a marked decrease in youth treatment admissions in both Colorado/Washington and non-RML states, even if marijuana use remained stable or increased." While the decrease in treatment admissions is clear, the reasoning is not. "While it is possible that the decreasing level of social stigma associated with marijuana use may make it more socially acceptable to seek treatment, it may also make users less likely to hide their use from friends and family, and may reduce the perception that their marijuana use negatively affects their social and work life (consistent with the observed decline in perceived risk), thus reducing the perception that heavy use warrants treatment."

Source: Mennis, J. and Stahler, G. (2020). *Adolescent Treatment Admissions for Marijuana Following Recreational Legalization in Colorado and Washington.* Drug and Alcohol Dependence, 210.

Cannabis-Infused Edible Products in Colorado

Edibles have increasingly become a common method of cannabis use particularly "among those who use cannabis for medical purposes and older adult cannabis users who value the discretion [edibles] offer in addition to perceived lower rates of toxin exposure and other health risks." In Colorado, the most common edible products are "candies and beverages, followed by baked goods and pastries." Currently, the Denver Department of Public Health Environment "routinely inspects infused product manufactures consistently with other types of food facilities." However, "Denver is the only jurisdiction in Colorado that enforces food safety regulations with routine regulatory food safety inspections at all dispensaries and edible manufacturers every six months." Some examples of potential food hazards are not meeting a safe baking temperature that removes toxins to maintain THC levels as well as producing non-THC products with the same equipment as edibles. The authors highlight the largest issue lies in the need for further research regarding food safety interventions, public health risks, and how consumption differs among various populations. Currently, CDPHE, Colorado Integrated Food Safety Center of Excellence, DDPHE, and the National Environmental Health Association provide guidance on how to address this concern.

Source: White, A., Van Tubbergen, C., Raymes, B., Contreras, A., and Scallan Walter, E. (2020). *Cannabis Infused Edible Products in Colorado: Food Safety and Public Health Implications.* American Journal of Public Health, 110, 790-795, https://doi.org/10.2105/AJPH.2020.30560

U.S. Surgeon General Addresses Health Concerns Associated with Marijuana Use

The U.S. Surgeon General created an advisory "emphasizing the importance of protecting our Nation from the health risks of marijuana use in adolescence and during pregnancy." His first concern is the impact of cannabis binding to cannabinoid receptors in the endocannabinoid system, which affects "the formation of brain circuits important for decision making, mood, and responding to stress." The THC concentration has tripled to 12% from 1995 to 2014. "Higher doses of THC are more likely to produce anxiety, agitation, paranoia, and psychosis. Edible marijuana takes time to absorb and to produce its effects, increasing the risk of unintentional overdose, as well as accidental ingestion by children and adolescents. In addition, chronic users of marijuana with a high THC content are at risk for developing a condition known as cannabinoid hyperemesis syndrome, which is marked by severe cycles of nausea and vomiting."

Additionally, the U.S. Surgeon General raised concerns regarding marijuana use during pregnancy. From 2002 to 2017, marijuana use in the past month for pregnant women doubled to 7%. "Many retail dispensaries recommend marijuana to pregnant women for morning sickness." The concerns involving the developing fetus include:

- "THC [entering] the fetal brain from the mother's bloodstream"
- "disrupt[ing] the endocannabinoid system, which is important for a healthy pregnancy and fetal brain development"
- "Studies [showing] marijuana use in pregnancy is associated with adverse outcomes, including lower birth weight"

"The Colorado Pregnancy Risk Assessment Monitoring System reported that maternal marijuana use was associated with a 50% increased risk of low birth weight regardless of maternal age, race, ethnicity, education, and tobacco use." "THC has been found in breast milk for up to six days after the last recorded use. It may affect the newborn's brain development and result in hyperactivity, poor cognitive function, and other long-term consequences."

Finally, marijuana use by adolescents continues to be relatively common as it is only second to alcohol use. "In 2017, approximately 9.2 million youth aged 12 to 25 reported marijuana use in the past month and 29% more young adults aged 18-25 started using marijuana." "Frequent marijuana use during adolescence is associated with:

- Changes in the areas of the brain involved in attention, memory, decision-making, and motivation. Deficits in attention and memory have been detected in marijuana-using teens even after a month of abstinence.
- Impaired learning in adolescents. Chronic use is linked to declines in IQ, school performance that jeopardizes professional and social achievements, and life satisfaction.
- Increased rates of school absence and drop-out, as well as suicide attempts."

Mental health has also been a concern when considering adolescent use of marijuana as "the risk for psychotic disorders increases with frequency of use, potency of the marijuana product, and as the age at first use decreases."

Source: Surgen General VADM Jerome Adams (2020). *U.S. Surgeon General's Advisory: Marijuana Use and the Developing Brain.* Retrieved from https://www.hhs.gov/surgeongeneral/reports-and-publications/addiction-and-substance-misuse/advisory-on-marijuana-use-and-developing-brain/index.html

Section IV: Black-Market

Some Findings

- RMHIDTA Colorado Investigative Drug Task Forces (10) conducted **278 investigations** of black-market marijuana in Colorado resulting in:
    - **237** felony arrests
    - **7.49 tons** of marijuana seized
    - **68,600** marijuana plants seized
    - **29** different states the marijuana was destined
- Seizures of marijuana reported to the El Paso Intelligence Center (EPIC) in Colorado **increased 17%** from an average of 242 parcels (2009-2012) to an average of 283 parcels (2013-2019) during the time recreational marijuana has been commercialized.

Definitions by Rocky Mountain HIDTA

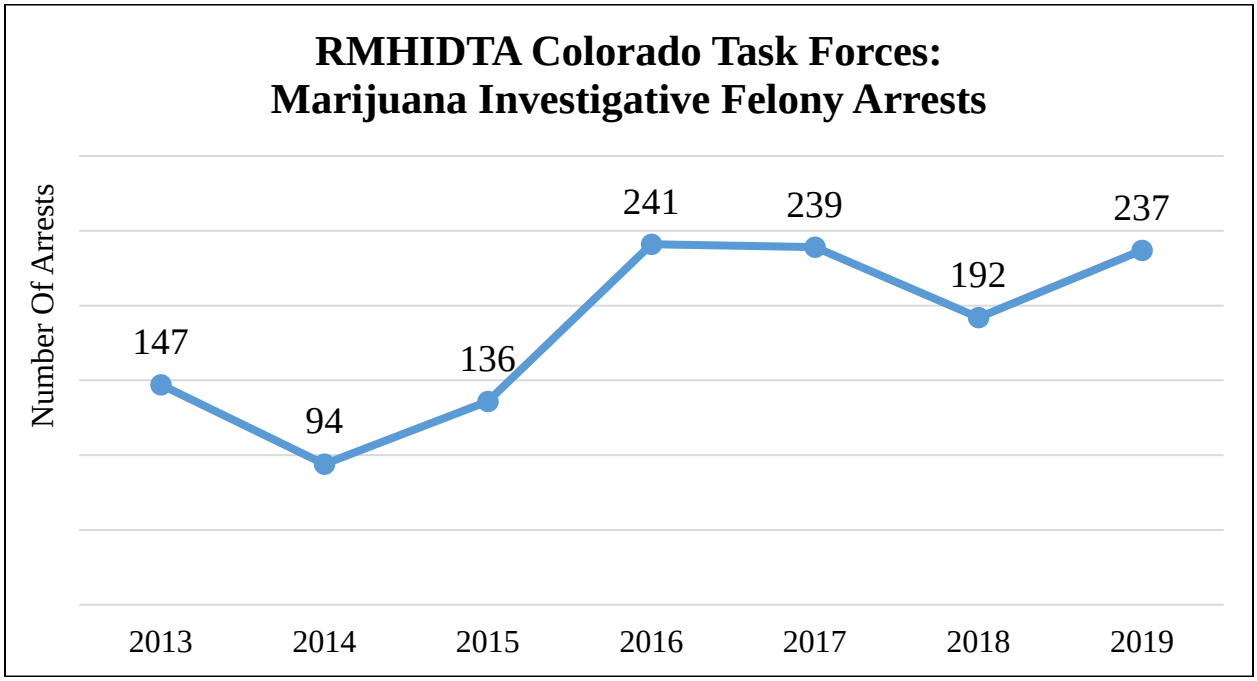
Colorado Marijuana Investigations: RMHIDTA Colorado drug task forces investigating individuals or organizations involved in illegally selling Colorado marijuana, both within and outside of the state. These investigations only include those reported by the ten RMHIDTA drug task forces.

Colorado Marijuana Interdictions: Interdictions include incidents where drugs are being transported, generally by vehicle or parcel, and the shipment is randomly seized by law enforcement. Interdictions are made by Colorado State Patrol.

