

IMPACT REPORT

2023-2024

Lessons Learned from State Marijuana Legalization

SAM Smart
Approaches to
Marijuana
preventing another big tobacco

www.learnaboutsam.org

IMPACT REPORT OUTLINE

- I. **Data and policy background**
 - a. A snapshot
 - b. Research on marijuana harms
 - c. Key outcomes
- II. **Commercialization: a growing concern**
 - a. High-potency marijuana
 - b. Not only potency, but consumption levels: What do users look like today?
 - c. State regulatory frameworks struggle to keep up with the number of licensed shops.
- III. **Adverse health effects of marijuana**
 - a. Marijuana and pregnancy
 - b. Marijuana and co-use with other substances
 - i. Marijuana's association with alcohol and other drugs
 - ii. Marijuana vaping
 - c. Emergency department and hospital admissions
- IV. **Impact on youth**
- V. **Impact on young adults**
- VI. **Impact on communities of color and low-income populations**
- VII. **Impact on homelessness**
- VIII. **Impact on impaired driving**
- IX. **Impact on crime**
- X. **Impact on the illicit market**
- XI. **Tax revenue from legalization**
- XII. **Localities opt-out of retail marijuana**
- XIII. **“Legal” products are unsafe**
- XIV. **Impact on the environment**
- XV. **Canada**
- XVI. **Impact on pets**
- XVII. **References**

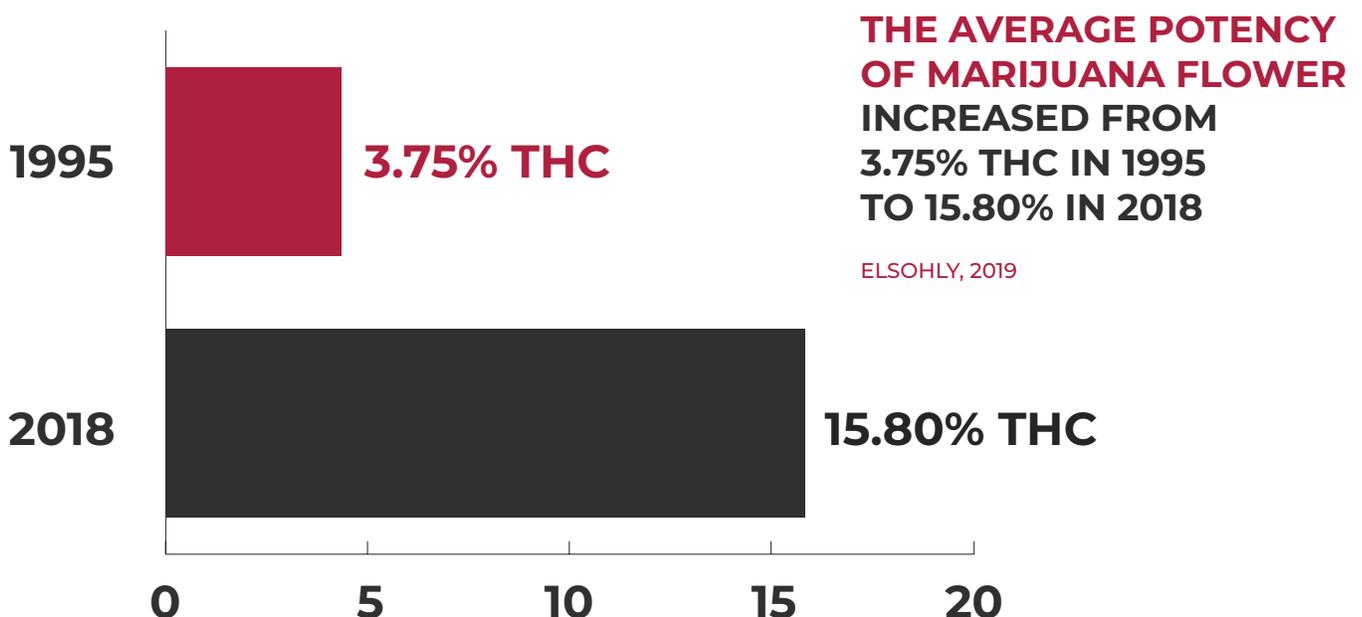
DATA AND POLICY BACKGROUND

Contrary to federal law, under which the possession and sale of marijuana are illegal (Controlled Substances Act, 1971), several states have legalized the cultivation, commercial sale, and use of marijuana, beginning in 2012. Despite this, dozens of states continue to reject the legalization of marijuana. The vast majority of localities in “legal” states also ban the production and retail sale of marijuana. Marijuana remains illegal at the federal level, although pro-marijuana lobbyists are actively working to undue this.

Smart Approaches to Marijuana (SAM) compiled publicly available federal and state-level data, reports, investigatory findings, peer-reviewed studies, and government health surveys to assemble this report. We have attempted to be as transparent as possible in our evaluation so as to allow readers to trace our steps and further their own research. For example, in reviewing the Substance Abuse and Mental Health Services Administration (SAMHSA) data taken from the National Survey on Drug Use and Health (NSDUH), we included data from the District of Columbia in our assessment of “legal” jurisdictions. They have legalized marijuana to some degree, although their measures differ from traditional recreational marijuana programs because they continue to prohibit commercial sales.

A note on 2020 and 2021 data: the data collected during 2020 and 2021 are unique because of the COVID-19 pandemic and the change in behaviors observed by many Americans. School-age children spent their time learning at home and were less influenced by peers, fewer drivers were on the road during peak crash times, but drivers overall were more reckless, many bars and restaurants were closed for long periods of time, and many employees worked from home. On the inverse, millions of Americans struggled with their mental health, overdose deaths skyrocketed, and many Americans missed healthcare appointments and postponed care. Because each state’s COVID-related regulations were different, national-level data is difficult to scrutinize. The data should be observed through this lens. If the data need additional qualifiers, we have noted that.

POTENCY



USE DATA

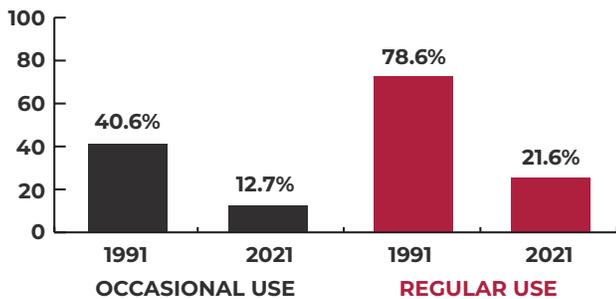
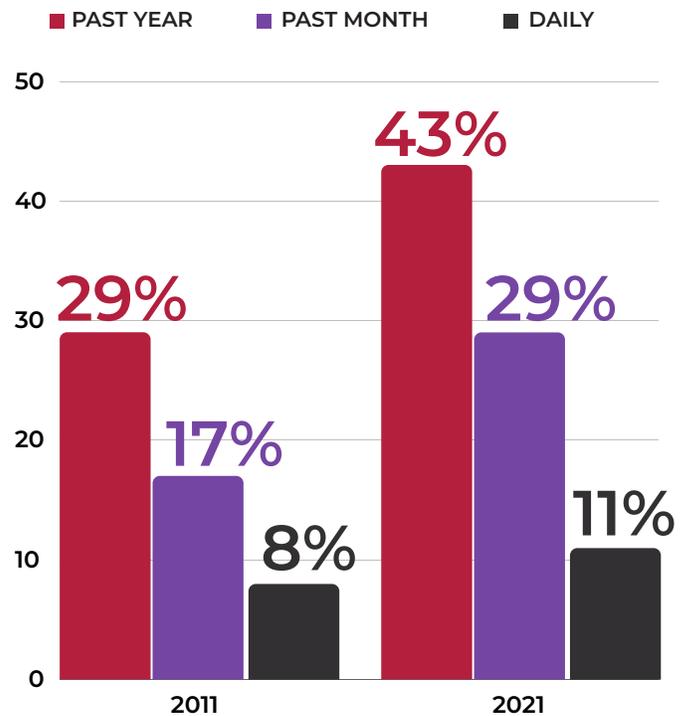
52.5

MILLION AMERICANS used marijuana in 2021 vs. 17.5 Million Americans used marijuana in 1992 NSDUH 2021

USE IS INCREASING ACROSS THE BOARD, BUT ESPECIALLY IN YOUNG ADULTS AGED 19-30:

29% reported past-month use in 2021 up from 17% in 2011; 11% reported daily use, up from 8% in 2011

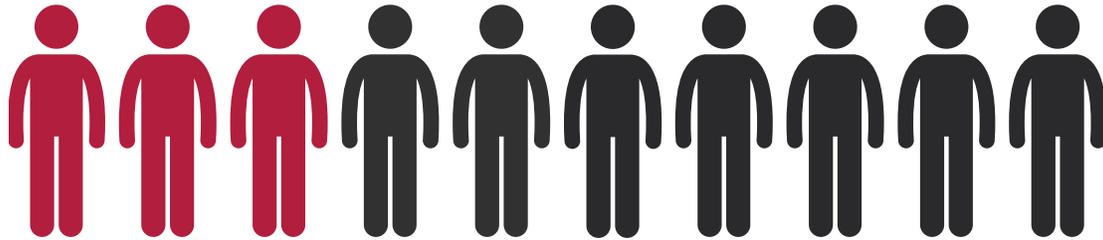
MTF 2021



12TH GRADERS PERCEPTION OF MARIJUANA'S HARM
MONITORING THE FUTURE, 2022B

WHILE THE USE OF MARIJUANA IS STEADILY INCREASING, THE PERCEPTION OF HARM FROM USING MARIJUANA IS DECREASING, ESPECIALLY AMONG HIGH SCHOOLERS

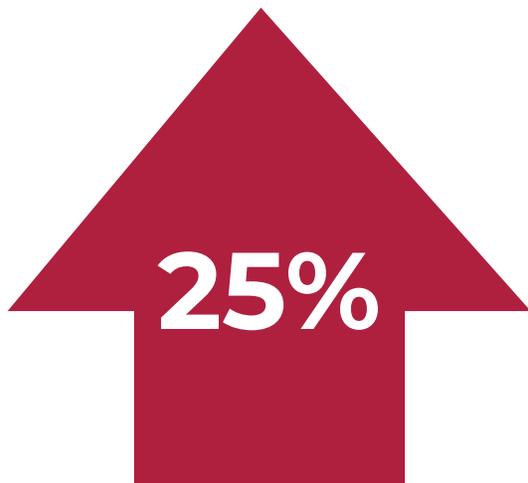
30% of marijuana users have some form of marijuana use disorder



National Institute on Drug Abuse, 2019a

USE BEFORE THE AGE OF 18 INCREASES THE LIKELIHOOD OF MARIJUANA USE DISORDER BY SEVEN FOLD

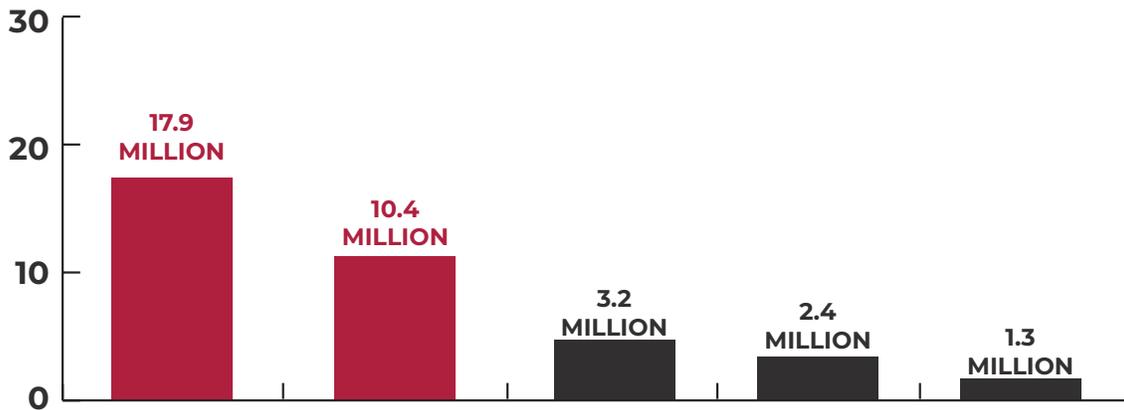
National Institute on Drug Abuse, 2019a



LEGALIZATION IS ASSOCIATED WITH A 25% INCREASE IN MARIJUANA USE DISORDER AMONG 12-17-YEAR-OLDS

CERDÁ ET AL., 2020

VAPING MARIJUANA IS ALSO UP ACROSS THE BOARD, ESPECIALLY FOR YOUTH

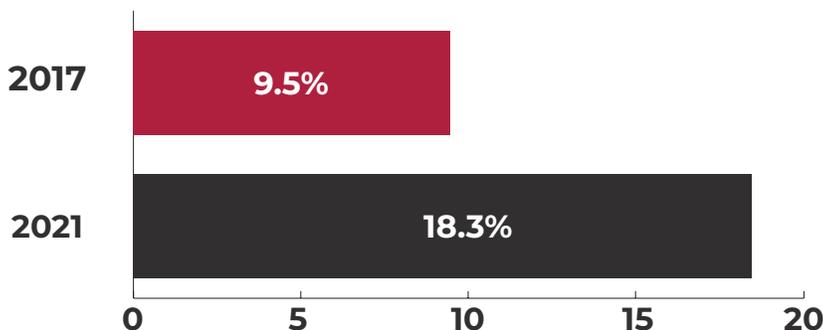


IN 2020, 34.5 MILLION INDIVIDUALS 12 OR OLDER REPORTED VAPING NICOTINE IN THEIR LIFETIME; 17.9 MILLION OF THOSE WERE WITHIN THE PAST YEAR, AND 10.4 MILLION WERE WITHIN THE PAST MONTH. AMONG THOSE AGED 12-17, 3.2 MILLION REPORTED HAVING USED A NICOTINE VAPE BEFORE; 2.4 MILLION OF THOSE VAPED NICOTINE IN THE PAST YEAR, AND 1.3 MILLION DID SO IN THE PAST MONTH (WHICH IS NOTABLY HIGHER THAN ALL OTHER FORMS OF CONSUMING NICOTINE)

SUBSTANCE ABUSE AND MENTAL HEALTH SERVICES ADMINISTRATION, 2020A

Between 2017 and 2019, dabbling at least once increased by 47.8%, and dabbling usually increased by 178.6%. Vaping at least once increased by 70.0%, and vaping usually increased by 185.7%

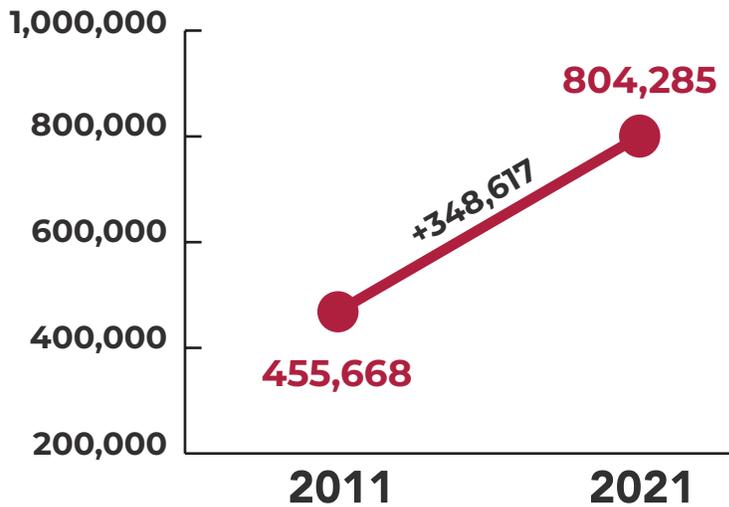
COLORADO DEPARTMENT OF PUBLIC HEALTH & ENVIRONMENT, 2021



BETWEEN 2017 AND 2021, THE PERCENTAGE OF 12TH GRADERS WHO VAPED MARIJUANA IN THE PAST YEAR INCREASED FROM 9.5% TO 18.3%

MONITORING THE FUTURE, 2022A

PUBLIC HEALTH



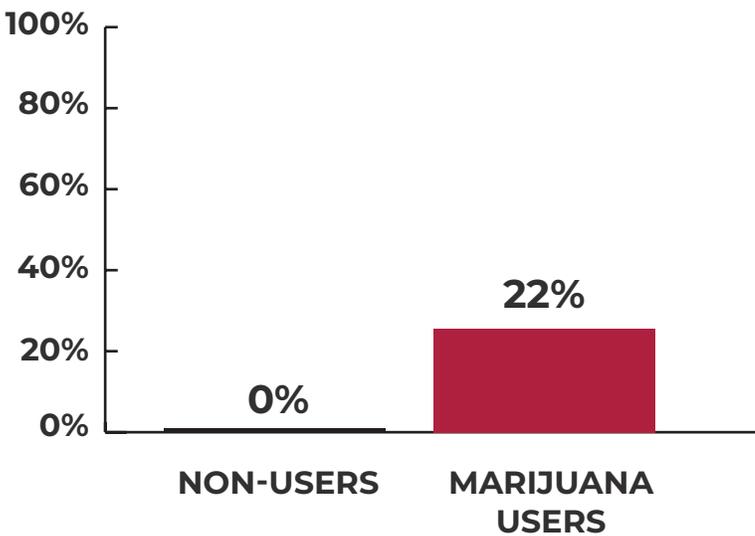
IN THE UNITED STATES, THERE WERE 804,285 MARIJUANA RELATED EMERGENCY DEPARTMENT VISITS HAVE INCREASED SINCE 2011