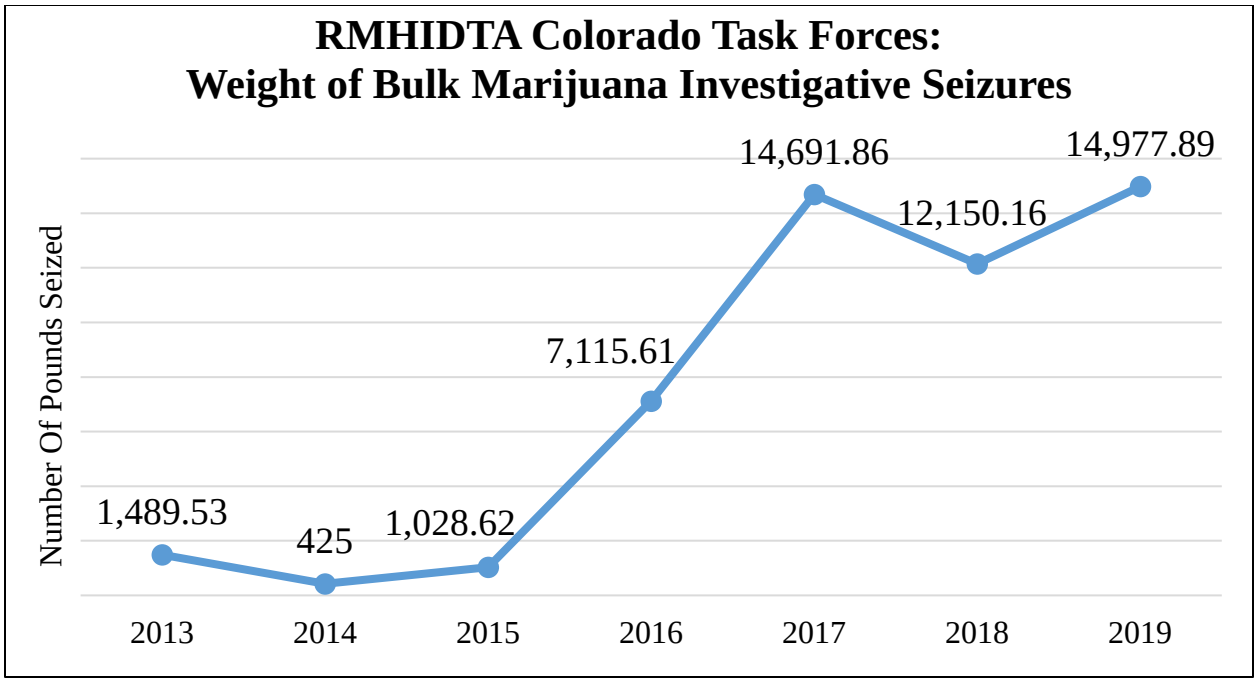
Task Force Investigations

Rocky Mountain HIDTA Colorado Task Forces			
	2017	**2018**	**2019**
Number of Completed Investigations	144	257	278
Number of Felony Arrests	239	192	237
Pounds of Bulk Marijuana Seized	14,692 (7.3 tons)	12,150 (6.1 tons)	14,978 (7.5 tons)
Number of Plants Seized	48,325	60,026	68,600
Number of Edibles Seized	6,462	2,894	15,025
Pounds of Concentrate Seized	102	319	86
Different States to Which Marijuana was Destined	24	25	29

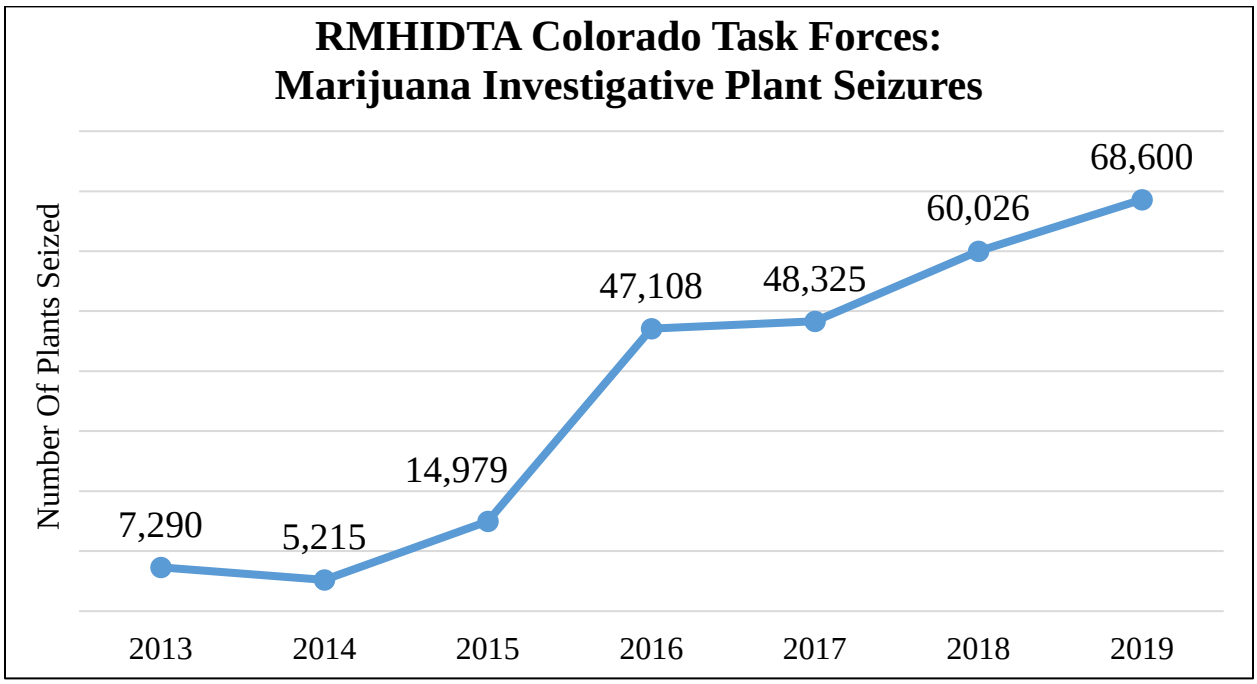
Task force data only includes completed investigations reported by the RMHIDTA Colorado Investigative Drug Task Forces. It is unknown how many of these types of investigations were completed by non-RMHIDTA Colorado drug units or task forces.



SOURCE: Rocky Mountain HIDTA Performance Management Process (PMP) Data



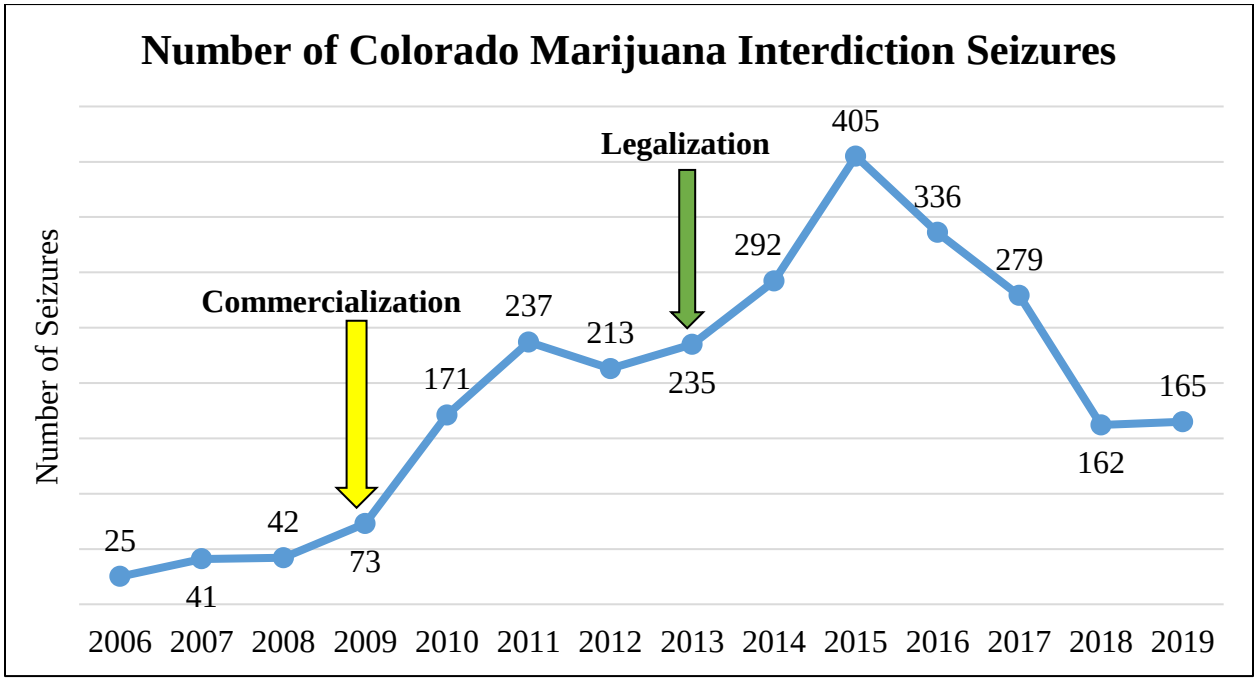
SOURCE: Rocky Mountain HIDTA Performance Management Process (PMP) Data