2011 & 2021 DRUG ABUSE WARNING NETWORK

MARIJUANA USERS WERE NEARLY 25% MORE LIKELY THAN NON-USERS TO GO TO THE ER OR BE HOSPITALIZED

VOZORIS ET AL., 2022

LIKELIHOOD OF NEEDING EMERGENCY SERVICES



“Colorado has reported a 46% increase in hospitalizations due to Cannabis Hyperemesis cyclical vomiting in just five years after the legalization of recreational cannabis”

G. S. WANG ET AL., 2021

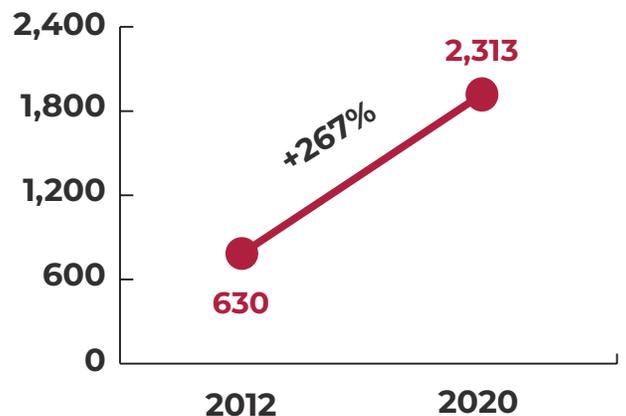
EMERGENCY DEPARTMENT VISITS AND ADMISSIONS RELATED TO MARIJUANA ABUSE IN CALIFORNIA IS UP 89% FOLLOWING LEGALIZATION

CALIFORNIA OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT, 2019



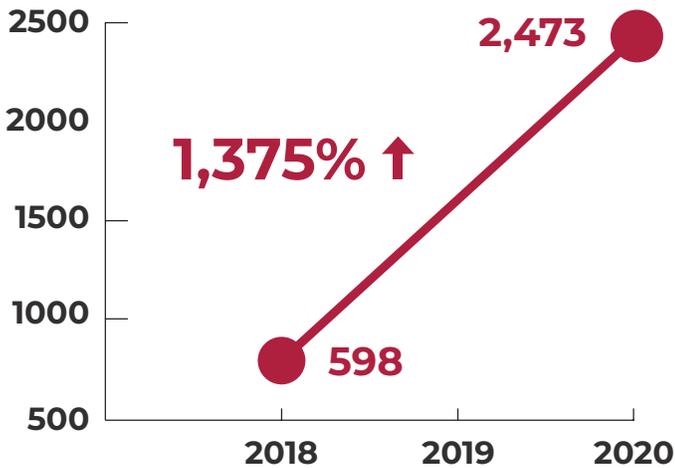
MARIJUANA-RELATED HOSPITALIZATIONS IN COLORADO PER 100,000 SINCE LEGALIZATION HAVE INCREASED 148%

COLORADO DIVISION OF CRIMINAL JUSTICE, 2021



MARIJUANA-INDUCED ER ADMISSIONS IN ARIZONA

ARIZONA DEPARTMENT OF HEALTH SERVICES

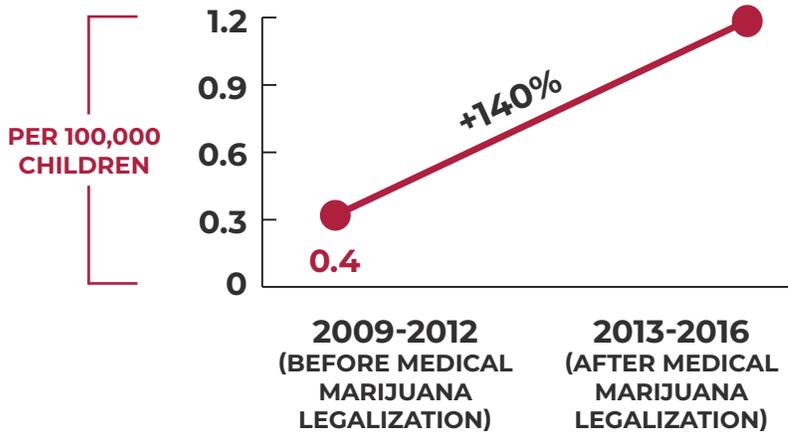


NATIONALLY, THERE WERE 2,473 IN-HOME THC EXPOSURES INVOLVING CHILDREN YOUNGER THAN 12 IN 2020, UP FROM 598 IN 2018

RUSSO, 2021

**586%↑
Colorado**

INCIDENCE OF CANNABIS CALLS TO POISON CONTROL IN MASSACHUSETTS



FROM 2012 TO 2019, THERE WAS A 586% INCREASE IN CALLS TO POISON CONTROL IN COLORADO FOR MARIJUANA-RELATED INCIDENTS IN CHILDREN BETWEEN 0-5

COLORADO DEPARTMENT OF PUBLIC SAFETY, 2021

INCREASES IN LEGAL STATES FOR MARIJUANA-RELATED POISON CONTROL CALLS:

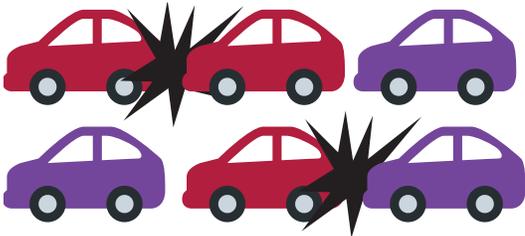


WASHINGTON POISON CENTER, 2019



EMERSON, 2022

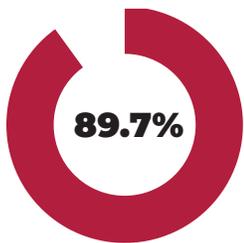
6800



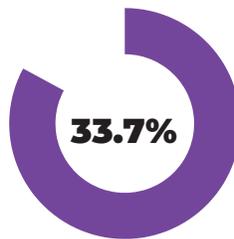
If marijuana were legalized nationwide, the U.S. would suffer an additional 6,800 excess fatal crashes every year

KAMER ET AL., 2020

Among Colorado drivers who underwent confirmatory testing for Delta-9 THC between 2016 and 2019



Tested positive for THC

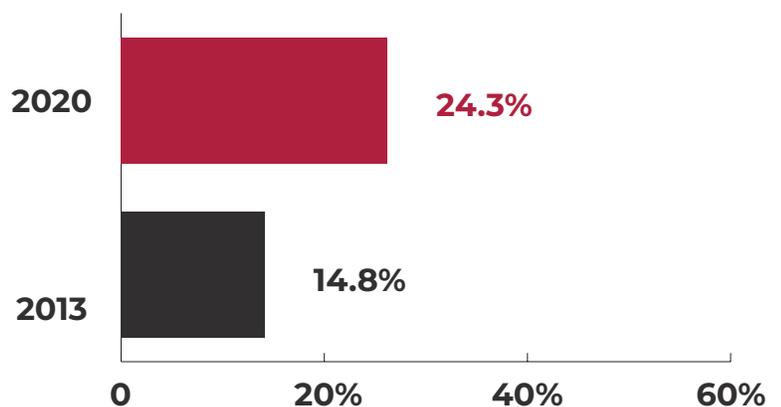
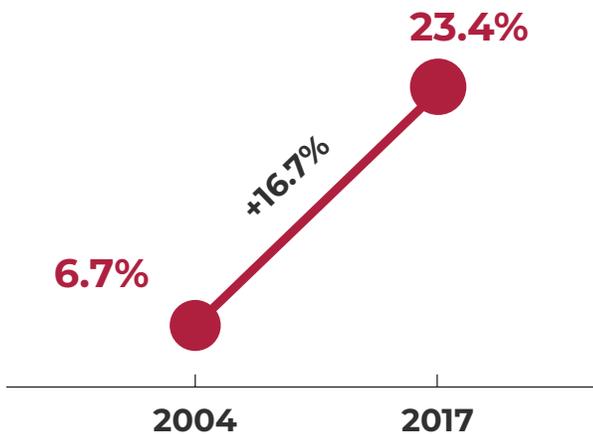


Tested positive for a THC level between 1.0 and 5.0 ng/ml



Tested positive for a THC level above 5.0 ng/ml

ROSENTHAL & REED, 2022



IN MICHIGAN AMONG THOSE FATAL CRASHES WHERE CANNABIS WAS TESTED, THE PROPORTION OF TESTS THAT WERE POSITIVE FOR CANNABINOIDS MORE THAN TRIPLED OVER 13 YEARS (6.7% IN 2004 TO 23.4% IN 2017).

IN 2020, 24.3% OF DRIVERS INVOLVED IN TRAFFIC FATALITIES TESTED POSITIVE FOR MARIJUANA, UP FROM 14.8% IN 2013

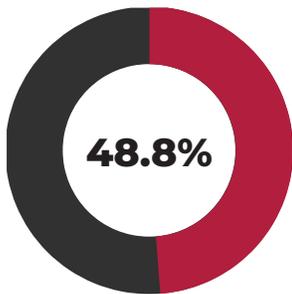
ROCKY MOUNTAIN HIGH INTENSITY DRUG TRAFFICKING AREA, 2021

UNIVERSITY OF MICHIGAN INJURY PREVENTION CENTER, 2022, P. 12

1 IN 4

ROAD DEATHS IN COLORADO INVOLVE MARIJUANA

COLORADO DIVISION OF CRIMINAL JUSTICE, 2020.

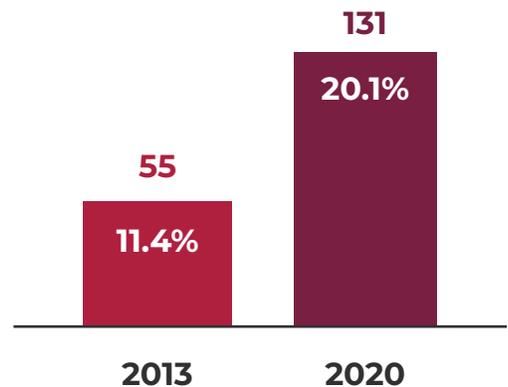


OF TEEN DRIVERS WHO USE MARIJUANA REPORT DRIVING UNDER THE INFLUENCE

LI ET AL., 2020

IN COLORADO, THERE WERE 131 MARIJUANA-RELATED TRAFFIC FATALITIES IN 2020, UP FROM 55 IN 2013—THE PERCENTAGE OF FATAL CRASHES THAT INVOLVED MARIJUANA NEARLY DOUBLED OVER THAT TIME PERIOD, INCREASING FROM 11.4% TO 20.1%

ROCKY MOUNTAIN HIGH INTENSITY DRUG TRAFFICKING AREA, 2021



60% OF PAST 3-MONTH USERS IN VIRGINIA REPORTED DRIVING WHILE UNDER THE INFLUENCE IN THE LAST FEW MONTHS

26% REPORTED DRIVING UNDER THE INFLUENCE OF MARIJUANA AT LEAST ONCE A WEEK

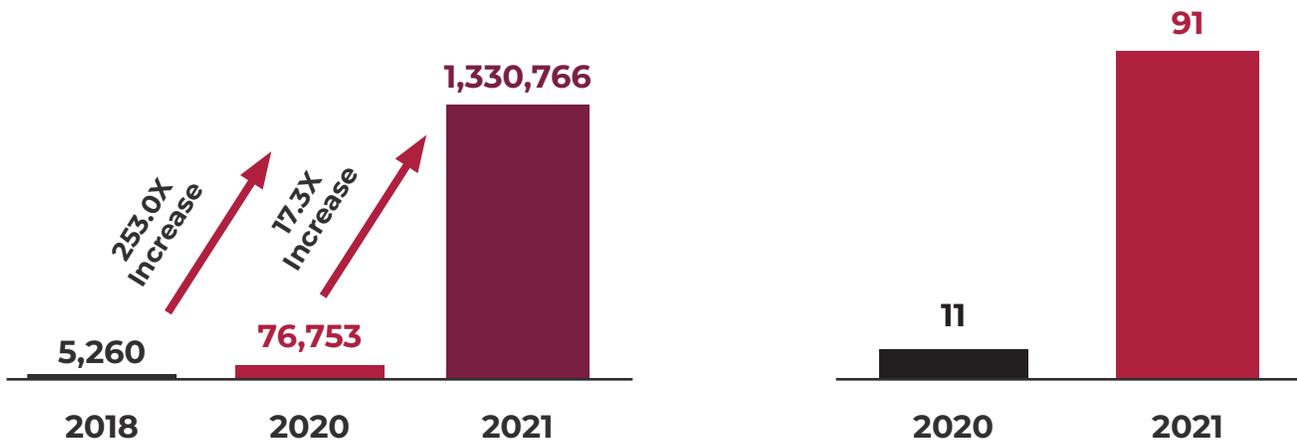
STRATACOMM, 2022

ILLICIT MARKET



70-80%
of marijuana sold in state-legal dispensaries in California was produced and grown illegally

NBC NEWS, 2022



THE OREGON-IDAHO HIDTA SEIZED 1,330,766 ILLICIT MARIJUANA PLANTS IN 2021. THAT'S COMPARED TO 76,753 IN 2020 (17.3X INCREASE) AND 5,260 IN 2018 (253.0X INCREASE)

OREGON-IDAHO HIGH INTENSITY DRUG TRAFFICKING AREA, 2022B, P. 17

THE NUMBER OF CLANDESTINE LABORATORIES SEIZED IN THE HIDTA REGION INCREASED FROM 11 IN 2020 TO 91 IN 2021, WITH THE MAJORITY (90) RELATED TO CANNABIS EXTRACTION FOR THE PURPOSE OF PRODUCING "BHO/HONEY OIL"

OREGON-IDAHO HIGH INTENSITY DRUG TRAFFICKING AREA, 2022A, P. 11

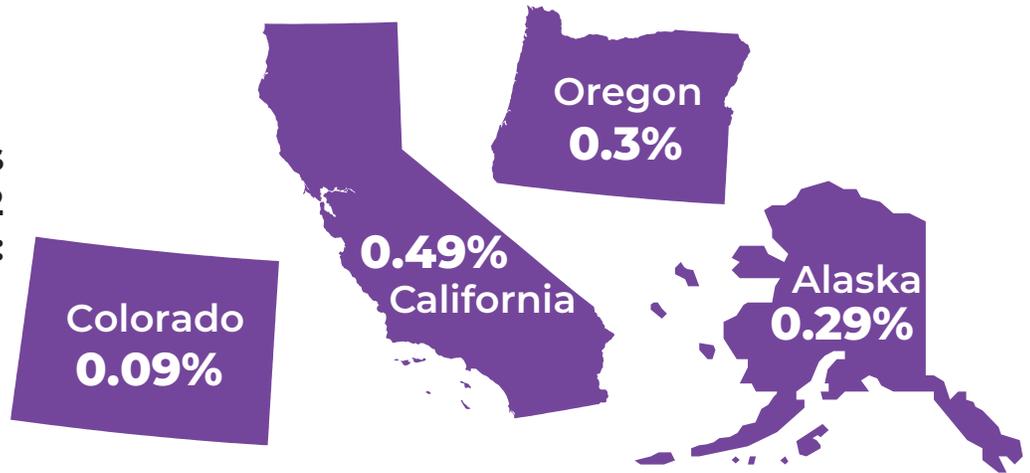
85-90%
of California-produced marijuana is exported

FULLER, 2019



TAX REVENUE

MARIJUANA TAXES AS A PERCENT OF FY21-22 STATE BUDGETS:

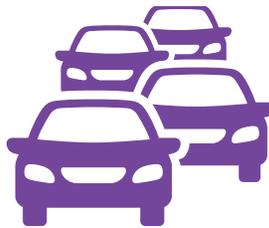


ENVIRONMENTAL IMPACT



OUTDOOR MARIJUANA GROW SITES CONSUME AN ESTIMATED 29.4 MILLION GALLONS OF WATER PER YEAR IN CALIFORNIA

GRETA WENGART, INTEGRAL ECOLOGY RESEARCH CENTER CA 29.4 MILLION GALLONS MARIJUANA



INDOOR MARIJUANA GROWS EMIT AS MUCH CO2 AS 3.3 MILLION CARS

LARKIN & SWEENEY, 2022



MARIJUANA PRODUCTION IS NEARLY FOUR TIMES MORE ENERGY INTENSIVE THAN COAL OR OIL PRODUCTION

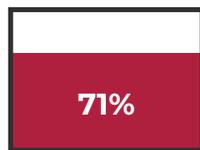
MILLS, 2012

LOCALITIES ARE OPTING OUT



CALIFORNIA

NIEVES, 2021



COLORADO

FUEGO, 2019



NEW YORK

ROCKEFELLER INSTITUTE OF GOVERNMENT, 2022



NEW JERSEY

MJBIZDAILY, 2021

A MAJORITY OF LOCALITIES IN “LEGAL” STATES HAVE OPTED OUT OF MARIJUANA SALES

DATA AND POLICY BACKGROUND

In 2013, the U.S. Department of Justice (DOJ) decided to take a hands-off approach toward legalization at the state level. Officially, the DOJ stated it would only get involved if any of eight requirements laid out in the “Cole Memo” (e.g., sales to minors, increased drugged driving) were violated. Unfortunately, the DOJ took no meaningful action as states routinely violated the “Cole Memo,” according to the U.S. Government Accountability Office (GAO). However, public health and safety departments and law enforcement agencies in “legal” states have produced primary data and impact reports that illustrate how current marijuana policies are failing to protect the health and safety of the general population (Alaska State Troopers, 2016; Financial Management, 2019; Grondel et al., 2018; Oregon Liquor Control Commission, 2018; Oregon Public Health Division, 2016; Oregon State Police Drug Enforcement Section, 2017; Oregon-Idaho High Intensity Drug Trafficking Area, 2018; Rocky Mountain High Intensity Drug Trafficking Area, 2019b).