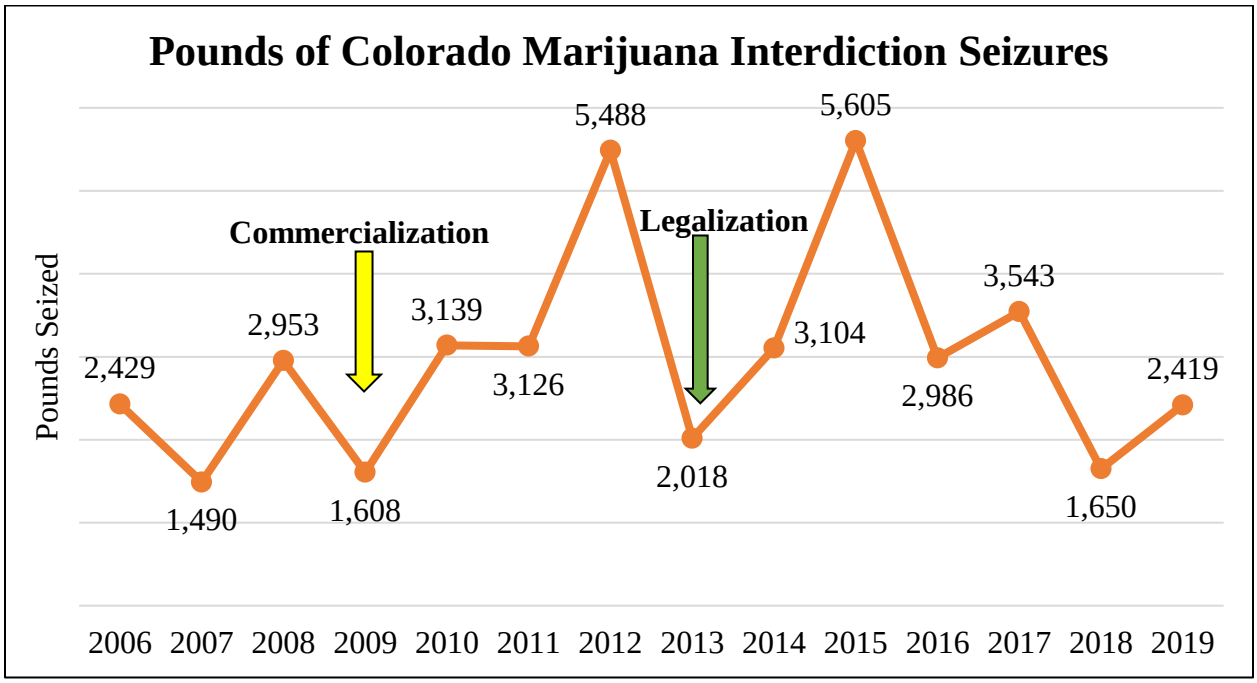
SOURCE: Rocky Mountain HIDTA Performance Management Process (PMP) Data

Highway Interdiction Data

NOTE: The charts below only include cases where Colorado marijuana was actually seized and reported. It is unknown how many Colorado marijuana loads were not detected or, if seized, were not reported. These are roadside interdictions voluntarily reported by state highway patrol to EPIC.



SOURCE: EPIC, National Seizure System, as of July 2020



SOURCE: EPIC, National Seizure System, as of July 2020

Black Market Information

Colorado's Continuing Black Marijuana Market Post-Legalization

Across the state, law enforcement agencies continue to investigate large-scale marijuana grow operations. In the spring of 2019, 420 marijuana plants, processed weed, weed concentrate, guns, and around $110,000 in cash were recovered in Fort Collins. The DEA has claimed to see a steady increase in the number of illegal marijuana plants seized since 2014 as well as Colorado's 18th Judicial District (Arapahoe, Douglas, Elbert, and Lincoln County). One of the largest busts occurred in the 18th Judicial District where 80,000 plants were seized across 41 homes. Many times, these illegal grow operations are intended to send to other states like Texas and Florida where there can be a greater profit. Some believe that a nationwide legalization of marijuana will decrease the black market as there is a decreased need to traffic marijuana to other states. Others feel that the legalization would not stop the black market due to past examples like "how cheap cigarettes are illegally trafficked into cities with high tobacco taxes, like New York."

Source: KUNC (2019). *Seven Years After Legalization, Colorado Battles an Illegal Marijuana Market*. Retrieved from https://www.kunc.org/news/2019-08-14/seven-years-after-legalization-colorado-battles-an-illegal-marijuana-market

6K Pot Plants Seized in Massive Southern Colorado Bust

In 2019, investigators from the Colorado Bureau of Investigations Black Market Marijuana Team and local law enforcement seized nearly $6 million worth of illegally grown marijuana across 40 grow sites in Las Animas County. Law enforcement confiscated and destroyed 5,904 marijuana plants during this investigation and identified multiple other grow sites containing anywhere between 5,000 and 15,000 black market marijuana plants. Suspects shot at a thirteen-year-old boy while rounding up cattle on a leased grazing property, which prompted the investigation. "Four suspects were arrested and charged with possession of more than 50 pounds of marijuana with intent to distribute, special offender, and cultivation of more than 30 marijuana plants." An additional suspect was arrested for cultivation of more than 30 marijuana plants.

Source: Hillstrom, Zach. (2019) *6K Pot Plants Seized in Massive Southern Colorado Bust.* Retrieved from https://www.chieftain.com/news/20190916/6k-pot-plants-seized-in-massive-s-colo-bust/

Marijuana Raids in Mesa, Teller, El Paso and Las Animas Counties

Authorities conducted two large raids in Colorado during the summer of 2020. In Teller, Las Animas, and El Paso County, 1500 plants and over $32,000 in cash were seized along with firearms and vehicles. The investigation began with tips of a three illegal marijuana grows near Divide, Trinidad, and Colorado Springs, resulting in three arrests. Additionally, there was an unrelated large marijuana grow operation on public lands in Mesa County in the Grand Mesa area. The investigation also included the Colorado Army National Guard with their helicopter.

Source: Phillips, Noelle (2020). *Marijuana raids ongoing in Mesa, Teller, El Paso and Las Animas counties*. Retrieved from https://www.denverpost.com/2020/07/08/colorado-marijuana-raids-mesa-teller-el-paso-las-animas/

Why Colorado's Black Market for Marijuana is Booming 4 Years After Legalization

Despite over 500 recreational marijuana dispensaries in Colorado, the black market has continued to be driven by the criminal organizations trafficking marijuana to other states. Not only is the focus on other states, but some Colorado marijuana users would prefer to stay loyal to a local grower compared to paying the higher dispensary prices. Other individuals buy from the black market as they are barred by their employment from using marijuana due to the federal laws. Additionally, not all jurisdictions outside the Denver Metro area permit dispensaries even though it is legal in the state. Some believe that state laws regarding growing marijuana are hard to enforce, resulting in this large black market.

One DEA supervisor claims "his team spends about 15 per cent of its time on marijuana trafficking cases --a threefold increase from before legalization." They have seen an increase drug trafficking organization in the state as well as large warehouses used to smuggle out of state. Rural communities have also been greatly impacted by the black market due to limited resources even with more restrictive laws introduced in 2018. Previously, an individual could grow up six plants and pool them together in a co-op while medical patients could grow up to 99 plants. As of 2018, the limit for recreational marijuana is 12 plants, which has led to an increase in enforcement.

Source: The Canadian Broadcasting Corporation (2018). *Why Colorado's Black Market for Marijuana is Booming 4 Years After Legalization.*

Colorado's Illegal Marijuana Grow Operations Are Straining Local Law Enforcement

Law enforcement investigated illegal growers looking to make an immense profit and avoid paying for costly state regulations, licensing and a 15% excise tax. The number of cannabis plants permitted in a private residence is 12 as of 2018. A large incentive to grow beyond this limit is in order to sell to states where recreational marijuana is illegal, such as Florida, where sales can be three or four times the amount in Colorado. Additionally, many of these grow operations take place in rural areas were law enforcement resources are limited. Most of the tips in these areas come from neighbors and then an investigation and surveillance can begin.

Some members of law enforcement have found that dispensaries have not been a large issue due to state regulations and instead the focus is on the illegal grows. The Colorado Bureau of Investigations estimated over 100,000 plants seized in Colorado in 2018 fiscal year. The Colorado Division of Criminal Justice found a 42% increase in charges for marijuana manufacturing from 2012 to 2017. As a result, there is a large financial strain on both state and local law enforcement to handle this increase in cases.

Source: KUNC (2019). *Colorado's Illegal Marijuana Grow Operations Are Straining Local Law Enforcement.* Retrieved from https://www.kunc.org/politics/2019-10-30/colorados-illegal-marijuana-grow-operations-are-straining-local-law-enforcement

The Impact of Marijuana Legalization on Law Enforcement in States Surrounding Colorado

Many of Colorado's surrounding states have not legalized medical or recreational marijuana, resulting in law enforcement agencies in these border states focusing on the impact since Colorado legalized. The states analyzed in this study were Kansas, Nebraska, and Wyoming with each state broken into three clusters based on proximity to Colorado. The three research questions were:

- How has legalization of recreational marijuana affected law enforcement duties in police departments in neighboring states?
- Do officers differ in their perceptions of favorability of marijuana legalization or the perceived impact Colorado's legalization has had on their jobs based on the state from which they work and proximity to Colorado?
- What factors impact officer's perceptions of the impact marijuana legalization in Colorado has had on enforcement in their area?

From June to September 2017, 427 survey were completed from 76 with 57% from Kansas, then 27% from Nebraska, and 14% from Wyoming. The first set of questions focused on "the potential impact that the legalization of recreational marijuana in Colorado has had on enforcement in their area. These items addressed topics such as increased marijuana trafficking, concern from citizens, calls for service, need of additional resources, and issues presented by the different types of cannabis." The second part pertained to "measuring the law enforcement officer's personal perceptions regarding the legalization of recreational marijuana. These items included views of marijuana as a gateway drug, belief that their state's marijuana laws are too strict or too lax, perceptions of the harm marijuana do to their state and the nation, and their support for decriminalization or legalization of recreational or medicinal marijuana."