In 2018, the DOJ rescinded the “Cole Memo,” signaling an uncertain future for the marijuana industry. One thing is clear: by legalizing marijuana, states continue to violate federal laws. We now have more than ten years of data to show how these marijuana policy changes—and the industry they created—harm families and communities. This industry is chiefly driven by higher use rates and increased normalization, seeking to convert casual users and non-users into life-long customers. As we are only now beginning to address the far-reaching and devastating consequences of the addiction epidemic—driven largely, but not exclusively, by opioids—the rise of additional corporate promotion of drug use comes at an inopportune time.

Following the transition to the Biden administration, Attorney General Merrick Garland signaled that the DOJ would not pursue the prosecution of individuals who use marijuana in accordance with their state’s respective marijuana laws. Garland has defended this position, in part, by arguing that, “Criminalizing the use of marijuana has contributed to mass incarceration and racial disparities in our criminal justice system” (Berman, 2021). Of note, the Biden administration fired would-be appointees who had previously used marijuana, highlighting the continued tension between federal and state-level marijuana laws (Berman, 2021). Additionally, in the administration’s Fiscal Year 2023 budget proposal, they again blocked Washington, DC, from legalizing marijuana sales, although voters had previously supported legalization as a ballot measure (Rawnsley, 2021).

In October 2022, President Joe Biden issued a pardon for all individuals convicted under federal law for the simple possession of marijuana (Shear & Kanno-Youngs, 2022). He also urged governors across the nation to adopt a similar policy. While Biden’s announcement was commended by supporters of criminal justice reform, others pointed out that no one was in federal prison solely for the possession of marijuana. Thus, although his policy retroactively helped 6,500 individuals who were previously charged, it did not free a single person from prison. Many of the people affected by this action also likely pled down from other charges. In November 2022, Governor Kate Brown, of Oregon, followed President Biden’s steps, pardoning more than 40,000 individuals who had been charged for marijuana possession.

In December 2022, President Biden signed the SAM-drafted Medical Marijuana and Cannabidiol Research Expansion Act (H.R. 8454) into law. This groundbreaking and bipartisan bill is the first stand-alone marijuana reform legislation to become law in United States history.

RESEARCH ON MARIJUANA HARMS

Scientific literature on the harms of marijuana use exists in abundance and will be discussed in this report. More than 20,000 peer-reviewed research articles have linked marijuana use to adverse mental health outcomes, ranging from depression to psychosis, as well as consequences for physical health and even negative outcomes for neonates exposed in utero. The connections between marijuana use and negative consequences for mental and physical health, among other risks, are often lost in conversations surrounding legalization.

The distinction between medical and recreational marijuana has been deliberately blurred by an industry with a heavy hand in both markets. A recent study found that despite evidence that lower THC dosage is more appropriate for medical purposes, the medical marijuana products advertised in retail stores contained around the same amount of THC as recreational marijuana products, which generally contain upwards of 15% THC (Cash et al., 2020). And a 2022 study suggests that the risk of developing a cannabis use disorder increases as marijuana's THC level increases (Petrilli et al., 2022). Though there is potential for the medical use of certain components found within the marijuana plant, these components should be researched through well-designed clinical studies and under the guidance of the Food and Drug Administration (FDA). These are just a few examples of the conflict between data-driven research and the normalization of marijuana. The science is clear. Yet proponents of legalization continue to march forward, single-mindedly pursuing profits.

KEY OUTCOMES

Similar to the nation's troubled past with tobacco and alcohol, the full consequences of the commercialization of marijuana will take decades

to materialize fully. However, researchers do not need to wait that long to understand certain key outcomes of commercialization. For example, the data in this report—and many others—show states that legalized marijuana often have the highest rates of marijuana use in the country. The data also show use is sharply increasing in vulnerable demographics, including youth and young adults whose brains are still developing. These states also have:

1. Higher rates of marijuana-related driving fatalities.
2. Issues with “legally” sold but contaminated marijuana vapes.
3. More marijuana-related emergency department visits, hospitalizations, and accidental exposures.
4. Expansive and lucrative criminal markets.
5. Exacerbated racial disparities in marijuana industry participation and criminal justice enforcement.
6. Increases in workplace problems, including labor shortages and accidents.

COMMERCIALIZATION: A GROWING CONCERN

The commercialization of marijuana results in negative consequences for public health, social justice, and public safety. Medical marijuana legalization gave way to recreational marijuana legalization in states across the country, and the industries maintaining both sectors have been heavily capitalized. The result is the creation of a new and powerful addiction-for-profit industry.

More people are using marijuana while remaining largely ignorant of its negative consequences. Additionally, usage rates are surging across the United States after years of declines. More than 52.5 million people aged 12 or older reported past-year marijuana use in the U.S. in 2021, a more than 20% increase from 2018 (Substance Abuse and

Mental Health Services Administration, 2018a, 2021a, p. 1). More than 45% of all adults reported trying marijuana at least once in their lifetimes. And 34.7% of 12th graders reported that they used marijuana in the past year (Miech et al., 2023). The United Nation's World Drug Report noted that there was a "General increase in cannabis use, with a narrowing gender gap and a more pronounced increase in frequent use among young adults" following legalization (UN Office on Drugs and Crime, 2022). The alarming increase in use among young people, in particular pregnant women, prompted then-U.S. Surgeon General Dr. Jerome Adams to issue a first-of-its-kind advisory on marijuana use (Office of the Surgeon General, 2019). Coinciding with increases in use, the concentration of THC in marijuana has steadily increased. Marijuana's THC concentration tripled between 1995 and 2014, and concentrated products, such as waxes, now contain up to 99% THC (Office of the Surgeon General, 2019).

Though his advisory specifically addressed significant increases in use among youth and pregnant women, he did not shy away from cautioning against marijuana use more generally. At one congressional hearing, Adams told senators, "I don't want anyone to mistake what I'm saying as implying that these products are considered safe for general adult usage" (Cornyn & Feinstein, 2019). In 2021, Surgeon General Dr. Vivek Murthy made similar comments in a Senate Finance Committee Hearing. Dr. Murthy warned:

"I worry that there is a perception that marijuana is completely harmless in children." Surgeon General Dr. Vivek Murthy

"When it comes to youth, I worry that there is a perception that marijuana is completely harmless in children. Our data tells us otherwise. Our data tells that in fact a portion, a substantial minority, of people who use marijuana will actually develop an addiction to marijuana. That number is significantly higher among youth.

When kids also have underlying mental health conditions, the impact of marijuana use can also be more significant. And, so, I worry Senator about the messages we may send that say this is 'utterly harmless' and 'there's no problem here'. We need to be responsible in how we teach our kids about marijuana. I think how we talk to families about marijuana use and I think health care providers also need to be empowered to have these conversations early on as well as teachers." (The United States Senate Committee on Finance, 2022)

HIGH-POTENCY MARIJUANA

In the 1970s, "Woodstock Weed" contained approximately 1–3% THC (ElSohly et al., 2000). Since then, products have become increasingly potent, driven in large part by industry-led innovation, market demand, and a shift in consumption methods. THC concentrates, such as shatter, budder, and waxes—as well as gummies and edibles—are packed with more THC than joints ever were. Now, even the marijuana plant itself is being genetically engineered to contain a higher percentage of THC. One study found that the average potency of the marijuana plant increased from 8.9% THC in 2008 to 17.1% THC in 2017. Concentrates, which contained an average potency of 6.7% THC in 2008, contained an average potency of 55.7% in 2017 (Chandra et al., 2019). The National Institute on Drug Abuse found that solvent-based products have been documented with an average of 54–69% THC and have been known to exceed 80% (National Institute on Drug Abuse, 2020, p. 2).

The market for marijuana flower hybrids and concentrates continues to rise with the increase in demand for products with higher THC potency levels. In Washington state, market share for flower products with 10–15% THC declined by 60.4% between 2014 and 2017, while the market share for flower products with more than 20% THC increased by 48.8% (Smart et al., 2017). In 2020, amid the outbreak of the coronavirus pandemic in Washington state, the retail sales

share of recreational marijuana generally increased, with a 0.7% increase in edibles and a 3.5% increase in flower from Jan-March to Apr-May (502Data, 2021).

In Oregon, concentrates and extracts surpassed flower in sales and comprise an increasingly large proportion of all marijuana sales. In December 2019 alone, nearly 1 million units of concentrates and extracts were sold in the state, and the number of units of edibles sold exceeded the pounds of flower marijuana sold (Oregon Liquor Control Commission, 2020). Retailers increasingly promote higher potency marijuana in order to drive profits—high-potency marijuana sells. Additionally, sales surpassed \$1 billion in 2020, increasing from \$795 million in 2019 (Oregon Liquor and Cannabis Commission, 2023), and the Oregon Liquor Control Commission anticipates that the supply of marijuana will further increase in coming years.

A leaked draft report from the Washington State Health Authority recommended enacting a number of policies to curb the rapidly increasing THC potency of products. These recommendations included an additional tax on products with more than 35% THC potency, raising the purchasing age of high-potency products to 25, prohibiting marketing and advertising of high THC products, high THC warning labels on high THC products, and required point-of-sale education about the risks of high THC products (Addictions, Drug & Alcohol Institute, 2022).

The demand for stronger marijuana threatens public health. The use of high-potency marijuana exacerbates many of the consequences of marijuana use. Frequent marijuana users and users of high-potency marijuana are more likely than regular users to develop schizophrenia and psychosis (Forti et al., 2019). Users of Butane Hash Oil (BHO), a marijuana concentrate that yields a potency of between 70–99% THC, are more likely to have lifetime diagnoses of depression and

anxiety while being more likely to report other substance use (Chan et al., 2017).

Ultra-processed high-potency products are also more likely to contain residues and contaminants from production. This is not isolated to the illicit market. A study of 57 concentrates legally sold for dabbing in California found that almost 72% of the samples contained residual solvents, including isopentane, butane, and propane. One third of those samples also contained pesticide residues (Haggerty, 2020).

The lucrative cash potential of high-potency marijuana also emboldens illegal producers of BHO. Its production involves forcing raw marijuana and butane into a reaction chamber, which creates a highly combustible liquid that can easily explode when introduced to an ignition source. This has implications not only for public health but public safety as well.

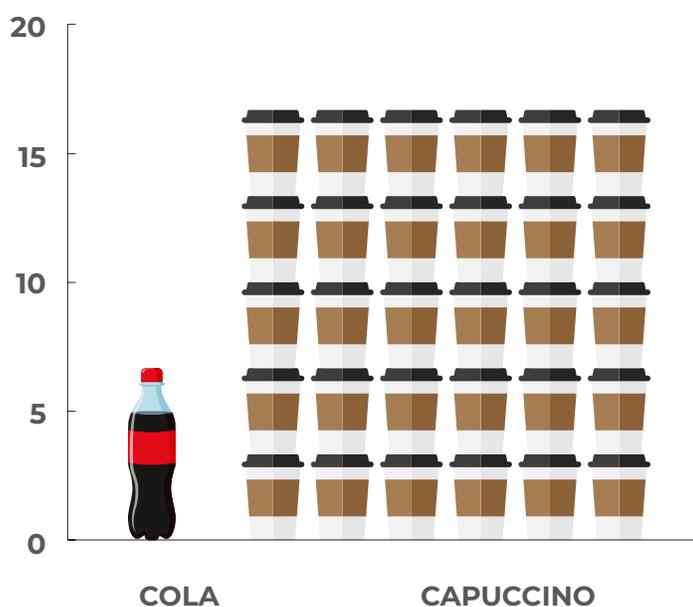
Between 2012 and 2018, over 100 marijuana extraction labs were seized in Oregon. More than 30 fires and explosions related to the production of this kind of marijuana were reported in the state in that time period. The number of labs seized in the area reached a new high of 39 in 2017, and another new record of 91 in 2021 (Oregon-Idaho High Intensity Drug Trafficking Area, 2019).

In addition to these concerns, BHO explosions led to an increasing number of BHO burn victims. The Oregon-Idaho High Intensity Drug Trafficking Area found that 87 marijuana extraction burn victims were treated from 2015 to 2017 (Oregon-Idaho High Intensity Drug Trafficking Area, 2019, p. 34). Since 2013, treatment costs for marijuana extraction burn victims have totaled \$15 million.

Products with high amounts of THC proliferate with market demand and, as such, consequences associated with high-potency marijuana become more apparent.

NOT ONLY POTENCY, BUT CONSUMPTION LEVELS: WHAT DO USERS LOOK LIKE TODAY?

The change in the typical marijuana user today versus twenty years ago, according to Carnegie Mellon professor Jonathan Caulkins, is akin to thinking about a typical caffeine drinker consuming one 20-ounce cola worth of caffeine versus about thirty 16-ounce cappuccinos today.



Ounces worth of caffeine

It's important to think about legalization as akin to commercialization—this is very different than simply removing criminal penalties for personal possession. Case in point: As soon as a state legalizes, the industry moves to open up as many shops as possible.

In states where marijuana is “legal,” retail and medical licenses outnumber popular food chains. For example, in Colorado, marijuana retail locations outnumber all McDonald's and

Starbucks locations combined (MJBizDaily, 2019). Colorado has about 1,010 registered retail and medical marijuana shops combined (Colorado Department of Revenue, 2023) compared with under 200 McDonald's and around 100 Starbucks coffee stores. The overwhelming presence of marijuana stores promotes and further normalizes its use. A 2022 twin study found that use increases by about 20% after legalization (Zellers et al., 2023). There is no question that the legalization of marijuana is associated with increases in use and lower perceptions of risk.

Adding to the danger of marijuana commercialization is the increasing market demand for high-potency products created by the combination of aggressive promotion and ever-increasing tolerance by heavy users. With innovation, the industry responded to meet the demand it had created, modifying marijuana to increase its potency further. The commonly conceived “Woodstock weed” had between 1–3% THC, the psychoactive intoxicant responsible for the high; according to recent studies, today's average marijuana flower—touted by industry advocates as a harmless plant—contains approximately 17.1% THC. Independent studies in “legal” states have also found the percentage to be even higher, such as an average THC percentage of 18.7% in plant material in Colorado (Colorado Department of Public Health & Environment, 2020).

Concentrates and edibles pack a more potent punch, containing an average of 55.7% THC (Chandra et al., 2019). But increasingly common products can be even more potent, with many marijuana retailers promoting and profiting from products containing up to 95–99% THC (Prince & Conner, 2019).

STATE REGULATORY FRAMEWORKS STRUGGLE TO KEEP UP WITH THE NUMBER OF LICENSED SHOPS

One significant problem with high-potency products is the lack of regulation. Numerous studies have found that product regulation in “legal” states is limited (Lamy et al., 2016; Peace et al., 2016; Yates & Speer, 2018), and internal audits conducted by state governments have exposed holes in regulatory frameworks. In Oregon, for example, the Liquor Control Commission found that there is an average of one state inspector for every 83 marijuana licenses (OLCC, 2020). Public health advocates continue to advocate for THC potency caps. Vermont and Connecticut became the first states to cap the potency of concentrates at 60% (still 30 times the strength of just a few decades ago) and flower at 30%; Montana capped the potency of flower at 35% but did not place a comparable cap on concentrates. In all other states that have legalized medical or recreational marijuana, these sensible attempts have been quickly blocked by the marijuana industry (Vermont Cannabis Control Board, 2022).

The mislabeling of products also plagues the “legal” market. Studies have found that the labeling of active ingredients in concentrates and edibles often misrepresents the actual ingredients in those products (Peace et al., 2016). Consumers are often unaware of the contents of what they are smoking or ingesting, potentially leading users to consume more of a psychoactive product than they intended to.

Furthermore, the adaptability of marijuana gives way to mass-market products modeled after popular consumer goods. Marijuana-infused “edibles” come in the form of cookies, candy, ice cream, sodas, and other sweet treats that are particularly appealing to children (O’Connor & Méndez, 2016). Marketing tactics make use of bright colors and catchy names, replicating

images or appropriating the names of well-known commercial food products. For example, “Pop Tarts,” a widely consumed kid-friendly breakfast product, was used by one marijuana producer to market “Pot Tarts.” Unfortunately, these products are thought to contribute to the increased accidental marijuana exposures among children and others. Stemming from the wide array of consumption methods and ways that marijuana can be infused with products, the American Addiction Center updated its definition of edibles in December 2022 to be “food products that have been infused with marijuana,” meaning a marijuana edible can essentially be any consumable product (American Addiction Centers, 2022).



These kinds of growth tactics by the marijuana industry are not new. They largely mirror the boom of Big Tobacco in the early 1900s—and this did not occur by accident (Ayers et al., 2019; Richter & Levy, 2014). Although operators in the marijuana industry claim to be up-and-comers, they are now well-financed and advised by professionals from the tobacco industry. For example, Altria, the corporate owner of Marlboro, purchased a 35% stake in Juul shortly after acquiring a 45% stake in Cronos, one of the largest international distributors of marijuana (LaVito & Hirsch, 2018). The UK-based Imperial

Brands invested around \$123 million CAD (~\$94M USD) in Auxly, a Canadian marijuana company. This partnership, which gave Imperial Brands a 20% stake in the company, will focus on utilizing Imperial Brand's vaping technology to develop marijuana vaping products.