While some respondents (17) felt there was little to no impact on law enforcement in their area, most of these participants were located in the third cluster, farthest away from the Colorado border. Those who felt the legalization of marijuana in Colorado affected their state had four main supporting reasoning: "overwhelmingly more plant and edible marijuana, strain on resources, trafficking concerns, and perceived increase of juveniles using the drug." Additionally, some felt that the potency of marijuana had increased.

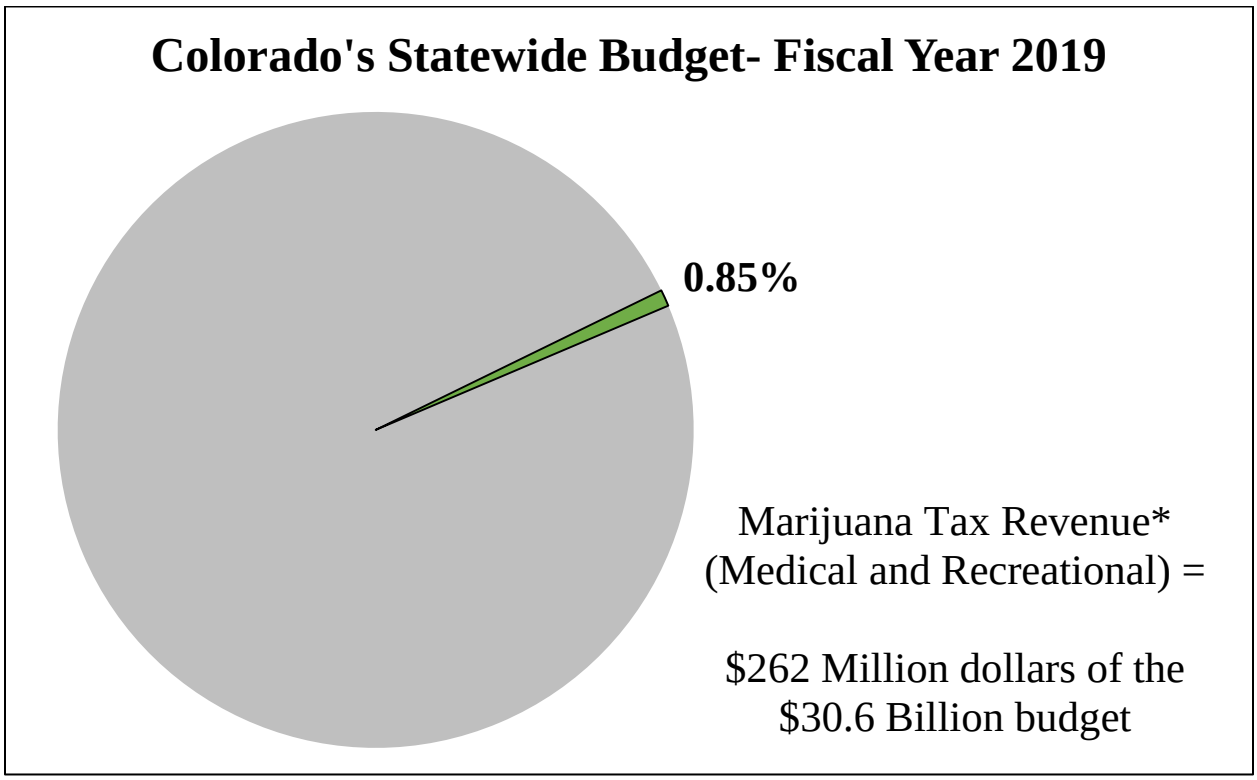
Source: Ward, K., Lucas, P., and Murphy, A. (2019). *The Impact of Marijuana Legalization on Law Enforcement in States Surrounding Colorado.* Police Quarterly 22(2), 217-242.

Section V: Societal Impact

Some Findings

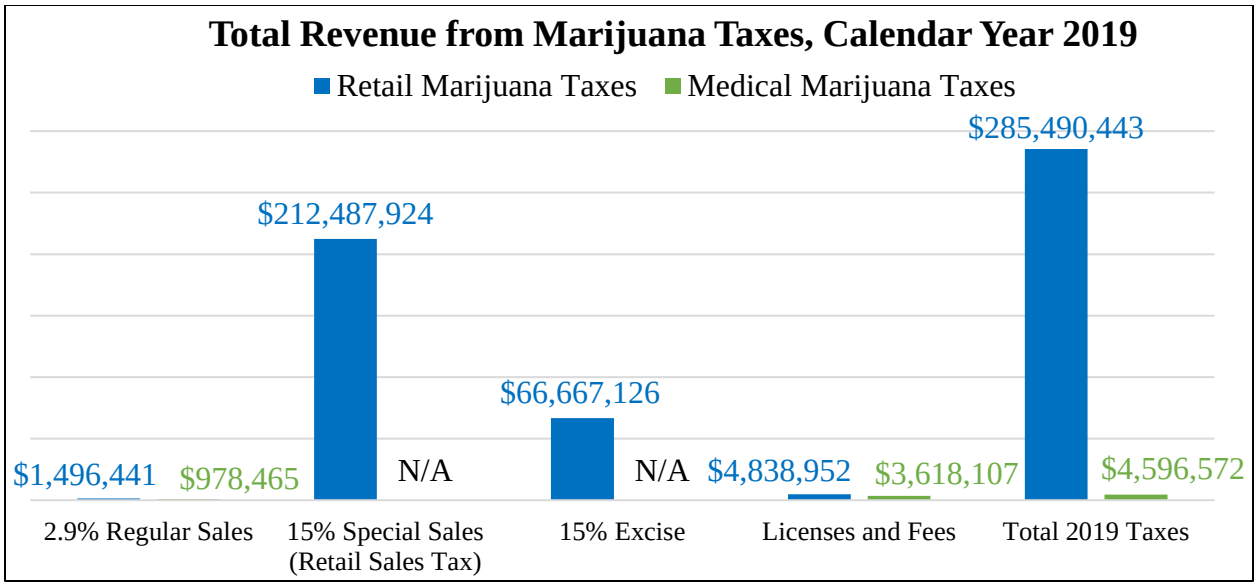
- Marijuana tax revenue represent approximately **0.85%** of Colorado's FY 2019 budget.
- **67%** of local jurisdictions in Colorado have banned medical and recreational marijuana businesses.

Tax Revenue



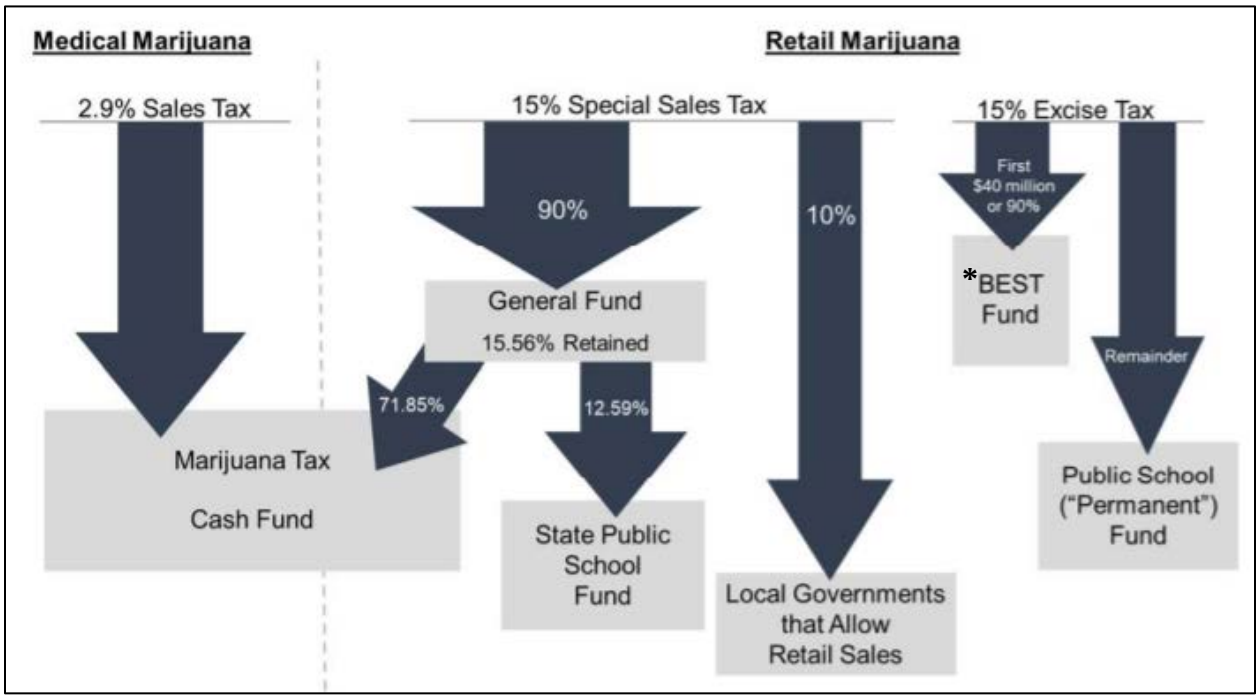
SOURCE: Governor's Office of State Planning and Budgeting

***NOTE:** Revenue from marijuana taxes as a portion of Colorado's total statewide budget.



SOURCE: Colorado Department of Revenue

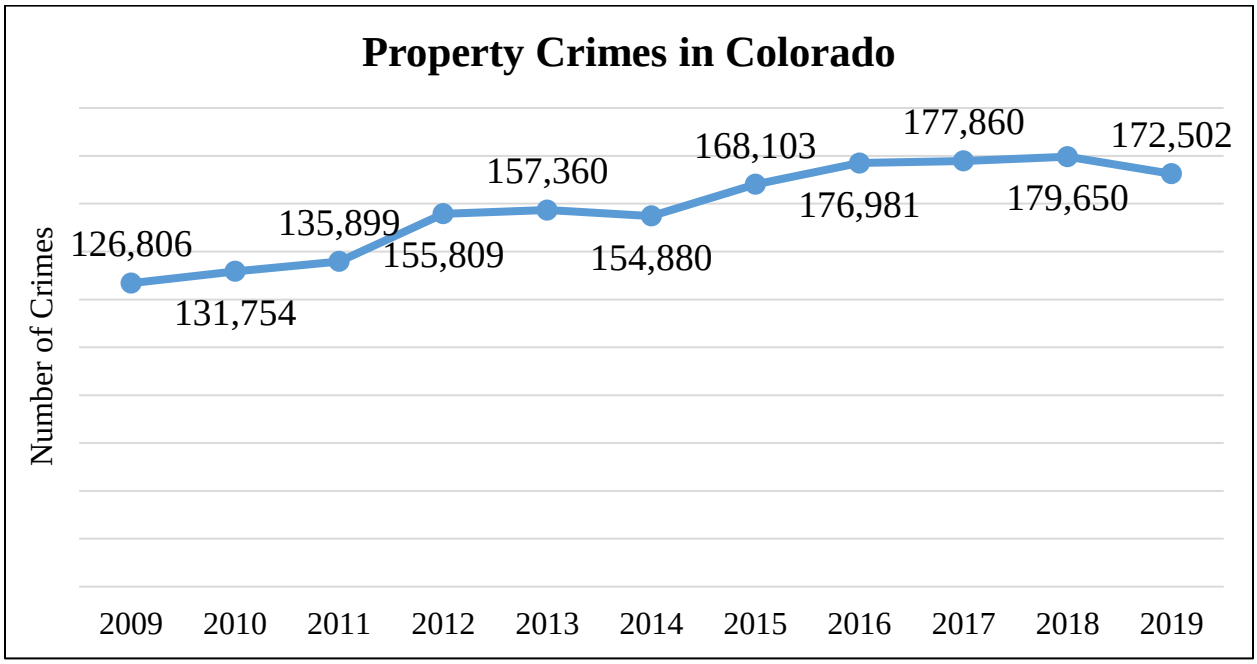
NOTE: Figures do not include any city taxes; the state does not assess or collect those taxes.
Per §39-26-729, C.R.S., retail marijuana, retail marijuana products, and retail marijuana concentrates are exempt from the 2.9% regular sales tax; however, products that do not contain marijuana (i.e., accessories) are still subject to the 2.9% regular sales tax. Licenses and fees include the following categories: retail marijuana, individual, others, and collections not yet allocated.



SOURCE: Joint Budget Committee Appropriations Report Fiscal Year 2019-2020

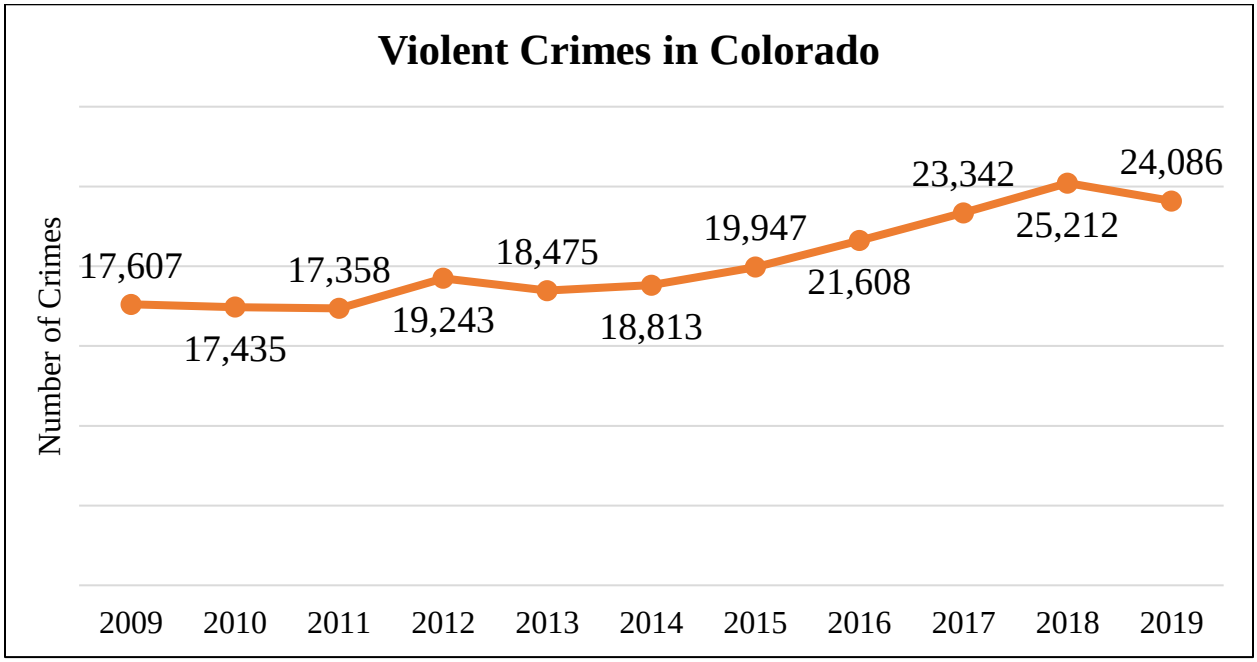
*BEST- Building Excellent Schools Today

Crime



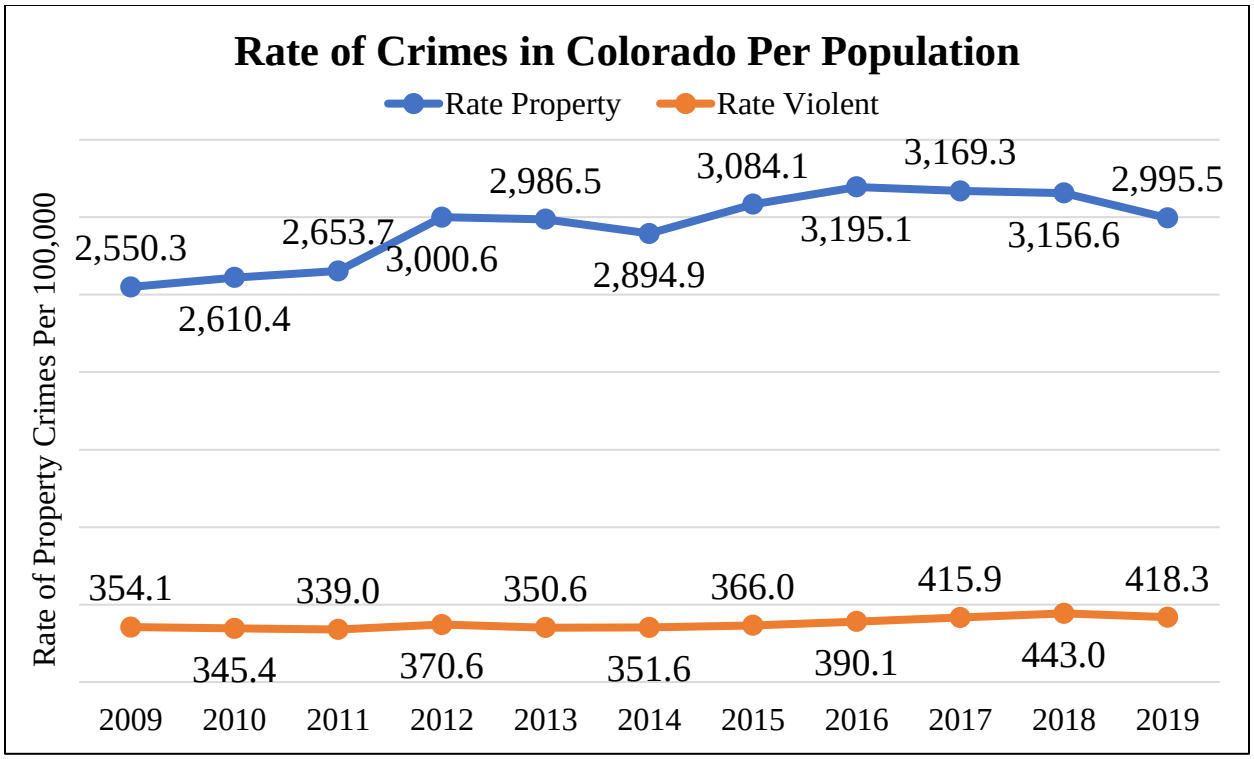
SOURCE: Colorado Bureau of Investigation

NOTE: Data collection methods for reporting crimes changed in 2018 and therefore numbers reported in this volume may vary from those reported in previous volumes.