The marijuana industry has also caught the attention of Big Pharma and Big Alcohol. In March 2022, Pfizer finalized a \$6.7 billion deal with Arena Pharmaceuticals, a company that develops cannabinoid-type therapeutics (Pfizer, 2022). Former Purdue Pharma executive John Stewart left the pharmaceutical industry to create his own marijuana company (Murphy, 2016). Teva Pharmaceuticals signed an agreement to become a medical marijuana distributor in Israel (Helfand, 2016). And Sandoz, a subsidiary of Novartis, signed an agreement with Tilray to distribute marijuana products (R.T.T. News, 2018).

Constellation Brands, the maker of Corona, purchased a 9.9% stake in Canopy Growth for \$191 million, then upped the stake to 38% for \$4 billion in 2018. The company has the option to increase its investment and purchase up to 139.7 million new shares at a price of up to \$5 billion more (Sheetz, 2018). Blue Moon has also made substantial investments in the marijuana industry (B. Miller, 2018).

The full impact of these investments has been brought to light with the establishment of CPEAR, Altria and Constellation's advocacy organization funded to lobby for legalization at the federal and state levels (Coalition for Cannabis Policy, Education, and Regulation, 2023). In March 2022, CPEAR issued a problematic paper purportedly revealing that youth use does not increase in legalized states. In reality, CPEAR made conclusions based on national-level data trends, which of course include non-legal states, instead of only looking at state-level data for states with legal marijuana. Their analysis did not mention any of the dozens of studies showing increased use as a result of legalization. (Davidson, 2022).

The investments of these big industry players coincide with more covert action taken to push legalization forward. In an investigative report that examined marijuana interests in the UK, journalist Jonathan Gornall linked several commercial organizations with vested interests in the creation of a recreational marijuana market with individuals and activists pushing for more access to medical marijuana. What's more, he found that several tobacco companies were funding studies on medical marijuana, an activity that calls for questioning into the validity of that research (BMJ, 2020).

These connections are unsurprising. Marijuana commercialization presents addiction-for-profit industries, which have long been under public scrutiny, with new and innovative pathways to profits.

ADVERSE HEALTH EFFECTS OF MARIJUANA

Contrary to popular belief, marijuana is a harmful drug. The main psychoactive ingredient in marijuana, THC, causes many different types of mental and physiological health problems—especially in children, young adults, and pregnant women. Its addictive properties exacerbate its potential harms as marijuana users become dependent on the drug.

Researchers found that marijuana is an addictive drug (Volkow et al., 2014). Brain scans of marijuana users show changes in the structure of the brain's reward center to be consistent with addiction (Gilman et al., 2014), and up to 47% of regular users experience withdrawal symptoms when they cease use (Bahji et al., 2020; Hasin et al., 2008). The National Institute on Drug Abuse reports that approximately 30% of marijuana users have marijuana use disorder and that people who begin using marijuana before the age of 18 are up to seven times more likely to develop a marijuana use disorder compared with those who start later (National Institute

on Drug Abuse, 2019a). One study found that marijuana vaping may support “conditioned drug-seeking behavior,” which is a cause for concern as vaporized marijuana gains popularity (Freels et al., 2020). A 2022 study found that youth who use e-cigarettes are significantly more likely to report marijuana use within one year (Sun et al., 2022).

Marijuana has also been found to cause severe consequences for mental health. Marijuana is increasingly linked to the onset of psychosis and schizophrenia (Henquet et al., 2005; Marconi et al., 2016; Mustonen et al., 2018; Niemi-Pynttari et al., 2013) and shows a more modest association with depression and anxiety (Agrawal et al., 2017; Duperrouzel et al., 2018; Gobbi et al., 2019). In one of the most comprehensive studies to date on marijuana and psychosis, Di Forti et al found that daily marijuana use is associated with an increased likelihood of developing psychosis. What’s more, they reported a more than four-times odds of daily users of high-potency marijuana developing psychosis (Di Forti et al., 2019). Additionally, a 2021 study found that cannabis use disorder in Denmark has been increasingly associated with schizophrenia; 2% of cases of schizophrenia were linked to cannabis use disorder in 1995, but this increased to 8% in 2010 (Hjorthøj et al., 2021).

A randomized clinical trial published in 2022 found that upon obtaining a medical marijuana card, patients suffered an “increased incidence and severity of cannabis use disorder (CUD) and resulted in no significant improvement in pain, anxiety, or depressive symptoms, but improved self-reported sleep quality” (Gilman et al., 2022).

“Compared with never users, participants who used high-potency cannabis daily had **4x higher odds of psychosis** in the whole sample.” (Di Forti et al., 2019).

There was a 25% increase in cannabis use disorder (CUD) among 12–17-year-olds in “legal” states (Cerdá et al., 2020). This population is also more likely than adults to develop a cannabis use disorder if they begin using marijuana at that age (Cerdá et al., 2020).

Chronic marijuana use increases the likelihood of anxiety in adults in their late twenties and older, and those who met the criteria for CUD had a high risk of adverse mental health symptoms across all ages (Leadbeater et al., 2019).

These studies are worth noting, particularly as marijuana is being increasingly marketed as a solution for anxiety and other mental health ailments.

Frequency of marijuana use, as well as higher THC potency, is associated with the most severe impact on mental health, which is evidenced by psychosis, suicidality, the reshaping of brain matter, and addiction (Cinnamon Bidwell et al., 2018; Fischer et al., 2017; Forti et al., 2019; Pierre et al., 2016). The increasing demand for high-potency marijuana products and the coinciding prevalence of CUD are indicative of a future maelstrom with unknown consequences for public health, especially as the industry engages in a concerted effort to undermine scientifically proven risks of marijuana use. The legalization of marijuana coincides with a nationwide increase in CUD. According to the Substance Abuse and Mental Health Services Administration’s (SAMHSA) National Survey on Drug Use and Health (NSDUH), 16.3 million Americans reported having marijuana use disorder in 2021, nearly four times as many people compared to 2019 (Substance Abuse and Mental Health Services Administration, 2021d). Part of this increase is due to a change in methodology, but the overall upward trend

MARIJUANA AND PREGNANCY

of CUD is concerning and is no doubt because of the normalization of marijuana. In addition to this alarming trend, more Americans who report any or serious mental illness issues also reported past-year marijuana use. Co-occurring mental illness and substance use disorder was higher among past-year marijuana users than past-year opioid users (Substance Abuse and Mental Health Services Administration, 2019b).

Commercialization advocates have also suggested that marijuana may help those with PTSD, a claim with particularly important implications for veterans. This may be a dangerous assumption. Two studies conducted on military personnel experiencing PTSD found an elevated risk for suicidal thoughts and behaviors among those using marijuana (Allan et al., 2019; Gentes et al., 2016).

Marijuana is also linked to significant physical ailments. Researchers have found a connection between marijuana use and lung damage (Hancox et al., 2022), as well as serious cardiovascular problems, including hypertension, myocardial infarction, cardiomyopathy, arrhythmias, stroke, and cardiac arrest (Bigay-Gamé et al., 2018; Hall & Lynskey, 2016; Pacher et al., 2018). The American Lung Association has highlighted the health impacts of marijuana, noting the specific risks associated with each way that it can be consumed, such as via pipes, bongs, and paper-wrapped joints (American Lung Association, 2022).

Studies have found marijuana to be linked to certain types of cancer (Liu et al., 2020), including testicular cancer (Ghasemiesfe et al., 2019; Gurney et al., 2015).

Government officials are increasingly sounding alarms on marijuana use during pregnancy after research and reports have revealed that more pregnant women are using the drug. In Alaska, for example, 9% of women who delivered a baby in 2017 reported having used marijuana during their pregnancy (Alaska Department of Health and Social Services, 2020). In fact, in Colorado, researchers found that seven in 10 dispensaries recommended marijuana to women posing as pregnant women (Nedelman, 2018).

Researchers at Boston University found that marijuana use among men may double the risk of partner miscarriage—regardless of the woman’s use (McAlpine, 2019). Additionally, marijuana use during pregnancy is accompanied by a host of risks for the baby. Use during pregnancy may affect cognitive development by increasing the risk of hyperactivity, impulsivity, and inability to focus (Huizink & Mulder, 2006; G. S. Wang et al., 2017). Prenatal exposure to marijuana also predisposes offspring to neuropsychiatric disorders (Frau et al., 2019). A mother’s marijuana use during pregnancy may also increase the risk of low birth weight, preterm birth, neonatal intensive care unit placement, and developmental problems (Gunn et al., 2016; Kharbanda et al., 2020). Low birth weight and preterm birth increase the risk of short- and long-term complications for the child (Clinic, 2017).

A 2022 retrospective cohort study in Colorado found that “legal” recreational marijuana is associated with a two-fold increase in marijuana-related hospitalizations of pregnant women (G. S. Wang et al., 2022). Of course, the risk to mothers is not the only concern. A 2023 study found that prenatal exposure to THC has long-term effects and inhibits brain and neural development in babies (Peng et al., 2023). In 2022, the largest long-term study of

brain development and health in children and teens in the US, the Adolescent Brain Cognitive Development Study, reported attention, social, and behavioral problems in children who were exposed to marijuana in the first trimester (National Institute on Drug Abuse, 2022). A 2019 study found that parental marijuana use increases the likelihood of marijuana use among children in the household, as well as increases their risk of tobacco and opioid use (Madras et al., 2019).

Dr. Nora Volkow, the director of the National Institute on Drug Abuse, published a report in response to this alarming trend developing across the country and warned of the detrimental health risks of in utero cannabis exposure (Volkow et al., 2017). Tragically, in 2019, a newborn whose mother reportedly used marijuana while pregnant was found dead at just 11 days old and doctors believe the cause was acute marijuana toxicity (Bao & Bao, 2019). The trend in marijuana use during pregnancy even prompted the U.S. Surgeon General to issue an advisory that warned women not to use marijuana to alleviate nausea during pregnancy (Office of the Surgeon General, 2019).

MARIJUANA AND CO-USE WITH OTHER SUBSTANCES

Some industry proponents claimed that legalizing marijuana would reduce the use of other substances in the United States, such as alcohol and opioids. Common industry rhetoric holds that former alcohol users will switch to marijuana if it is made legal. They also suggest that legalization will be “the exit to the opioid crisis” (MadMoney, 2018) and cite a since-debunked and severely flawed study that seemed to show a decrease in opioid overdoses in states that legalized medical marijuana.

For instance, a 2021 study found that the implementation of recreational marijuana laws in 2017 was associated with a decline in opioid-

related emergency department visits; however, the decline did not continue after the six-month mark, suggesting that marijuana users began using opioids again (Drake et al., 2021). Researchers in 2022 found that legalization has contributed to the opioid epidemic, and this was especially pronounced among Black Americans (Bleyer et al., 2022).

Amid the third wave of the decades-long opioid crisis (Centers for Disease Control, 2019c) and in a population in which nearly 14.5 million people are impacted by alcohol use disorder (National Institute on Alcohol Abuse and Alcoholism, 2020), the false assertions by the marijuana industry are harmful and not backed by science.

A 2014 study (Bachhuber et al., 2014) suggested medical marijuana legalization was associated with a decrease in opioid-related deaths until 2010. However, a more recent study of that data showed the opposite. This 2019 study, which now includes more years of data, found instead that marijuana legalization coincided with a 23% increase in opioid-related deaths after 2010 (Shover et al., 2019). (However, the study notes that medical marijuana legalization, more likely than not, had no impact on opioid-related deaths.) Medical marijuana users, according to the findings of this study, represent 2.5% of the U.S. population; consequently, the legalization of medical marijuana is likely incapable of exerting a demonstrable impact on opioid overdose deaths. Other studies have supported this finding (Caputi, 2019). The positive correlation found in this study is still worth further examination, given the relationship between marijuana use and opioid misuse. A 2021 study found that marijuana use was 34% higher in study participants who also misused prescription opioids as opposed to those who did not misuse prescription opioids, which undermines the premise of the possibility of marijuana being a solution to opioid misuse (Arora et al., 2021).

Studies have found a link between marijuana and opioid use, as well as marijuana and future use of other drugs. In particular, marijuana exposure in adolescence seems to impact future opioid use (Ellgren et al., 2007). A large proportion (44.7%) of lifetime marijuana users ultimately use other drugs (Secades-Villa et al., 2015). A study by Azagba and colleagues (Azagba et al., 2019) found marijuana users were more likely than non-users to report prescription opioid misuse, echoing an earlier study that demonstrated that participants who reported marijuana use in the previous year were 2.6 times more likely to misuse non-prescription opioids (Olfson et al., 2018). A 2021 study also found an association between the implementation of marijuana home cultivation and an increase in opioid-related hospitalizations and emergency department visits (Jayawardhana & Fernandez, 2021).

A body of research shows early marijuana use can more than double the likelihood of other drug use later in life (Olfson et al., 2018; Secades-Villa et al., 2015). In fact, according to the National Survey on Drug Use and Health, 95–97% of people who used cocaine or heroin started with marijuana (Substance Abuse and Mental Health Services Administration, 2019b). The scientifically validated relationship between substance misuse and marijuana use is difficult to ignore.

Marijuana is often lauded as a plausible substitute for opioids in the treatment of pain. But mounting evidence suggests that marijuana use—particularly chronic use—is associated with poor pain control (Salottolo et al., 2018). A 2022 meta-analysis found that marijuana is no better than a placebo at relieving pain. (Gedin, 2022). A study found adults with pain are vulnerable to adverse marijuana use outcomes, a finding that calls into question the prescribing of marijuana as a pain reliever (Hasin et al., 2020). Considering that severe pain continues to be one of the most common reasons for obtaining a medical marijuana card—93% of registered cardholders in Colorado reported severe pain as the reason for marijuana use (Colorado Health

Institute, 2019)—current state policies should be reconsidered.

A four-year prospective study in the highly respected journal *The Lancet Public Health* followed patients with chronic non-cancer pain and found no evidence marijuana use mitigated pain severity or interference or that marijuana affected rates of opioid prescribing or opioid discontinuation (Campbell et al., 2018).

MARIJUANA'S ASSOCIATION WITH ALCOHOL AND OTHER DRUGS

Rising alcohol use is also an issue, and some have suggested that marijuana may be a substitute for alcohol use. However, a 2022 report found that alcohol consumption did not go down in states with legal marijuana; instead, legalization resulted in an increase in the co-use of marijuana and alcohol (Gonçalves et al., 2022). According to a 2018 report, Washington state saw a 9% increase in gallons of beer consumed since legalization (Sauter, 2018). Since legalization in Colorado, state officials recorded a 7% increase in gallons of alcohol consumed (CO Department of Revenue, 2019). And according to America's Health Rankings, 20.5% of adults in Colorado reported binge drinking in 2021, compared to the national average of 17.3% (America's Health Rankings, 2022). Other studies showed no meaningful decrease in alcohol use since legalization (Haughwout et al., 2016). Further analysis found that, "Allowing for changes in the adult population over the period 2005–2017, the data show a continuing increase in wine servings alongside...legalization" (Pellechia, 2018). Most recently, a 2023 study found that marijuana use was associated with the co-use of alcohol regardless of state- and national-level marijuana policies.

Rather than discouraging polysubstance use, which is the use of multiple drugs, marijuana

legalization is associated with further use, misuse, and dependence on other drugs. While the “gateway” effect of marijuana is sometimes considered outdated, the association between the use of marijuana and other drugs is supported by science. Marijuana use often predicts future drug use—ranging from tobacco and alcohol use to opioid use.

Marijuana use itself may be forecasted by other, seemingly less harmful drugs, such as tobacco and alcohol. Among high schoolers who first initiated alcohol use by 12th grade, subsequent marijuana use was more likely. Marijuana seems to both impact—and be impacted by—tobacco use in younger age groups (Keyes et al., 2019). Moreover, a 2021 study found that “Respondents reporting at least one family member or peer using e-cigarettes were more likely to use e-cigarettes” compared to respondents whose family members did not use them, illustrating how one’s social environment influences his or her drug use (Coleman et al., 2021).

A 2018 study published in the *Journal of Studies on Alcohol and Drugs* found that, similar to tobacco and alcohol co-users, marijuana and alcohol co-users were more likely than non-marijuana alcohol users to overvalue alcohol, signaling a dependence on both drugs (Morris et al., 2018). Marijuana use is also associated with an increased likelihood of alcohol use disorder (Weinberger et al., 2016). In 2021, researchers found co-users of alcohol and marijuana are over three times more likely to suffer from alcohol use disorder (Waddell, 2021). Another study in the same year from the CDC found that “During 2015–2019, one third (34.4%) of Colorado adults who binge drank used marijuana compared with one tenth (9.9%) of nondrinkers” (Crawford, 2021).

The commercialization of marijuana perpetuates an understatement of the dangerous consequences of marijuana use, adding to the social burden of addiction rather than subtracting from it.

MARIJUANA VAPING

The vaping of marijuana in THC oil pods and cartridges is a relatively new yet rapidly exploding marijuana-industry innovation. Vaping quickly delivers 70–90% THC concentrates to users by heating extracted oils so that they can be inhaled as vapor. No studies on consumer safety were conducted prior to the mass marketing of vaporizers, which are also popular among tobacco users.

Vaping is popular among youth because vapes can be easily concealed and produce less (if any) odor, as compared to other consumption methods. In 2022, 27.5% of 12th graders reported vaping marijuana in the last year (Miech et al., 2023). Vaping has been normalized among youth, and many have transitioned from smoking marijuana to vaping it. Between 2017 and 2022, the percentage of 12th graders who vaped marijuana almost tripled from 9.5% to 27.5% (Miech et al., 2023). A study in *Addiction* found “cannabis vaping is increasing as the most popular method of cannabis delivery among adolescents in the United States, and that frequent (six or more times per month) use is increasing faster than occasional use.” The CDC’s 2019 Youth Risk Behavior Surveillance System found 50.1% of high school students had tried electronic vapes and 10.7% of high schoolers used those products on 20 or more days in the past 30 days (Abuse, 2022c).

In Michigan, the state’s regulatory agency was forced to issue a recall on vaping products sold at state-licensed dispensaries after it was revealed that several of them contained vitamin E acetate (Neavling, 2020). Another recall implicated 3,400 “legal” cartridges. In November 2021, the Michigan Marijuana Regulatory Agency issued a marijuana product recall, impacting more than 400 sales locations throughout the state, citing “inaccurate and/or unreliable results” (LeBlanc, 2021).

In the spring of 2020, a whistleblower revealed that Hawaii's standards for medical vapes were far below the standard of any other state, putting patients at risk. Almost half of vapes subjected to a blind test were found to contain ethanol levels so high that the cartridges would be illegal if sold in states in the likes of California, Colorado, and Washington (Blair, 2020).

Legalization will not solve the problem of contaminated products because standards will continue to be unmet; that comes with potentially deadly implications for consumers and patients alike.

EMERGENCY AND HOSPITAL ADMISSIONS

The widespread availability and accessibility of high-potency marijuana due to legalization has resulted in an increasing number of marijuana-related poison control calls, hospitalizations, and ER visits.

A 2022 study published in *Pediatrics* found a 1,375% increase in accidental edible marijuana exposure in children under the age of 6 from 2017 to 2021 (Tweet et al., 2023). Additionally, a 2022 study found that hospital discharges for marijuana-associated psychosis were higher in states with legal marijuana (Moran et al., 2022). These results are underlined by an earlier study that found the commercialization of recreational marijuana is associated with a 66–77% increase in marijuana exposures. State-specific data shed greater light on this phenomenon (Shi & Liang, 2020).

A study published in March 2022 found that after California legalized marijuana, there was a significant increase in hospitalizations and emergency room visits by children who had some sort of marijuana exposure. Researchers found that 43% of patients presented with complaints of suicidal ideation (Harvey et al., 2022).

In Colorado, the number of marijuana-related emergency department visits increased 54% from 2013 to 2017. Yearly marijuana-related hospitalizations increased 101% in that same period (Colorado Health Institute, 2019). Calls to the poison control center for marijuana exposures also increased. In 2013, 125 calls were made for marijuana-related exposures. By 2018, that number jumped to 266, representing a 113% increase. Youth cases—instances of marijuana-related exposures of children aged 8 or younger—increased 126.2% from 2013 to 2018. In 2018, youth cases represented more than half of all marijuana-related exposure calls to the Rocky Mountain Poison and Drug Center (Rocky Mountain High Intensity Drug Trafficking Area, 2021).

A study by the Colorado Department of Public Health and Environment found that in 2018, over 23,000 homes in the state with children aged one to 14 years had marijuana products stored in an unsafe manner (Colorado Department of Public Health & Environment, 2018). In 2018, 60% of youth (0-8 year old) marijuana exposures involved edibles, compared with just 18% in 2016 (Rocky Mountain High Intensity Drug Trafficking Area, 2021, p. 28). Even when packaging is compliant with Colorado's regulatory requirements, it often fails to discourage and prevent children from accessing potent and dangerous marijuana. There has also been a steep increase in youth marijuana exposures nationwide. There were 598 in-home exposures involving children younger than 12 in 2018; in 2020, that number increased to 2,473 (Russo, 2021).

Researchers who studied the impact of medical marijuana legalization also found many pediatric marijuana exposure cases in the state, despite childproof packaging and warning labels (Whitehill et al., 2019). During the eight-year period studied, the Regional Center for Poison Control and Prevention (RPC) recorded a 140% increase in single substance (marijuana) exposures, with 81.7% of these calls regarding marijuana exposures of 15–19-year-olds.

A study conducted in Washington state found that the rate of pediatric exposures to marijuana among children aged 9 or younger was 2.3 times higher following legalization (A. A. Thomas et al., 2019). Poison control center cases in Washington state have increased 103.2%. Cases for children aged 5 and younger increased by 176.5%. In 2018, there were 497 calls—compared with 245 when legalization in the state began (Washington Poison Center, 2018).

Following legalization in Illinois, hospitalizations for children who accidentally consumed edibles spiked. In Cook County, three children were hospitalized in 2017 for THC exposure, but in 2021, 124 children in Cook County were hospitalized (Ponce, 2022).

In Alaska, in 2017, there were a total of 3,296 inpatient discharges and 6,639 outpatient discharges related to marijuana (ADHSS, 2020). In Illinois, just several days after legalization, doctors reported a surge in emergency room visits and hospitalizations for marijuana, including several cases of marijuana-induced psychosis (McCall, 2020).

Though it is true that marijuana misuse does not result in the same kind of immediate overdose that other drugs may cause, cases of Cannabinoid Hyperemesis Syndrome (CHS)—or sometimes Cannabis Vomiting Syndrome (CVS)—have increased significantly since legalization. CHS is a disease that presents as episodes of screaming and vomiting, dubbed “scromiting,” and the only effective treatment is the immediate stoppage of marijuana use. The disease primarily affects heavy, daily users of marijuana.

From 2010 to 2014, researchers recorded a 46% increase in CHS cases in Colorado (Bhandari et al., 2019). Another study of CHS in Colorado found at least two deaths that were caused by CHS and recorded a third death that CHS is believed to have contributed to (Nourbakhsh et

al., 2019). This phenomenon was not reported before 2004.

Additionally, there is mounting evidence that marijuana users are more likely to be hospitalized for serious adverse health events, including bodily injury (G. S. Wang et al., 2017), falls (Workman et al., 2021), skeletal fractures (Sophocleous et al., 2017), and acute trauma (Vozoris et al., 2022). In fact, a 2022 study found that marijuana users were nearly 25% more likely than non-users to be hospitalized or go to the emergency room (Vozoris et al., 2022). A 2022 study “observed a higher proportion of hospital discharges for psychosis associated with cannabis use in areas with more liberal cannabis legalization laws” (Moran et al., 2022).

The dramatic increase in emergency cases related to marijuana exposure highlights the danger of commercialization. In many instances, the danger impacts children or people who mistakenly consume marijuana. Innocent, unwitting citizens are subjected to the consequences of a situation that they did not create.

IMPACT ON YOUTH

The legalization of marijuana has had a profound impact on rates of youth use, coinciding with decreases in risk perception.

Years of playing catch-up to alcohol and tobacco normalization have resulted in important downward trends in youth alcohol and cigarette use. But a new wave of substance use among children is appearing. Given the relationship between marijuana use, alcohol use, and cigarette use, it is important to note that usage rates of all substances among youth may rise if the dangers of youth marijuana use go ignored.

While some marijuana industry proponents have suggested that a strict legal marijuana market would limit youth use, marijuana use among youth is rapidly increasing concurrently

with legalization—while perceptions of risk associated with use are decreasing. For instance, a 2022 analysis of a longitudinal cohort study of 21,863 individuals found that youth in states with legal recreational marijuana were more likely to use marijuana than youth in non-legal states (Knopf, 2022). A 2021 study found that 33% of 16–18-year-olds reported marijuana use (Masonbrink et al., 2021). A 2022 study found that this demographic of users, aged 16-17, are more likely to have severe CUD than adult users (Lawn et al., 2022).

Risk perception is directly related to use. A 2022 study found that in legal states, youth have lower perceptions of risk of marijuana use and higher rates of use compared to non-legal states (Bhatia et al., 2022). The pro-legalization Cato Institute also found, “All states that have legalized marijuana fall below the average U.S. risk perception” (Dills et al., 2021).

Compounding this problem are the increasing rates of use by adults. The 2021 Monitoring the Future report found the highest instance of marijuana use in young adults aged 19–30 since 1988, with 43% of young adults reporting use in the past year (University of Michigan Institute for Social Research, 2022, p. 56).

In part, the ease of obtaining marijuana has contributed to youth use in “legal” states. Restrictions on selling to minors have not stopped state-sanctioned vendors from selling the drug to underage consumers in “legal” states. In 2020, 41% of young people nationwide aged 12 to 17 indicated that they perceived marijuana to be easy or fairly easy to obtain (Substance Abuse and Mental Health Services Administration, 2020b). In Washington state, where marijuana is “legal,” this number is much higher, with 51% of 12th graders believing that marijuana was easy to obtain (Washington State Healthy Youth Survey, 2021). Additionally, 38% of high school students nationwide reported having used marijuana at some point in their lives (Centers for Disease Control, 2019a).

Youth use marijuana differently and are affected by marijuana differently. Developing brains are particularly susceptible to both short- and long-term negative repercussions. A 2022 study found that youth marijuana users are more likely to have severe CUD and are more likely to have greater psychotic-like symptoms than adult marijuana users (Lawn et al., 2022).

Youth aged 12-17 have seen a 145% increase in rates of Cannabis Use Disorder from 2018 to 2021 (Substance Abuse and Mental Health Services Administration, 2018, 2021).

In Washington state, marijuana violations have remained high since legalization in 2014. As of December 2019, 3,220 violations have been documented. Violations pertaining to the sale or service of marijuana to a minor, or for allowing a minor to frequent a restricted area, comprised 16.3% of all of these violations (Washington State Liquor and Cannabis Board, 2020). A study of youth in Seattle also found that “nonmedical marijuana legalization predicted a higher likelihood of self-reported past-year marijuana and alcohol use among youth” (Bailey et al., 2020).

Among 11th graders in Oregon who currently use marijuana, 67% reported obtaining marijuana from a friend (Oregon Health Authority, 2016). Furthermore, 37.2% of 8th and 49.5% of 11th graders reported being exposed to online marijuana advertisements in the past 30 days (Oregon Health Authority, 2017). A study found that one in three youth living in a state where marijuana is “legal” engaged with marijuana promotions on social media. The same study found that youth who engaged with marijuana promotions were five times as likely to use marijuana (Trangenstein et al., 2019).

In Washington state, 44% of 8th graders believed there to be no or low risk from regular marijuana use, while 40% of 10th and 12th graders reported no or low risk from regular marijuana use. 67% of 10th and 12th graders in the state reported

no or low risk of trying marijuana once or twice (WSHYS, 2021).

Additionally, near-daily marijuana use—as reported by the University of Michigan’s Monitoring the Future (MTF) survey—increased dramatically from 2018 to 2019; 6.4% of 12th graders, 4.8% of 10th graders, and 1.3% of 8th graders reported near-daily marijuana use in 2019. The increase in near-daily marijuana use among 8th graders is particularly concerning: near-daily usage rates jumped 85.7% from 2018 to 2019 (Miech et al., 2019). The University of Michigan also found that marijuana use in the past 12 months and in the past 30 days had reached the highest levels ever reported since 1988 (Monitoring the Future, 2021, p. 2). Notably, because of the implications of the COVID-19 pandemic (e.g. parental supervision as a result of remote learning environments), youth use decreased from these highs in 2021 and 2022 (Miech et al., 2023). It remains to be seen what will happen with these national numbers as kids return to school and normal living and learning environments.

Youth marijuana vaping has added to the already-alarming trend of increasingly prevalent marijuana use among young people amid widespread commercialization. Trends in youth vaping have given way to a countrywide epidemic (Centers for Disease Control, 2019b) that presents implications for youth marijuana use. Youth vaping of any kind (tobacco or flavors) has been shown in several studies to increase the likelihood of subsequent marijuana vaping or marijuana use generally (Chadi et al., 2019; Kowitt et al., 2019; Sun et al., 2022).

Past-year youth vaping of marijuana has increased dramatically since the MTF survey began recording data on the subject in 2017. As reported by this survey (Miech et al., 2019), lifetime, annual, and past-month marijuana vaping among 8th, 10th, and 12th graders has all dramatically increased in just one year. Past-month use among teenagers increased

over 167% from 2017 to 2022. An average of 10% of teens reported past-month marijuana vaping in 2019. In 2019, MTF first recorded data on near-daily marijuana vaping and found that 2.4% of this age group vaped marijuana almost every day. That number exceeds near-daily cigarette and near-daily alcohol use among this group. A 2021 study found that vaporized marijuana was among the most socially acceptable modes of use among youth (Romm et al., 2021).

As marijuana legalization advocates have argued that youth marijuana use falls in conjunction with legalization, it is important to note trends in use in states that have legalized the drug. More young people use marijuana in “legal” states—and they use it more frequently. A recent study “suggests an increase in adolescent past-month consumption of cannabis following legalization” (Lachance et al., 2022). These trends are driven by the decreased perception of risk as well as the increased availability of marijuana that accompanies legalization. Nationally, fewer people, especially youth, perceive a risk from smoking marijuana. This downward trend is driven by the relaxed approach to marijuana in states where it’s “legal.”

A 2023 study found that not only do rates of youth past-month marijuana use increase in legal states, but perception of harm decreases. This study also found that despite higher use in youth and young adults, fewer people are receiving treatment for CUD (Mennis et al., 2023). Researchers were careful to note that lower CUD treatment utilization does not mean lower rates of CUD, but means more people need treatment and fewer are receiving it. Rates of CUD are increasing as potency increases and perception of harm decreases; in fact, 1 in 3 past month users of marijuana in the U.S. meet the criteria for CUD diagnosis (Lehman, 2022).

Despite claims by the marijuana lobby that adolescent use is not higher in “legal” states, researchers using the Monitoring the Future

study found increases in use following legalization in Washington state among 8th, 10th, and 12th graders (Cerdá et al., 2017). This was confirmed by University of Washington researchers, who published in the *American Journal of Preventive Medicine* and found that marijuana legalization predicted a six-fold increase in self-reported past-year marijuana use among youth when controlling for birth cohort, sex, race, and parent education (Bailey et al., 2020).

An average of 16.4% of 12–17-year-olds in “legal” states reported past-year use in 2017/2018, and an average of 9.4% reported past-month use (Substance Abuse and Mental Health Services Administration, 2018b). In California, Colorado, Massachusetts, and Nevada, past-month marijuana use among young people jumped over 4% in each state from 2016/2017 to 2017/2018. In Washington state, use increased even more dramatically: 9.9% of young people reported past-month marijuana use, marking a near 11% increase in past-month use from 2016/2017. An independent report in Alaska found that 22% of high schoolers in the state reported past-month use in 2019 (Alaska Youth Risk Behavior Survey, 2019).

A study found legalization “in California was associated with an increase in adolescent marijuana use in 2017–2018 and 2018–2019,” which is troubling because “increases observed in California may portend continued increases in adolescent marijuana use in future years if marijuana use becomes more popular among legal age adults and more normative in California” (Paschall et al., 2021). The study also found that after California legalized, teens were 18% more likely to consume marijuana at any point in their lives and 23% more likely to consume in the last 30 days (Paschall et al., 2021).

These nationwide increases far exceed marijuana use rates among youth aged 12 to 17 in states where marijuana remains illegal (Substance Abuse and Mental Health Services Administration,

2019a). According to 2018/2019 pre-pandemic, state-specific data in the NSDUH, 12.4% of youth in non-legal states reported past-year marijuana use and 6.6% of young people in those states reported past-month use. Comparatively, use rates for 12–17-year-olds in “legal” states are several percentage points higher: 16.5% for past-year use and 9.2% for past-month use (Substance Abuse and Mental Health Services Administration, 2019a).

The issue of marijuana use among youth in “legal” states is further elucidated by data taken on first-use rates—the percentage of young people initiating marijuana use in the past year (Substance Abuse and Mental Health Services Administration, 2019a). The average rate of first use in “marijuana-legal” states was 7.3% in 2018/2019. In states where marijuana remains illegal, first-use among 12- to 17-year-olds in 2018/2019 was 5.6%.

Marijuana commercialization—and the subsequent normalization of marijuana use—plays an important role in the increased marijuana use of young people. A 2017 study found that the longer duration of legalization and higher dispensary density was associated with increased use of vaping and consumption of edibles by 14–18-year-olds (Borodovsky et al., 2017). Marijuana dispensary density has been linked to more use among youth, with 16% of 11th graders reporting marijuana use in areas with less dispensary density compared to 24.3% of the same age group reporting use in more retail-dense areas (A. Hatch, 2017). And a 2020 study found that regular exposure to marijuana advertising raises the likelihood of adolescents using marijuana (Fiala, 2020).

A 2020 study by the University of Washington finds that marijuana legalization and commercialization may have begun a reversal of previous downward trends in teen marijuana use (Bailey et al., 2020). The study, which followed 230 teens and young adults, found that young people may be more likely to use marijuana

after commercialization, due to normalization as a result of the oversaturation of stores, advertisements, and rapidly rising adult use of the drug.

The commercialization of marijuana has also adversely impacted schools and youth academic performance. According to Joe Zawodny, director of secondary education for the Anchorage School District, “Because it’s legal in the community, I think, the stigma around marijuana use is decreasing. The data would seem to say there is increasing use” (Wohlforth, 2018). In Washington state, high schoolers reporting marijuana use also reported lower grades (more C’s, D’s, and F’s) than those of their peers who did not smoke marijuana (Washington State Healthy Youth Survey, 2021).

In Alaska, the number of youths referred for marijuana-related crimes jumped to a high of 302 (Alaska Department of Health and Social Services, 2020). A study also found about 22% of students in grades 9–12 reported that illegal drugs were “offered, sold, or given to them on school property during the previous 12 months” (National Center for Education Statistics, 2021).

Marijuana use among youth in “legal” states also coincides with marijuana misuse and substance use disorder.

A 2019 study (Cerdá et al., 2020) found that recreational marijuana legalization was followed by a 25% increase in adolescent marijuana use disorder.