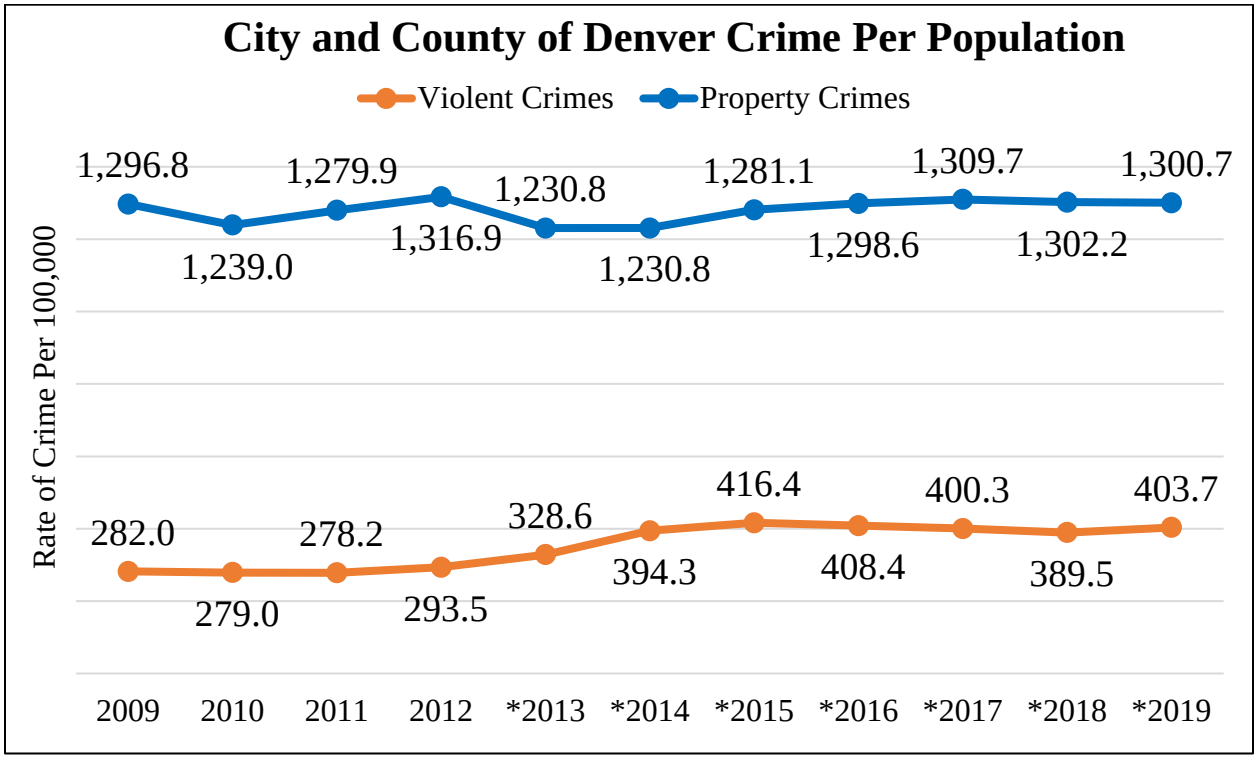
SOURCE: Colorado Bureau of Investigation

NOTE: Data collection methods for reporting crimes changed in 2018 and therefore numbers reported in this volume may vary from those reported in previous volumes.

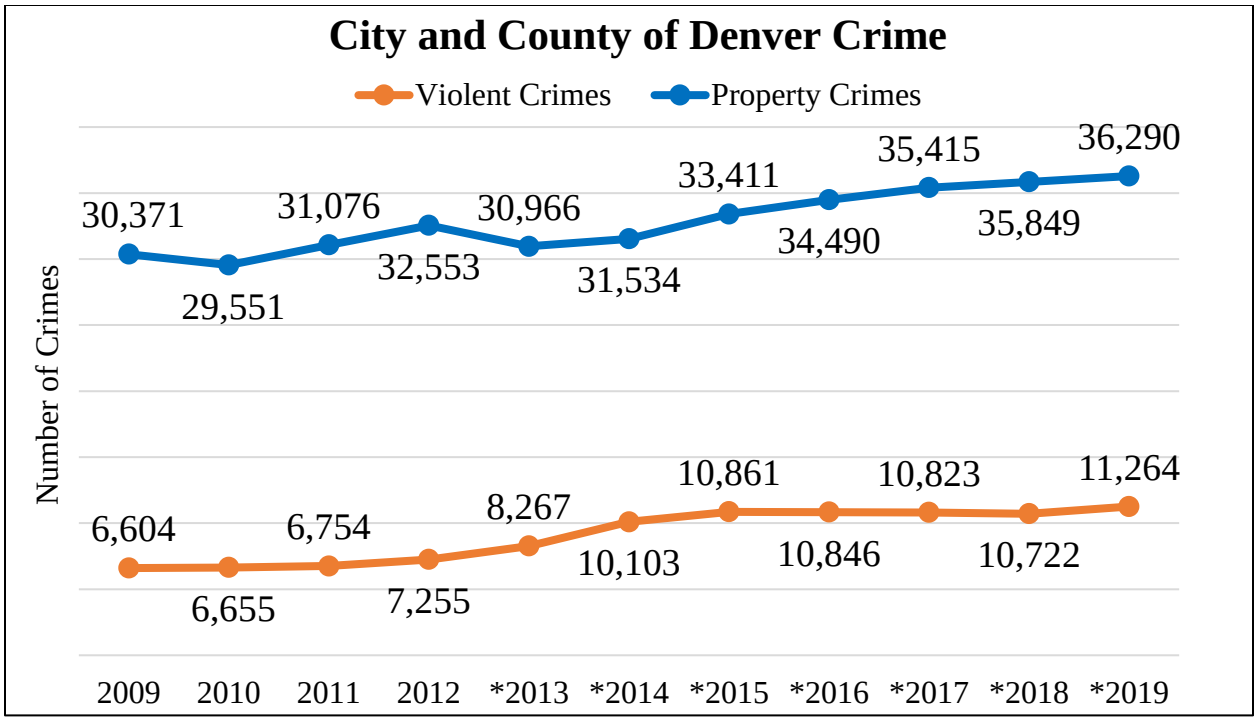


SOURCE: Colorado Bureau of Investigation

NOTE: Data collection methods for reporting crimes changed in 2018 and therefore numbers reported in this volume may vary from those reported in previous volumes.



SOURCE: City and County of Denver, Denver Police Department



SOURCE: City and County of Denver, Denver Police Department

***NOTE:** In May 2013, the Denver Police Department implemented the Unified Summons and Complaint (US&C) process. This process unifies multiple types of paper citations, excluding traffic tickets, into an electronic process. That information is transmitted to the Denver Sheriff, County Court, City Attorney and District Attorney through a data exchange platform as needed. As a result of this process a reported offense is generated which was previously not captured in National Incident Based Reporting System (NIBRS).

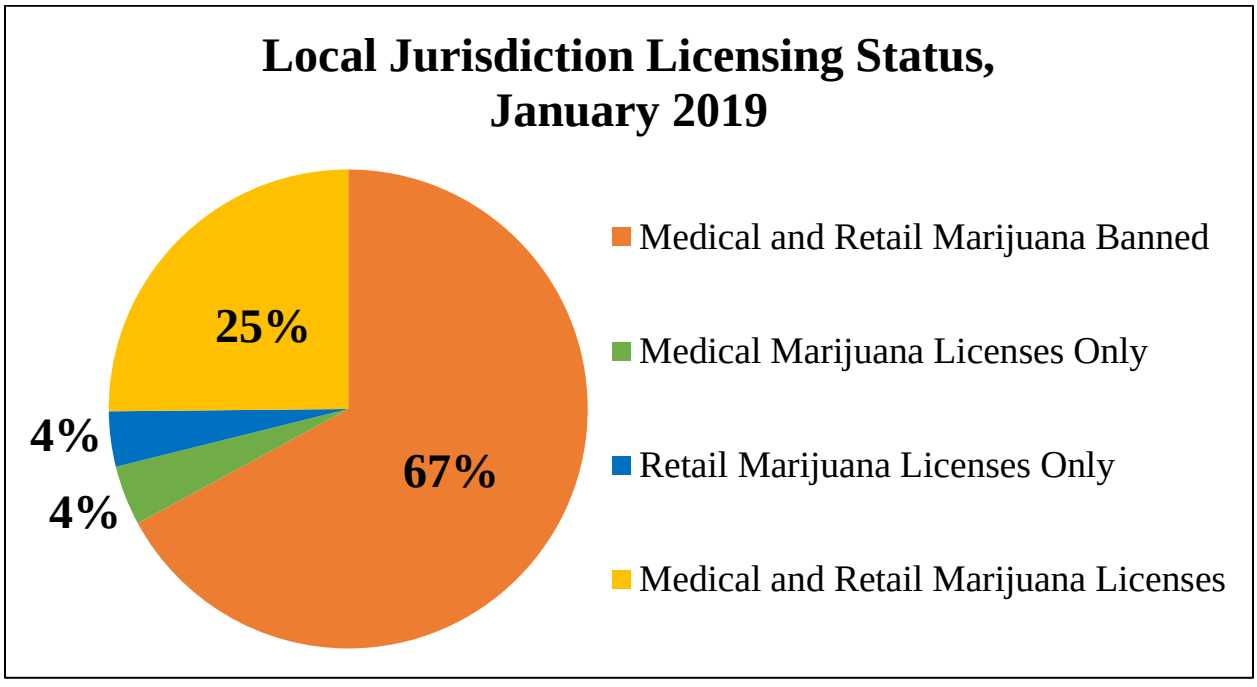
Denver Crime 2015-2019	Number of Crimes	Rate of Crimes (Per 100,000 People)
Crimes Against Persons	3.7% Increase	3.1% Decrease
Crimes Against Property	8.6% Increase	1.5% Increase
Crimes Against Society	12.5% Increase	5.2% Increase
All Other Offenses	16.7% Decrease	22.1% Decrease
All Denver Crimes	2.6% Increase	4.1% Decrease

SOURCE: City and County of Denver, Denver Police Department

Local Response

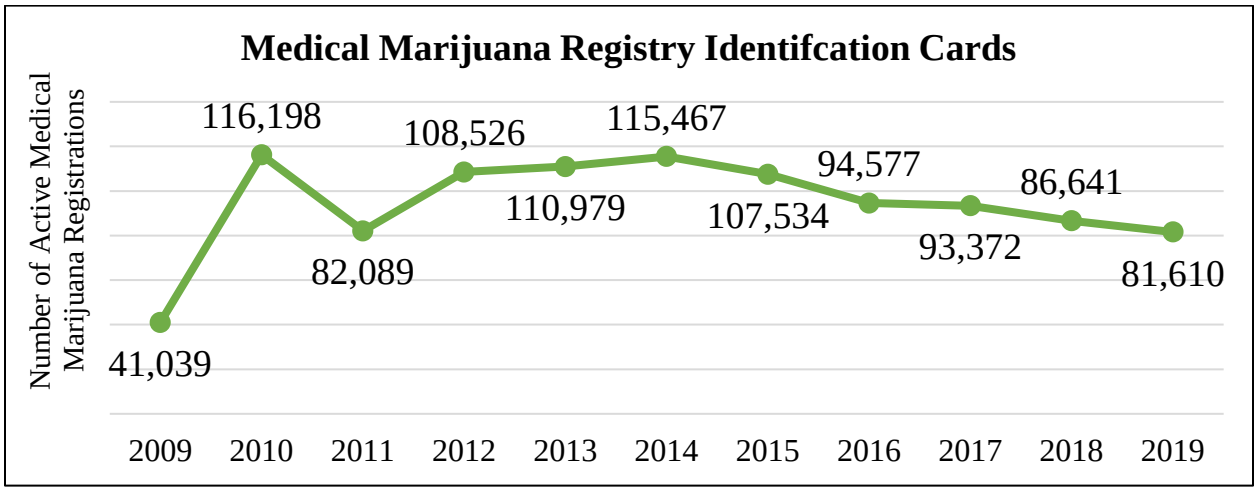
Status of Local Jurisdictions Reporting Marijuana Licensing as of January 10, 2019*	
	Number of Jurisdictions
Medical and Retail Marijuana Banned	216
Medical Marijuana Licenses Only	13
Retail Marijuana Licenses Only	12
Medical and Retail Marijuana Licenses	81
Total	322

SOURCE: Colorado Marijuana Enforcement Division



SOURCE: Colorado Marijuana Enforcement Division

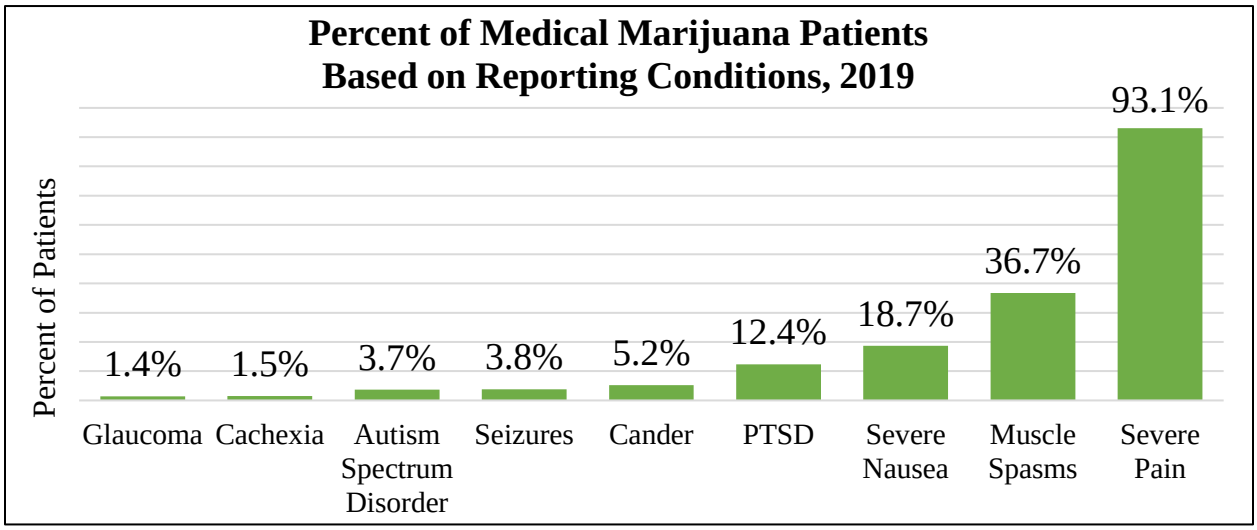
Medical Marijuana Statistics



SOURCE: Colorado Department of Public Health and Environment (CDPHE)

Profile of Colorado Medical Marijuana Cardholders:

- Demographics of cardholder:
  - 62% male with an average age of 42 years
  - 38% female with an average age of 46 years
  - 0.4% between the ages of 0 and 17
  - 48% between the ages of 18 and 40 and 21% between the ages of 21 and 30
- Top five counties in Colorado- 63.1% of total patients:
  - El Paso County- 26.3%
  - Denver County 13.1%
  - Jefferson County- 9.8%
  - Arapahoe County- 7.8%
  - Adams County- 6.1%

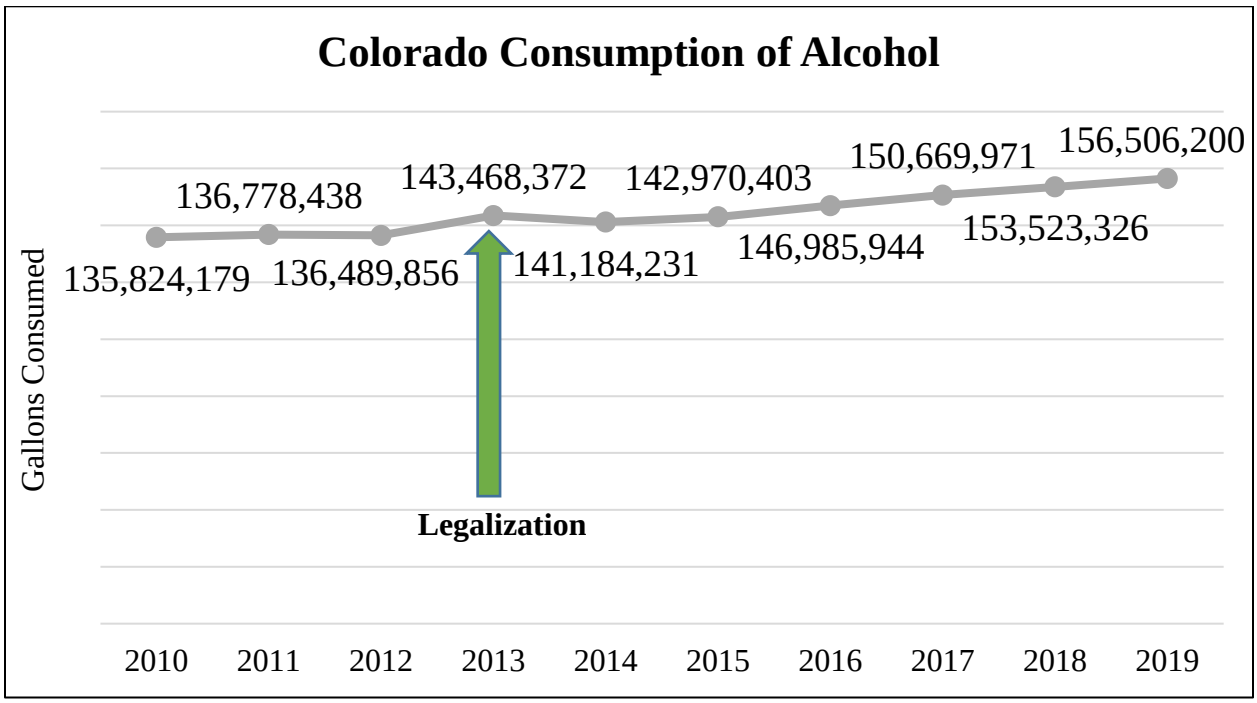


SOURCE: Colorado Department of Public Health and Environment (CDPHE)