This trend speaks to the prevalence of high-potency marijuana products. A 2021 Washington state survey revealed that 33% of 12th graders, 36% of 10th graders, and 37% of 8th graders who used marijuana reported that they dabbed it. These numbers are up significantly from 2018 when 13% of 8th and 10th graders and 19% of 12th graders reported dabbing marijuana (Washington State Healthy Youth Survey, 2021). Dabbing involves heating marijuana

concentrate, often of unspecified potency that can reach up to 99% THC, and inhaling the vapor. One study on dabbing found that the process may deliver significant amounts of additional toxins, such as methacrolein and benzene (Meehan-Atrash et al., 2017). A 2020 study found that adolescents who dabbed were six times more likely to continue using concentrated forms of marijuana later in life (Medzerian, 2020).

There are intense ramifications to marijuana use by youth. Developing brains are especially susceptible to the negative effects of marijuana use, and young users have demonstrated changes in grey matter volume, indicating negative consequences for brain development (Orr et al., 2019). Young users are also at a greater risk for mental health problems, dependence on marijuana, and future substance misuse (Coffey & Patton, 2016). Chronic adolescent marijuana use has been correlated with cognitive impairment and worsened academic or work performance (Arria et al., 2015; Meier et al., 2015; Salmore & Finn, 2016; Schuster et al., 2018; Silins et al., 2014). Meier et al. found that “the most persistent adolescent-onset cannabis users evidenced an average 8-point IQ decline from childhood to adulthood” (Meier et al., 2012).

A 2022 study found that adolescent users of marijuana lost an average of 5.5 IQ points in adulthood, compared to an average loss of 0.7 points among lifelong non-users (Hill & Hsu, 2022).

Youth marijuana use poses a significant risk for depression and suicide (Gobbi et al., 2019; Silins et al., 2014). In Colorado, where teen suicides have become the cause of one in five adolescent deaths (Daley, 2019), youth suicide toxicology reports have demonstrated this devastating effect. In 2013, marijuana was present in 10.6% of suicide toxicology reports for young people aged 15 to 19 years; in 2017, marijuana was present in over 30% (Colorado Department of Public Health

& Environment, 2023). One study found that marijuana was the most common substance found in post-mortem toxicologies of youth suicide decedents (Choi et al., 2019). Additionally, a 2021 study found that polysubstance use of marijuana, alcohol, and tobacco was associated with depressive symptoms, anxiety, and lower grade point averages (Crane et al., 2021).

The efforts to legalize marijuana are playing out with devastating effects on youth across the country, while public health agencies are ill-equipped to mitigate the consequences. But youth are not the only group at risk.

IMPACT ON YOUNG ADULTS

Though the legal age for marijuana consumption in “legal” states is 21, marijuana use during young adulthood carries a host of adverse effects. Marijuana has a particularly strong impact on developing brains, which continue to develop through a person’s late twenties. Unfortunately, marijuana use in this age group is higher than that of any other.

The low perception of risk associated with marijuana use, as well as the highest use rates of all age categories, makes marijuana an unexamined issue for many young adults.

According to the NSDUH (Substance Abuse and Mental Health Services Administration, 2021c, p. 3), in 2021 young adults across the country had the lowest percentages of perception of risk associated with marijuana use. Only 11.6% of young adults believed that smoking marijuana once a month was risky and only 15.2% perceived a great risk from smoking marijuana once or twice a week. This is far lower than the perception of risk of people aged 26 and up: 22.9% perceive great risk from smoking once a month and 27.3% perceive a great risk from smoking once or twice a week.

Young adult marijuana use outpaces other age groups in the United States. Young adults

aged 18 to 25 reported lifetime, past-year, and past-month use in higher numbers compared to other age groups at 49.9%, 35.4%, and 24.1%, respectively. Daily or near-daily marijuana use rates of 19- to 30-year-olds reached a new high in 2021. In 2021, more than 42.6% of that group reported marijuana use in the last year; 28.5% reported using in the last 30 days (University of Michigan Institute for Social Research, 2022, p. 56). In 2021, the National Institute on Drug Abuse found that marijuana use reached a historically high rate among college students, with 44% reporting use in 2020 (National Institute on Drug Abuse, 2021).

Higher instances of marijuana use disorder have been reported by people aged 18 to 25, coinciding with higher rates of marijuana use. In 2021, 14.4% of adults aged 18–25 reported marijuana use disorder, up 144% from 2018 (Substance Abuse and Mental Health Services Administration, 2021d, p. 5).

These trends in use are most dramatic in states that have legalized marijuana (Substance Abuse and Mental Health Services Administration, 2019a). The percentage of young adults, aged 18 to 25, reporting past-year and past-month use in 2018/2019 was significantly higher than young adults in legal states. An average of 44.5% of young adults in legal states reported past-year use and 30.5% reported past-month use. In non-legal states, 33.4% of young adults reported past-year use and 21.2% reported past-month use. Legalization has not reduced use; it has encouraged and accelerated it.

Given what we know about marijuana’s effects on the developing brain, young adults should be discouraged from using it, but the commercialization of marijuana instead heavily promotes it—without providing any warnings about its risks. The same health risks faced by teen marijuana users affect young adult users. Although initiating marijuana use during the early teen years is thought to be associated with a greater risk of psychosis than if the use begins

in young adulthood (Arseneault et al., 2002), this does not mean continuing use through young adulthood is safe even for those who have not yet exhibited marijuana-induced psychosis, nor that commencing use is safe after age 20. Often, marijuana-induced psychotic symptoms develop in young adulthood, with consolidation of those symptoms into a chronic disorder occurring over a period of 8 or more years (Niemi-Pynttari et al., 2013). The frequency of use and the potency of the product have been found to be more important than the age at which use began for increasing the odds of a psychotic outcome (Forti et al., 2019). Conversely, the cessation of use is a protective factor (Gonzalez-Pinto et al., 2011; Schoeler et al., 2016).

Co-use also presents a compounded harm to young-adult users. As this age group goes off to college—where drinking, drug use, and other kinds of experimentation are prevalent—marijuana may be used in conjunction with other drugs, presenting a risk for future substance use disorder. Researchers from Oregon State University found that college students who were binge drinkers before the age of 21 saw relatively large increases in marijuana use after legalization (Kerr et al., 2017).

A 2023 study found that college students who used marijuana and alcohol were at a significantly higher risk of serious adverse consequences (M. R. Hatch et al., 2023). A 2021 study in *JAMA Pediatrics* also found that “Young adults who reported co-use of alcohol and marijuana or met criteria for alcohol use disorder and/or marijuana use disorder accounted for 82.9% of young adults with prescription drug use disorder and 85.1% of those with illicit drug use disorder” (McCabe et al., 2021).

IMPACT ON COMMUNITIES OF COLOR AND LOW-INCOME POPULATIONS

Marijuana legalization poses a significant threat to low-income and minority communities. Though industry proponents suggest that marijuana legalization will alleviate injustices against socioeconomically disadvantaged populations, disparities in use and criminal offense rates have persisted in states that legalized marijuana.

While it is important to evaluate the impact of incarceration within certain communities, it is also important to understand the impact of marijuana legalization on those same communities. It is inappropriate to suggest that only through marijuana legalization will social justice be achieved or criminal justice inequity remedied. In fact, no such effect has been demonstrated in the states where marijuana has been made “legal.”

Instead of addressing social justice disparities in one fell swoop, legalization exacerbates these problems in lower income and minority communities. What’s more, the marijuana industry has identified them as an important new consumer base.

An early study of medical marijuana implementation in California found that marijuana dispensaries were disproportionately located within areas where the demand for marijuana was higher, where there were higher rates of poverty as well as a greater number of alcohol outlets (Morrison et al., 2014). In other words, when choosing where to locate dispensaries, owners followed the data to low-income communities. Further studies of marijuana dispensaries in Los Angeles found that the majority of dispensaries have opened primarily in African American communities (C. Thomas & Freisthler, 2017). And an overlay of socioeconomic data with the geographic location of pot shops in Denver shows marijuana stores are disproportionately located in disadvantaged neighborhoods (Hamm, 2016). In Oregon, the state conducted an analysis on the distribution of state-sanctioned dispensaries

and found that sites were concentrated among low-income and historically disenfranchised communities (McVey, 2017; P. Smith, 2017). A 2020 study found that racial minorities in California were disproportionately exposed to unlicensed marijuana sellers, which comes at the cost of “potentially exacerbating health disparities by selling unregulated products or selling to minors” (Unger et al., 2020).

Even though dispensaries are often located in low-income communities of color, those communities do not reap the profits.

In fact, fewer than 2% of marijuana business operators are Black (Gibson, 2021). Less than 20% of business owners and founders are minorities (Koski, 2022). In Denver, 74.6% of dispensary licensees are white and only 12.7% are Hispanic (Levine, 2021).

As a result, the harms associated with marijuana dispensary locations (such as increased use and misuse, normalization, hospitalizations, etc.) are disproportionately concentrated within particularly vulnerable communities while profits are raked in outside such communities.

The importance of this cannot be overstated. Historically, disadvantaged communities lack many of the resources needed to combat the industry’s targeting and also often lack adequate access to proper drug treatment facilities, thereby exposing community members to an increased likelihood of substance misuse with limited resources to combat the consequences (Kneebone & Allard, 2017). What the country has seen in the fallout of the opioid epidemic and the expansion of Big Tobacco (Truth Initiative, 2018) is being replicated by Big Marijuana.

In 2021, past-year and past-month use among minority young people was higher than the average, as reported by SAMHSA (Substance Abuse and Mental Health Services Administration, 2021b, p. 1). Past-month and past-year marijuana use among youth aged 12 to

17 was more prevalent among African Americans and AIAN youth. For example, nationally, 6.7% of young people aged 12 to 17 reported past-month marijuana use, with 6.8% of Caucasian youth using it in the past month. Comparatively, 7.5% of African American youth and 9.4% of AIAN youth reported past-month marijuana use. Interestingly, past-month use was lower for 12–17-year-olds identifying as Black or African American in both 2019 and 2020 than it was for white 12–17-year-olds. White 12–17-year-olds appear to have reported the highest numbers in past-month usage. Past-year use was 17.3% for Black or African American 12–17-year-olds in 2019, compared to 17.0% for white individuals, but was 11.3% in 2020 as compared to 14.9% for white individuals in the same age group (Substance Abuse and Mental Health Services Administration, 2021b, p. 1).

The decreased perception of risk associated with marijuana use during pregnancy has a particularly damaging impact on socioeconomically disadvantaged communities. A study by the American College of Obstetricians and Gynecologists reported that young, urban women from lower income levels have a 15–28% rate of marijuana use during pregnancy (American College of Obstetricians and Gynecologists, 2017). As previously stated, marijuana use during pregnancy has a host of dangerous consequences for neonates. A 2021 study found that cannabis use or dependence is highest among pregnant women who are 25 years old or younger, low-income, Medicaid-insured, and receiving care at urban teaching hospitals (Gesterling & Bradford, 2022).

From an economic standpoint, advocates of the marijuana industry often argue that any detrimental effects of marijuana will be offset by the cash potential of the drug. Proponents of legalization suggest that the new industry presents previously disenfranchised groups with new economic opportunities. In reality, although some states have attempted to use legislation to protect and provide for minority

marijuana business owners, the industry is largely bereft of diversity. Nationally, fewer than 2% of all marijuana businesses are owned by minorities (Schoenberg, 2018).

Massachusetts serves as a case study for this phenomenon. As of 2021, only 10 of the 280 cannabis business licenses awarded in Massachusetts were awarded to Economic Empowerment or Social Equity applicants (Cotter, 2021). The state requires all “Marijuana Agents,” persons who work at marijuana businesses, to register with the state. Demographic analysis revealed that of 1,306 agents who applied in the city of Boston, 6% were Hispanic and 4% African American. This is unrepresentative of the city’s population (US Census Bureau, 2019). Indeed, an exposé by the Boston Globe revealed that a handful of out-of-state marijuana corporations had locked-in almost all of the licenses through shell companies (Wallack & Adams, 2019). In 2021, 72.4% of these “Marijuana Agents” identified as white, while only 7.6% identified as Hispanic and 6% identified as Black (T. Smith, 2021).

In Chicago, Illinois, where not one of the 11 existing growers licensed to sell recreational marijuana was African American, the city council’s Black Caucus pushed back. Soon after the state legislature legalized recreational marijuana, local African American legislators took issue with the obvious discrepancy (Koziarz, 2019). Still, Chicago Mayor Lori Lightfoot, who received \$123,000 from the marijuana industry in her contentious bid for mayor, suggested that those councilmembers take the issue up with the state legislators in Springfield. Legalization was implemented on schedule. In 2022, there was only one minority-owned dispensary in Illinois (Vinicky, 2022).

The late New Jersey State Senator Ron Rice was among the most vocal leaders against marijuana legalization. He wrote in an op-ed, “Seeing firsthand how drugs eviscerate urban communities—and understanding how marijuana legalization will impact the health, education, economics, business, liability, and

litigation complexities of our densely-populated, metropolitan-bookended state—I fully oppose it” (Rice, 2019).

Legalization is not a blanket solution to social injustice. In fact, it may perpetuate it.

“Seeing firsthand how drugs eviscerate urban communities—and understanding how marijuana legalization will impact the health, education, economics, business, liability and litigation complexities of our densely-populated, metropolitan-bookended state—I fully oppose it.” (Rice, 2019).

IMPACT ON HOMELESSNESS

Though the extent to which a correlation may exist between the increasing homeless population and the legalization of marijuana is unclear, some trends in this area are notable.

A 2022 comprehensive study from Clemson University determined that data “strongly suggest that RCL [recreational cannabis legalization] adoption may cause an increase in aggregate rates of homelessness” (Sanderson, 2022). Statistics from individual state data appear to support this claim. In Colorado, for example, the homelessness rate appears to have increased with the expansion of recreational marijuana. The U.S. Department of Housing and Urban Development reported a 13% increase in Colorado’s homeless population from 2015 and 2016, while the national average decreased 3% (Burke & Acuna, 2017). Business owners and officials in Durango, Colorado, have testified that the resort town “suddenly became a haven for recreational pot users, drawing in transients, panhandlers, and a large number of homeless drug addicts” (Kolb, 2017).

Youth homelessness is often negatively impacted by marijuana use. A 2018 study found that daily marijuana use among young men substantially increases the probability of becoming homeless (McVicar et al., 2019).

Additionally, a 2022 study found that the co-use of marijuana and tobacco was common among youth experiencing homelessness, with 85.4% having reported marijuana usage in the past month (Glasser et al., 2022).

A 2018 study, conducted by the Colorado Division of Criminal Justice, surveyed seven Colorado jail populations. It yielded results that further link homelessness and marijuana use (Colorado Division of Criminal Justice, 2018). The study, though small, found that 50.8% of respondents reported using marijuana 30 days prior to their time in jail. Additionally, 54.9% of respondents who were homeless prior to their jail time reported marijuana use 30 days prior to it (compared with 36.1% reporting alcohol use). Of note, “The total number of marijuana arrests decreased by 68% between 2012 and 2019, from 13,225 to 4,290,” and “The total number of marijuana-related court case filings declined 55% between 2012 and 2019, driven primarily by decreases in misdemeanors and petty offenses,” according to a 2021 press release from the Colorado Division of Criminal Justice (Colorado Division of Criminal Justice, 2021).

The study also found that of the respondents, 38.5% were Colorado natives and 61.5% were not. Of the non-Colorado natives surveyed, 35.1% reported marijuana as his or her reason for moving to Colorado after it was legalized in 2012 (Colorado Division of Criminal Justice, 2018).

Considering the impact of homelessness on communities—and the resources required to help those impacted by it—it is worth further investigating the correlation between homelessness and legalization.

IMPACT ON IMPAIRED DRIVING

Driving while under the influence of marijuana has proven itself to be an increasingly damaging phenomenon due to the legalization and

normalization of marijuana in the United States. In 2019, 14.8 million U.S. residents reported driving under the influence of marijuana in the last 30 days, up from 12 million in 2018. (Gross, 2019). This represents 6.5% of the driving population. Marijuana users who drive high are twice as likely to be involved in a crash (Gross, 2019). A 2020 analysis of crash data in legal states found that if marijuana were legalized nationwide, the U.S. would suffer an additional 6,800 excess fatal crashes every year (Kamer et al., 2020).

The COVID-19 pandemic affected nearly every part of life, including driving. Fewer Americans drove during the early months of the pandemic and crashes went down in the first half of 2020 but spiked in the latter half of 2020 (US Department of Transportation, 2022). In Colorado, fatal DUI crashes doubled during the first half of 2020 and alcohol- and marijuana-related crashes were up 32% compared to the first half of 2019 (Grewe, 2020). While data is still forthcoming on the impact of the pandemic on driving in other states, according to the NHTSA, active THC was more prevalent among drivers during the COVID-19 pandemic than alcohol, with 32.7% testing positive for THC and 28.3% testing positive for alcohol (US Department of Transportation, 2020).

In Michigan, a survey found that 51% of medical marijuana users admitted to driving while “a little high,” and one in five of those surveyed admitted to driving while very high (Rounds, 2019). A 2022 Virginia survey found that 60% of past 3-month users reported driving while under the influence in the last few months and 26% of past 3-month users reported driving under the influence of marijuana at least once a week (Stratacomm, 2022). 48.8% of teen drivers who currently use marijuana reported driving under the influence (Li et al., 2020).