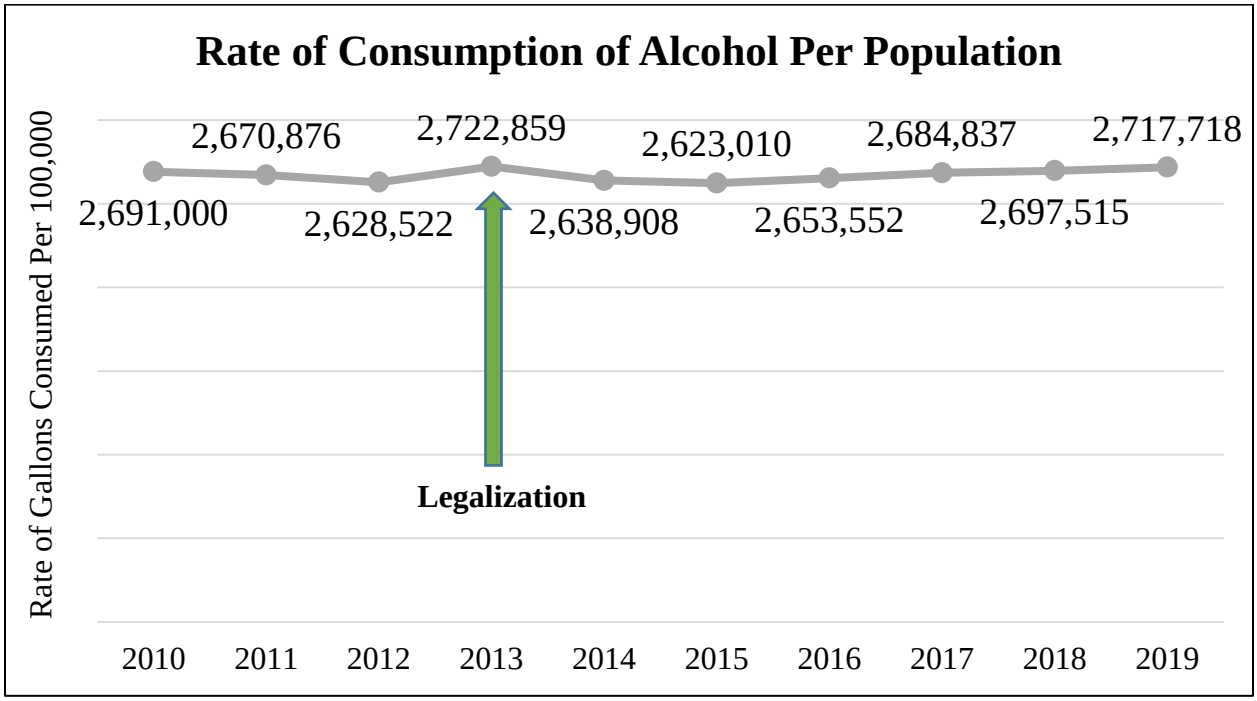
NOTE: Percentages do not add to 100% as some patients report more than one debilitating or disabling medical condition.

Alcohol Consumption

- It has been suggested that legalizing marijuana would reduce alcohol consumption. Thus far that theory is not supported by the data.



SOURCE: Colorado Department of Revenue, Colorado Liquor Excise Tax



SOURCE: Colorado Department of Revenue, Colorado Liquor Excise Tax

Societal Impact Information

Marijuana Dispensaries and Neighborhood Crime and Disorder in Denver, Colorado

Opponents of marijuana legalization in Colorado have claimed that marijuana dispensaries would result in greater crime and disorder particularly due to the cash-driven industry. A study was conducted to analyze crime rates in Denver from 2012 to 2015 to determine if there was a correlation with medical dispensary locations and "hot spots" for crime. A previous finding was that medical marijuana dispensaries in Denver were "more likely to be located in statistical neighborhoods with relatively high rates of crime and retail employment."

The results of the study supported that finding in that from 2012 to 2015, "the presence of at least one medical marijuana dispensary was associated with statistically significantly increased neighborhood crime and disorder, including the violent offenses of robbery and aggravated assault." There was not found to be a strong correlation between medical marijuana dispensaries and increased murder rates in Denver but as expected, there was an increased in drug and alcohol offenses. The authors' recommendation was that this relationship was not strong enough to imply that there would be major spikes in crime if other cities/states legalize marijuana. Instead, their focus was emphasizing the need to "develop and support secure and legal ways for dispensaries to engage in financial transactions" to decrease both violent and property.

Source: Hughes, L., Schaible, L., and Jimmerson, K. (2019). *Marijuana Dispensaries and Neighborhood Crime and Disorder in Denver, Colorado*. Justice Quarterly, 37(3), 461-485. DOI: 10.1080/07418825.2019.1567807

The Criminogenic Effect of Marijuana Dispensaries in Denver, Colorado: A Microsynthetic Control Quasi-Experiment and Cost-Benefit Analysis

These authors conducted a study in response to the Hughes et al. (2019) article that analyzed the correlation between marijuana dispensaries and neighborhood crime in Denver. This study slightly differed in measuring "changes in violent, property, disorder, and drug crime levels from the three-year period before recreational marijuana was legalized (2011-2013) against the three-year period (2014-2016)." The three primary focuses of the study were potential crime change at individual street segments by dispensary type, the spatial diffusion of crime at the street segments adjacent to dispensaries, and the cost-benefit analysis of crime and revenue.

The results supported some of the findings in the Hughes et al. (2019) but also challenged the notion that medical and recreational marijuana dispensaries had the same impact on crime. The authors found "street segments with a recreational marijuana dispensary experienced a statistically significant increase in the level of property crime relative to controls." Conversely, the results for medical marijuana dispensaries indicated that street segments not only "maintained crime levels that were almost identical to the corresponding pools of controls." In some areas there were fewer crimes, though the percent change was not significant. Drug crimes were more likely to occur near recreational dispensaries and at a lower, less significant level, disorder also appeared to increase from 2014-2016. These findings were not found near or at medical dispensaries in Denver. The results for violent crimes near or at both medical and recreational dispensaries were very similar across all six years.

The cost benefit analysis found that tax revenue alone was not enough to offset the cost of crime and instead sales volumes play a large role in countering crime expenses. While revenue from sales at recreational dispensaries appeared to outweigh the cost of an increase in local crime, the revenue was not sufficient to cover the added increase in drug crime and spatial disorder. "The sales revenue numbers reflect only $28 of revenue generation relative to every $1 cost of crime and the tax revenue results paint a bleaker picture, indicating that every $1 cost of crime is only offset by about a $1.18 gain in tax revenue."

Source: Connealy, N., Piza, E., and Hatten, E. (2020). *The Criminogenic Effect of Marijuana Dispensaries in Denver, Colorado: A Microsynthetic Control Quasi-Experiment and Cost-Benefit Analysis*. Justice Evaluation Journal, 3(1), 6993. DOI: 10.1080/24751979.2019.1691934

Increase in Marijuana Revenue in June and July Despite COVID-19

In June, recreational marijuana shops set a record of selling over $150 million of products, a 6% increase from May with the previous record of $149.2 million. However, the record of medical marijuana sales was set in May with almost $43 million in sales and in June, there was a slight dip to almost $41 million worth of products sold. The combined total for recreation and medical marijuana sold in June was almost $199 million, a 3.5% increase from May's total sales.

Research supports not only coronavirus contributing to this increase but a preexisting "maturation of the state's legal cannabis ecosystem." The per capita sales in Colorado doubled to $290 in 2019 compared to 2014, the first full year of legal recreation. The percent of users who consumed cannabis in the past six months in Colorado also increased to 42% in the third quarter of 2019 compared to 24% in the third quarter of 2017. The Colorado Department of Revenue (CDOR) reported a total of $203.3 million in state revenue collected as of July 2020, which by the end of the year will likely surpass the $302.5 million in annual cannabis-related revenue in 2019.

Source: Rubino, Joe. (2020). *June was Colorado's Biggest Marijuana Sales Month Ever. July Was Likely Bigger*. Retrieved from https://www.denverpost.com/2020/08/12/june-2020-colorado-marijuana-sales-record/

Potential Regional Air Quality Impacts of Cannabis Cultivation Facilities in Denver, Colorado

In March 2018, there were 1472 cannabis cultivation facilities (CCF) in Colorado. In Denver, there were 233 registered recreational and 375 medical facilities, 41% of Colorado's CCFs. Denver along with the Front Range area place a large focus reducing ozone emissions and precursors, resulting in a need to research the environmental impact of cannabis. The main focuses of the study were the emissions capacity, dry plant weight, and plant count of cannabis. Additionally, the total number of plants recorded by the CDOR is expected to double from 2018 to 2025 to a total of 2 million plants. The results showed Denver was much more at risk than three Colorado cities with a large concentration of CCFs (Colorado Springs, Pueblo, and Boulder). The increase is due to biogenic volatile organic compounds (BVOC), gaseous emissions from cannabis from both inside and outside growing. The authors generated seven scenarios due to changes in the three parameters and the range in BVOC was an increase between 36% and 326% in Denver.

Source: Wang, C., Wiedinmyer, C., Ashworth, K., Harley, P., Ortega, J., Rasool, Q., and Vizuete, W. (2019). *Potential Regional Air Quality Impacts of Cannabis Cultivation Facilities in Denver, Colorado.* Atmospheric Chemistry and Physics, 19, 13973-13987.