Legal states are chasing the science on in-field THC testing and hoping science catches up to policy, as opposed to allowing science to dictate policy. The science is clear: driving under

the influence of marijuana is dangerous. The National Institute on Drug Abuse maintains that marijuana use impairs driving in a number of ways: by slowing reaction time, decreasing coordination, and impairing judgment of time and distance. According to a 2021 AAA study, speeding on residential streets when co-using alcohol and marijuana was 55% compared to 35% alcohol-only, and aggressive driving was marked at 52% compared to 28% for alcohol-only (Gross, 2021).

A 2020 double-blind randomized clinical trial to assess the impact of vaped marijuana on driving found that THC impairs driving skills. Drivers who consumed THC had more difficulty maintaining lane position for up to five hours after consuming THC (Arnell et al., 2020). This study confirms previous findings: a 2010 study found THC use affects multitasking (Lenné et al., 2010) and a 2013 study found that smoking increases lane weaving, slows reaction times, and hurts a driver's ability to perform divided-attention tasks (Hartman & Huestis, 2013).

Polysubstance use—using marijuana along with alcohol or another drug—compounds the risk of a vehicle crash more than the drugs being used alone (National Institute on Drug Abuse, 2019b). Drivers under the influence of marijuana and alcohol are more dangerous than drivers who consume marijuana alone or alcohol alone (Hartman & Huestis, 2013). Nevertheless, marijuana-impaired driving is rising while the perception of its negative consequences is decreasing.

The reduced perception of risk and the prevalence of stoned drivers on the road bear consequences for road safety and raise questions for legislators and law enforcement going forward. This false perception that marijuana makes people better drivers is growing, especially among frequent users. A 2022 Virginia survey found that 68% of people who used marijuana in the last 3 months claimed that

marijuana actually makes people safer drivers (Stratacomm, 2022).

A survey conducted by AAA found that only 65% of drivers perceived driving within an hour of using marijuana as extremely dangerous or very dangerous, compared with 94% who felt that driving under the influence of alcohol above the legal limit was extremely or very dangerous (AAA Foundation for Traffic Safety, 2022). The answers from younger drivers were even more alarming. Of respondents between the ages of 19 and 24, only 63.1% believed that driving under the influence of marijuana was extremely or very dangerous, but 100% of respondents in that age group said that driving while over the legal limit for alcohol is extremely or very dangerous (AAA Foundation for Traffic Safety, 2022). This disconnect is concerning. The overall downward trend in perception of risk has coincided with an increased percentage of marijuana-impaired drivers on the road.

According to the biological results of Washington's Roadside Survey, "nearly one in five daytime drivers may be under the influence of marijuana, up from less than one in 10 drivers prior to the implementation of marijuana retail sales" (Grondel et al., 2018). A 2021 study found that 29.5% of cannabis users have driven under the influence of marijuana, and daily cannabis users had a 57% predicted probability of driving under the influence (Salas-Wright et al., 2021). The Washington state Healthy Youth Survey found that in 2021, 9% of 12th graders drove after using marijuana and 15% rode with a driver who was using marijuana (Washington State Healthy Youth Survey, 2021). In Alaska, one in 10 high school students had driven after using marijuana (Alaska Department of Health and Social Services, 2020).

In Colorado, DUIs (driving under the influence of drugs) have risen in recent years and Colorado traffic fatalities where the driver tested positive for marijuana have been consistently rising (with a slight decrease in 2018) despite varying

numbers of traffic fatalities annually (Rosenthal & Reed, 2022). Now, 1 in 4 road deaths in Colorado involve marijuana (Colorado Division of Criminal Justice, 2020). Out of Colorado drivers who were tested for drugs and alcohol in 2019, 47% of drivers tested positive for THC; 19% tested positive for alcohol and THC; and 6% tested positive for alcohol, THC, and a third substance (Rosenthal & Reed, 2022). Additionally, there are more intoxicated drivers who test positive for THC and alcohol together than those who test positive for alcohol alone (Rosenthal & Reed, 2022). In fact, 40% of Colorado drivers who are convicted for a DUI test positive for alcohol, THC, and at least one other substance (Rosenthal & Reed, 2022).

In a 2022 Colorado report of DUID data, of all case filings where a cannabinoid screen was conducted after a driver was pulled over for demonstrating impaired driving, marijuana was detected in 2,848 of the cases, about 90% of drivers who were tested. Of these positive screens, 82.9% tested positive for 1.0 to 5.0+ active THC (Rosenthal & Reed, 2022). What's more, 49.2% of those who tested positive for THC tested positive for extremely high levels of the drug, with a THC level of 5.0 or higher.

In Colorado, traffic fatalities have increased over 51% since 2013 (Colorado Department of Transportation, 2023). The rise in statewide traffic fatalities has coincided with a rise in instances of traffic fatalities where the driver tested positive for THC. The number of traffic fatalities involving drivers who tested positive for marijuana in Colorado rose from 55 deaths in 2013 to 115 deaths in 2018. In 2018, 18.2% of all traffic fatalities in Colorado involved a driver who tested positive for marijuana (Rocky Mountain High Intensity Drug Trafficking Area, 2021).

A recent report released by AAA found that the number of drivers who tested positive for marijuana after a fatal crash doubled after legalization in Washington state. Researchers found that in the five years prior to legalization in

the state, marijuana-impaired drivers comprised around 8.8% of all drivers implicated in traffic fatalities. In the years following, the rate jumped to around 18% (Stratton, 2020). AAA writes, "AAA opposes the legalization of marijuana for recreational use because of its inherent traffic safety risks and because of the difficulties in writing legislation that protects the public and treats drivers fairly" (Stratton, 2020). AAA also reported that "drug use among nighttime weekend drivers has risen by 25 percent since the previous survey in 2007, and driver use of cannabis has spiked by 46% in that same period of time" (AAA Exchange, 2022).

After Canada legalized marijuana, trauma centers in British Columbia reported double the number of moderately injured drivers who tested with a THC level of at least 2 ng per milliliter (Brubacher et al., 2022). Research by the Highway Loss Data Institute found that the legalization of recreational marijuana in Colorado, Oregon, and Washington coincided with an increase in collision claims (Highway Loss Data Institute, 2018).

Compounding the risk of an increasingly impaired driving population is the difficulty posed to law enforcement officers who attempt to stop and detain marijuana-impaired drivers. The smell of marijuana in a suspected driver's car is no longer enough to make an arrest in many states, including in states that have not legalized marijuana (Romo, 2019). Technology that can accurately determine THC levels is underdeveloped and lacks the certainty of traditional breathalyzers. The quick metabolization of THC renders it difficult to detect, requiring tests to be administered quickly in suspected cases.

Additionally, many states have struggled to create a standard level of impairment when THC is detected (Queally & Parvini, 2018). Studies are mixed on what level of THC constitutes impairment. Recently, scientists found that drivers may still be impaired from marijuana use well after intoxication, demonstrating an

increased likelihood of poor driving performance, increased accidents, and decreased rule-following (Dahlgren et al., 2020). In response, 13 states, including Michigan, Arizona, and Pennsylvania, implemented a zero-tolerance policy regarding driving under the influence of any detectable amount of THC (Governors Highway Safety Association, 2021).

Many of the “legal” states failed to establish laws and guidance prior to legalizing marijuana, leaving law enforcement officers in the dark as legislators played catch-up to dangerous trends. As a result, road safety has been compromised.

TRENDS IN CRIME SINCE LEGALIZATION

Marijuana legalization advocates have argued that legalization will reduce overall crime. However, in “legal” states, marijuana crime rates have risen at a faster rate than other states across the country.

While it is difficult to say whether crime can be causally associated with marijuana legalization, some studies shed light on a correlation. A 2019 study conducted in Denver found that the prevalence of both recreational and medical marijuana dispensaries in Denver neighborhoods is significantly and positively associated with increased crime (Hughes et al., 2019). A 2021 study linked recreational marijuana legalization in Oregon to increased property crime and violent crime, although further research is needed (Wu et al., 2021). A 2022 study in Oregon “found that counties in [Oregon] have experienced increases in simple assault rate following legalization, relative to rates in the 19 non-legalized states” (Wu & Willits, 2022).

Researchers found that Denver neighborhoods adjacent to marijuana businesses saw 84.8 more property crimes each year than those without a marijuana shop nearby (Freisthler et al., 2017). The number of court filings charged with the

Colorado Organized Crime Control Act that were linked to a marijuana charge increased 643% from 2013 to 2017 (Colorado Department of Public Safety, 2021). Further, crimes against society, such as drug violations, have increased 44% since 2014 (Denver Police Department).

Colorado’s crime rate in 2016 increased 11 times faster than the 30 largest cities in the nation since legalization (Mitchell, 2017). In 2018, data from the Colorado Bureau of Investigation demonstrated a 14.2% increase in property crime since 2013—157,360 to 179,650—and a 36.5% increase in violent crime since 2013—18,475 to 25,212 (Rocky Mountain High Intensity Drug Trafficking Area, 2019a, p. 52).

Though arrests for marijuana offenses had declined in the years prior to legalization in Colorado, they are increasing again. In 2013, arrests for marijuana sales offenses were at a low of 337, having decreased 52.1% since 2008. From 2013 to 2018, arrests for marijuana sales offenses increased 29.4%. Additionally, prior to legalization, from 2008 to 2013, arrests for all drug sales offenses declined 54.9%. In the years following legalization, arrests for drug sales offenses have increased 11% (Federal Bureau of Investigation, 2018).

Overall, while increased crime has not been definitively linked to marijuana legalization, these upward trends in property crime and violent crime—as well as crimes against society—warrant further investigation.

A THRIVING UNDERGROUND MARKET

Commercialization advocates have long argued that legalization will reduce black market marijuana activity in “legal” states. They claim legalization will prevent the exporting of marijuana to non-legal states, serve as a money-maker for state budgets, bolster consumer safety, drive out Drug Trafficking Organizations

(DTOs), and free up law enforcement time. However, the legalization and commercialization of marijuana have led to greater black-market activity than ever before. States do not see a surplus in funds, consumer and environmental protections prove meaningless, DTOs are operating in legal states and not trying to hide it, but because of legalization, now law enforcement officers have fewer tools to combat illegal activity.

The unchecked proliferation of the marijuana industry has abetted some of these significant problems. The market saturation and overproduction permitted and written into law by “legal” states have caused tremendous problems for regulators and law enforcement.

All legal states have failed to curtail the illicit market, but no state has fared as poorly as California. A bombshell Los Angeles Times series published in September 2022 found the illegal marijuana market in California is much worse than the government wants to acknowledge. The LA Times calculated that the illegal grows outnumber legal grows by as much as 10:1 (Twitter et al., 2022) but not all counties are equally equipped to deal with the illicit market. The 56% of CA counties that have opted-out of marijuana sales are prohibited from using state government funds to combat illegal grows and instead rely on federal funds. This misguided policy, in combination with the lowering of criminal penalties for illegal grows, has lowered the cost of business for illicit actors and emboldened their actions.

Not only do these illegal grows rely on trafficked workers for labor, they also ignore environmental regulations, including pesticide limits and water restrictions in the midst of California’s most severe water shortage in recent memory (St. John, 2022). These illegal grows set up shop on federal land or commandeer private land and engage in coercion and acts of violence;

many landowners have given up (LaMalfa, 2022; St. John, 2022).

A report from NBC found that 70–80% of marijuana sold in state-legal dispensaries in California was produced and grown illegally (NBC News, 2022). The illegal supply is also of course being diverted to other states. Even California Governor Gavin Newsom in 2016 admitted that 85–90% of California-produced marijuana was exported (Fuller, 2019). Instead of solving that issue, now the Governor is conceding and in September 2022 signed legislation to permit the exporting of California marijuana to other legal states, a clear violation of constitutional interstate commerce powers (Office of Governor Gavin Newsom, 2022).

Illegal marijuana originating from “legal” states is uncovered at increasingly high rates. In its 2019 National Drug Threat Assessment report, the DEA (Drug Enforcement Administration, 2019) found that states with the highest marijuana removals came from states with major border crossings or states with medical or recreational marijuana markets. These states give cover to illegal activity; black-market problems abound.

Illicit activity has proliferated with marijuana legalization, much of it tied to “state-legal” marijuana. Many pro-marijuana figures have suggested the black market causes problems because other states have not legalized marijuana. This is not true. The unfettered black market will always be able to undercut the “legal” market. Despite their widespread legality, cigarettes are still one of the most trafficked commodities (Kilmer, B., et al., 2010; USA Today (Mar. 17, 2014; Zinsmeister, J., 2015; Center for Public Integrity, 2009).

It is well documented that Oregon’s supply of marijuana far outweighs the demand for the drug in the state’s legal market. Between July 2015 and January 2018, 14,550 pounds of illegally trafficked Oregon marijuana, worth approximately \$48 million, was seized en route

to 37 different states (Oregon-Idaho High Intensity Drug Trafficking Area, 2018). According to a report from the Oregon Liquor Control Commission, the supply of marijuana is twice the level of demand. Oregon's overproduction issue is so vast, the state has enough marijuana to meet the current demand for at least six years (Oregon Liquor Control Commission, 2019). A 2019 audit by Oregon's Secretary of State found that the volume of marijuana produced in Oregon is nearly 7 times its local consumption (Oregon Secretary of State, 2019). A 2021 report found that this trend of supply outweighing demand continued, even after Oregon saw a jump in demand amid the COVID-19 pandemic (Oregon Liquor Control Commission, 2021).

Adding to this issue, the same 2019 Oregon audit found that black market marijuana fetches prices several times higher than "legal" marijuana. As the U.S. Attorney in Oregon reported in 2018, the state has "an identifiable and formidable marijuana overproduction and diversion problem" (Flaccus, 2018). Still, marijuana proponents in numerous states seek faster license approvals and more marijuana licenses (Alfosni, 2019). The 2021 Recreational Marijuana Supply and Demand Report found that since Oregon released its last report in 2019, production has increased by 78% and cannabis sold has increased by 150% (Oregon Liquor Control Commission, 2021).

In 2018, Colorado law enforcement seized 12,150 pounds (6.1 tons) of bulk marijuana and officials recorded 25 different states to which marijuana was destined (Rocky Mountain High Intensity Drug Trafficking Area, 2019b). In addition to physically moving marijuana out of state in vehicles, much of it is sent via the U.S. Postal Service. In FY15, USPS apprehended approximately 34,000 pounds of marijuana, but in FY19, USPS apprehended 93,651 pounds of marijuana, a 175% increase in 5 years (Office of Inspector General, 2016).

The proliferation of high-potency THC extracts has made smuggling logistically easier. The Oregon-Idaho HIDTA seized 91 clandestine labs in 2021; 90 of the labs were producing BHO/honey oil, a marijuana extract (Oregon-Idaho High Intensity Drug Trafficking Area, 2022a).

Despite the dropping seizures of marijuana at the southern border, the supply of illicit marijuana has not decreased; on the contrary, it has boomed. The Oregon-Idaho HIDTA alone seized 875% more marijuana in FY22 in their region than was seized at the U.S. southern border during the same time period (Oregon-Idaho High Intensity Drug Trafficking Area, 2022b). In 2020, the Central Valley California HIDTA, one of the 4 HIDTA regions in California, seized 662,063 kilograms of illicit marijuana (Central Valley California High-Intensity Drug Trafficking Area, 2021). In 2020, Colorado law enforcement seized 5,028 kilograms (5 metric tons) of bulk marijuana. Officials recorded 21 different states to which marijuana was destined (Rocky Mountain High Intensity Drug Trafficking Area, 2021).

"Legal" states also have a proliferation of illegally produced marijuana, even in their state-licensed dispensaries. In "legal" states, illegal grow operations have easily blended their production facilities with "legal" ones and have taken advantage of rural cover to hide from law enforcement. In Washington, Okanogan County Chief Criminal Deputy Steve Brown told NPR reporters that prior to legalization, operations of the kind he continues to uncover were "hidden up in the hills." Now, he finds some just off roads and within sight of neighbors. Other investigations have uncovered illegal operations run by people who were licensed in other "legal" states (Kaste, 2018).

In California, according to recent reports, the black market outsells the "legal" marijuana market at a rate of three to one. These illicit sellers have brazenly opened shops in cities across the state, hiding in plain sight and giving

way to a perpetual game of “whack-a-mole,” as one law enforcement officer described it. These companies also advertise on the popular marijuana website, Weedmaps, blending in with “legal” sellers. When the state warned Weedmaps to stop permitting illegal operators to advertise, CEO Chris Beals complained that the problem was not his company’s fault but rather a result of the state prohibiting more retail marijuana licenses (Romero, 2019).

Local illicit actors are not the only beneficiaries of “legal” marijuana. The proliferation of black-market marijuana bolsters the businesses of well-financed international cartels, which extend as far north as Alaska (Alaska State Troopers, 2016). The DEA found that Asian drug trafficking organizations (DTOs) were operating grow facilities across the state of Washington (Drug Enforcement Administration, 2020).

Cartel presence in California has only expanded since legalization. In California, authorities suspect—based on phone records and wire transfer activity, as well as figurines commonly associated with cartels, such as those depicting Jesus Malverde—that illegal marijuana activity is tied to the Sinaloa and La Familia Michoacana cartels (Magdaleno, 2018). In 2021, the Oregon-Idaho High Intensity Drug Trafficking task force identified 136 DTOs with foreign and domestic connections (Oregon-Idaho High Intensity Drug Trafficking Area, 2022a).

A 2022 report found the Sinaloa Cartel, previously led by the Mexican drug trafficker Joaquín “El Chapo” Guzmán who is now serving a life sentence in U.S. federal prison, was lobbying in favor of marijuana legalization in Mexico, presumably because cartels could find a “legal” way to get into the drug business and launder money from other drugs as well (Chaparro, 2022).

The legality of marijuana in some states continues to boost the underground market. Additionally, the United Nations’ 2021 World Drug Report found that “cannabis potency has

quadrupled in some parts of the world over the last two decades, while the percentage of adolescents who perceived the drug as harmful fell by as much as 40 per cent”—this has led to a 22% increase in worldwide drug use since 2010, which drug trafficking organizations have been working to supply (UN Office on Drugs and Crime, 2021).

The corruption permeates the state-legal market. The DEA reports that financial backing for some state-legal marijuana businesses flows from illicit revenue and DTOs that illegally shelter profits from marijuana businesses and undercut tax revenues anticipated by state governments (Drug Enforcement Administration, 2020).

The Drug Enforcement Administration concluded in their 2020 National Drug Threat Assessment: “Domestic production and trafficking of marijuana will likely increase as more states adopt or change current marijuana laws to establish medical or recreational marijuana markets, allowing criminals to exploit state legality” (Drug Enforcement Administration, 2020).

TAX REVENUE FROM LEGALIZATION

Regulated marijuana has not been the revenue cash cow that industry advocates promised. Despite having some of the highest marijuana taxes in the country, California has still not seen a boom in tax revenue. California’s projected marijuana tax revenue by July 2019 was nearly half of what was originally expected when the state permitted retail sales in 2018 (Blood, 2019; Fuller, 2019). The FY21-22 marijuana tax revenue was only 0.49% of the state’s entire budget (California Department of Tax and Fee Administration, 2022).

In Alaska, marijuana tax revenue represented 0.29% of the state budget, in Oregon 0.30%, and in Colorado, it represented nine tenths of one percent of Colorado’s 2022 statewide budget

(Smart Approaches to Marijuana, 2022). While marijuana’s supporters may point to the fact that Colorado received \$332 million (projected) in tax revenue in 2022 (Colorado Department of Revenue, 2022), a study from Colorado Christian University found that every \$1 in tax revenue resulted in approximately \$4.50 in costs, ranging from additional healthcare costs to more students dropping out of high school (Centennial Institute, 2018).

In 2022, California cut several marijuana-related taxes in hopes of saving “failing” marijuana businesses (Yee, 2022). In reality, many state-legal growers had already given up on the bureaucracy and had begun illegally (El Mahrer et al., 2022). Marijuana license holders complain that “legal” states are excessively regulated and that taxes on the drug are too high (Alfosni, 2019). They go as far as to say that regulation and taxes are the reason the black market continues to dominate. As we have seen in California, that contention is ill-founded for several reasons. The regulatory and compliance systems instituted in the “legal” states were instituted with little foresight. State compliance officials are left on their heels while various regulatory and compliance issues become exposed. The Oregon Liquor Control Commission wrote in a 2018 report that, “due to the legally required rapid implementation of the recreational program, OLCC has not been able to implement robust compliance monitoring and enforcement controls and processes for the recreational marijuana program” (Oregon Liquor Control Commission, 2018).

LOCALITIES OPT-OUT OF RETAIL MARIJUANA

Although marijuana legalization has been passed by ballot measures in several states, the picture at the local level is very different. The perception that legalization is welcomed

by the citizens of marijuana-friendly states is not accurate.

Proposition 64, the marijuana ballot measure in California, received just over 57% of the vote when it appeared on the ballot in 2016. Yet 68% of California localities have opted out of allowing marijuana shops to open (Nieves, 2021). This means the “legal” shops will be concentrated in a handful of towns and communities. While California has 2.1 dispensaries for every 100,000 residents, Alaska has a rate of 20.3 dispensaries for every 100,000 residents, Oregon has a rate of 17.9, and Colorado has a rate of 14.2, as of October 2021 (Nieves, 2021).

What’s more, licensed operators have expressed frustration with the restrictive policies of the localities, prompting one legislator to craft a law that would require towns that opted out to permit at least one marijuana business for every four bars or restaurants. According to a Los Angeles Times report, that would result in nearly 2,200 new marijuana shops across the state (McGreevy, 2019a). The legislation runs counter to what the citizenry was promised in the ballot initiative.

The shocking discrepancy has been replicated across the country. When it comes to marijuana-related ballot measures, voters may think the issue is very important. The picture changes when legalization hits home. Voters choose to opt-out of marijuana in their communities in large numbers. This raises questions about the political process of legalization.

In Michigan, where recreational marijuana sales began in December 2019, more than 1,400 of the state’s 1,773 municipalities opted out of recreational marijuana—with 40 of 83 counties reporting none of their municipalities allowing the sale of medical marijuana (WXYZ Detroit, 2019). That amounts to approximately 79% of the state’s municipalities opting out of marijuana.

In Colorado, another state thought to be marijuana-friendly, 64% of jurisdictions banned

both recreational and medical marijuana sales (Colorado Marijuana Enforcement Division). As a result, nearly 59% of licensed medical and recreational marijuana locations are concentrated in four counties: Denver (345), El Paso (125), Boulder (68), and Pueblo (58) (Colorado Department of Revenue, 2019).

In New York, 58% of municipalities have opted out of consumption sites (Rockefeller Institute of Government, 2022).

Over 60% of municipalities and counties in Oregon have opted out of marijuana sales. Although some of these jurisdictions voted after shops set up in their cities, no new marijuana retail stores are permitted. As such, 50% of Oregon dispensaries are concentrated in three counties, with 196 of the total 666 dispensaries located in the county of Multnomah (Oregon Liquor and Cannabis Commission, 2023).

In Illinois, similar debates are raging, with more community mobilization than many legislators and community organizers have ever seen, according to a report by the Chicago Tribune (McCoppin et al., 2019). The wave of anti-marijuana sentiment surprised some, since the measure passed fairly easily in the state legislature. That being said, an investigative report by Illinois-based newspapers found that—from January of 2017 to the spring of 2019—marijuana companies, executives, and lobbyists donated over \$630,000 to various politicians in the state (Grace, 2019).

While it may pay to gain the favor of legislators, localities are far less certain about “legal” marijuana taking over their hometowns.

“LEGAL” PRODUCTS ARE UNSAFE

The lack of oversight also bears consequences for consumer safety. An independent investigation in San Diego found that nearly 30% of marijuana

samples purchased from licensed retailers in Southern California tested positive in labs for pesticides (Grover & Corral, 2019). A 2021 study also found that medical marijuana is “prone to contamination of metals, fungi, and pesticides during manufacturing and storage processes” (Dryburgh et al., 2018). States are ill-equipped to handle marijuana testing, and even states with the most stringent regulatory requirements have demonstrated significant lapses, which has allowed contaminated marijuana products to reach the market (Crombie, 2017). Licensed marijuana retailers are not incentivized to comply with the law and they benefit from that leeway while continuing to point fingers at the black market when problems arise. As a result, the states themselves are blurring the lines between “legal” and illegal marijuana, by allowing “legal” operators to skirt regulation.

In “legal” states, illegal grow operations have easily blended their production facilities with “legal” ones and have taken advantage of rural cover to hide from law enforcement. Additionally, illicit actors have taken advantage of federal hemp legalization. Because hemp and marijuana are only distinguishable through laboratory testing, these illicit actors shield their illegal marijuana grows in legal hemp fields. (Drug Enforcement Administration, 2020). Even legal hemp fields are not exempt from issues. The New York Times reported that sellers are now offering Delta 8 THC, which is derived from hemp, to circumvent a law that prohibits Delta 9, the psychoactive ingredient in marijuana, from being sold (Richtel, 2021).

In a 60 Minutes story on marijuana in California, Sheriff Tom Allman took reporter Sharyn Alfonsi in a helicopter to survey an illegal grow site in the “Emerald Triangle”—an area of California known for its illicit production of marijuana. He was not surprised that the operation wasn’t hidden. “Allman explained since Prop 64 and the legalization of marijuana, the black-market suppliers try to blend in with legal pot farmers sometimes on the same property” (Alfonsi,

2019). In response, the three counties within the “Emerald Triangle” were given \$1.5 million to address the increasing rates of illegal marijuana growth and crime (Barringer, 2022).

Another major promise of marijuana proponents was that a “legal” market would eliminate black market weed and allow law enforcement officials to focus on other things. Allman laughed at the idea and told Alfonsi that he was “looking forward to that day” (Alfosni, 2019). The very creation of the “legal” marijuana market in California has ushered in a more powerful illicit market than had ever existed before. What’s more, Allman believes that his department lacks resources to combat the illegal operations. He estimates that it only has the capacity to handle 10% of the illegal grows. According to a 2019 industry report, \$8.7 billion of the revenues made from marijuana sales in California’s massive cannabis market are illegal, compared to \$3.1 billion in legal revenues (McGreevy, 2019b).

ENVIRONMENTAL IMPACT

Conversations regarding the legalization of marijuana have largely ignored the threat that the industry poses to the environment. Given the lack of data, it is difficult to predict the full extent of marijuana’s impact. However, early indications point to damaging consequences. Research suggests that indoor marijuana grows emit as much CO₂ as 3.3 million cars on the road (Larkin & Sweeney, 2022). A 2021 report from the American Chemical Society identified six impact pathways from cannabis cultivation: land-cover change, water use, pesticide use, energy use, air pollution, and water pollution (Wartenberg et al., 2021).

The environment is at risk of pollution from both “legal” and illegal marijuana operations. Regulatory standards are lacking and enforcement is low. The lack of clarity in regulation has blurred the line between “legal” and illegal marijuana cultivation practices.

Furthermore, limited resources have prevented law enforcement officials from investigating illegal grow sites—which are often well disguised on state and federally protected land. In 2017 alone, for example, 80,826 plants were seized from Colorado public lands, compared to 4,980 in 2013 (CBS News, 2019).

Surrounding communities and ecosystems are at stake. Marijuana facilities on federal land in California are estimated to contain up to 731,000 pounds of solid fertilizer, 491,000 ounces of liquid fertilizer, and 200,000 pounds of toxic pesticides (Bernstein, 2017). These chemicals threaten the surrounding environment and have devastated local animal species. An illegal rodent poison has been associated with a rise in instances of death of the northern spotted owl, a threatened species native to the northwest (Franklin et al., 2018).

In California, officials estimate that 70% of the illegal market is cultivated on public lands. According to one investigative report, nine out of every 10 illegal marijuana farms raided in 2018 contained traces of carbofuran, an extremely toxic and banned chemical. From 2012 to 2017, six times as many chemicals have been found at these operations. “These places are toxic garbage dumps. Food containers attract wildlife, and the chemicals kill the animals long after the sites are abandoned,” said Rich McIntyre, director of the Cannabis Removal on Public Lands (CROP) Project, which is dedicated to restoring lands devastated by criminal grow sites on state and federal property in California (Weber, 2019). “We think there’s a public health time bomb ticking,” he said, because 60% of California’s water comes from national forest land. The reclamation of such illegal grow sites costs an average of \$40,000 per site (Weber, 2019).

As marijuana legalization expands, so too does the illicit market and the threat it poses to the environment. But illegal marijuana is not the only culprit. Marijuana cultivation uses and requires a significant amount of power.

Indoor marijuana cultivation (which makes up 80% of all growing) is highly inefficient. In fact, indoor marijuana cultivation consumes 709 kBtu/sq ft. A normal home or office building consumes just 40-50 kBtu/sq ft (Price, 2020). The indoor cultivation of one kilogram of marijuana requires 5.2 megawatt hours of electricity and releases 4.5 metric tons of carbon dioxide emissions, comparable to that of a passenger car in one year (Reitz, 2015; US Environmental Protection Agency, 2023). Indoor cultivation in Massachusetts makes up 10% of the state's industrial electricity consumption (Young, 2021). Marijuana cultivation is so energy intensive that its emissions are similar to levels caused by coal mining in Colorado (Summers & Quinn, 2021).

Marijuana production is nearly four times more energy intensive than coal or oil production (Mills, 2012). The Alliance to Save Energy found, "Indoor cannabis cultivation is one of the most energy-intensive industries, spending an estimated \$6 billion on energy annually. That's a hefty electricity bill, matching that of the federal government powering its facilities" (Reott, 2020). And energy consumption issues will only worsen. Research estimates that annual marijuana cultivation electricity demand will increase by 65% over the next ten years (T. Miller & Bischof, 2020).

A 2015 study on the impact of marijuana cultivation on watersheds in California found that individual marijuana plants require 22.7 liters of water daily. Production facilities range in daily water demand from 523,144 liters to 724,016 liters (Bauer et al., 2015). A 2021 article from the Brookings Institution also found, "The scale of the problem is staggering: Even at the end of 2020, illegal cannabis grows sucked up between 11.4 million and 36.3 million liters of water daily! The widespread illegal cultivation contributes to water depletion and conflict over water and has other bad environmental consequences" (Felbab-Brown, 2021). Researchers expect the total amount of water used by the legal cannabis

market to increase by 86% by 2025 (Felbab-Brown, 2021).

Additional studies have highlighted the need for a better understanding of the consequences of marijuana cultivation. A 2016 study focused on marijuana production in Humboldt County, California, found that 68% of the grow sites were less than 500 meters from developed roads, introducing a risk of landscape fragmentation; that 22% of grows were on steep slopes, posing a risk for erosion, sedimentation, and landslide; and that 5% were less than 100 meters from threatened fish habitats (Butsic & Brenner, 2016). A subsequent study found that marijuana farming has drastic impacts on its surrounding environment, an important observation as the industry seeks to expand (I. J. Wang et al., 2017).

From 2012–2016, the number of marijuana farms in Northern California increased 58% and the total area under cultivation expanded 91%. Expansion of these farms occurred in locations of extreme environmental sensitivity. However, budgetary accommodations for regulating marijuana farm expansion were relatively low compared with other regulatory programs (Butsic et al., 2018). Additionally, a study from the University of California, Berkeley, found that "While California only has 8,000 permitted cannabis farms, scientists mapped 15,000 in Humboldt County alone" (Dillis et al., 2021).

Legalization has thus far resulted in extreme environmental damage, and the consequences may not be fully understood in time to prevent worse outcomes, as the industry further expands.

INCREASED DANGER TO PETS

More pets are inadvertently eating marijuana and marijuana-infused products, stemming from the products being improperly stored in households. Dogs have more cannabinoid receptors in their brains than humans, which

means marijuana side effects are much more pronounced in canines (Gollakner & Buzhardt, 2022).

Pets are likely unable to differentiate edibles from regular food or treats so accidental ingestion is a concerning risk. The ASPCA's Animal Poison Control Center reported the number of these cases increased from 330 in 2012 to 5,811 in 2021, representing a 1,660% increase (N. Martin, personal communication, October 18, 2022). In 2021, the Pet Poison Hotline reported a 450% increase in accidental marijuana ingestion (Nationwide, 2023). According to the ASPCA, "Signs pets commonly show after ingesting marijuana or marijuana products include unsteadiness on the feet, depression, dilated eyes, dribbling urine, sensitivity to sound and touch, slow heart rate and even low body temperature" (ASPCA, 2018).

A Colorado study found that the consumption of "medical grade tetrahydrocannabinol butter" resulted in the death of two dogs (Meola et al., 2012). In 2019, the American Veterinary Medical Association warned, "Even if you don't bring marijuana into your house, legalization could increase the chances of your dog coming upon a discarded joint or edible while outdoors" (American Veterinary Medical Association, 2019). This trend is likely to worsen as more states legalize marijuana and more individuals begin using marijuana more frequently.

The industry has also heavily marketed unproven, unregulated marijuana products to pet owners, claiming it can help calm anxious pets and help relieve pain. Some claim CBD can even cure dog cancer (Coile, 2021). Studies on THC or CBD use in pets are limited; even if THC is legal in a state, it is only legal for adult human consumption, not legal for pet consumption. One of the few things that is known about CBD consumption in dogs is that it can inhibit the effectiveness of medication (Coile, 2021).

CANADA

Canada was one of the first countries to legalize recreational marijuana, legalizing its possession and use in 2018. Early data are indicative of problematic trends.

Canadian use rates have increased. Among those 16 or older, past-year use increased from 22% in 2018, the year Canada legalized marijuana, to 27% in 2022 (Health Canada, 2022b). Furthermore, past-month use increased from 15% in 2018 to 19% in 2022, indicating that these same users are using the drug more frequently. Among 16–19-year-olds, past-month use increased from 23% in 2018 to 25%; among 20–24-year-olds, it increased from 30% to 36%. Daily use among those 16 or older has remained largely unchanged, going from 25% of past-year users in 2018 to 26% in 2021 and back to 25% in 2022.

Marijuana use among youth in Canada is high. Past-year use among people aged 16 to 19 increased more than 22% from 2018, when marijuana was legalized, to 2019 (Health Canada, 2019). In 2019, 16% of Canadians aged 16 to 19 reported using marijuana almost every day, or every day (Health Canada, 2019). According to Canada's youth drug survey, 18% of young people in middle school and high school reported past-year marijuana use (Health Canada, 2022a). Over 19% of young people in grades 7–9 and nearly 30% of young people in grades 10–12 reported dabbing marijuana when they used it (Health Canada, 2022a). 17% of young people in grades 7–12 reported using both alcohol and marijuana (Health Canada, 2022a).

Marijuana-impaired driving is on the rise. A 2022 study found that after legalization, the rate of drivers who tested positive for THC in British Columbia doubled (Brubacher et al., 2022). Additionally, 7% of drivers in Canada reported driving after using marijuana in 2019, a jump of over 112% just one year after legalization (Woods-Fry et al., 2019). And 20% of those who

reported driving while high reported co-using marijuana with alcohol (Health Canada, 2019).

The black market continues to dominate in Canada. Reports suggest that the legal market comprises just a third of the market for marijuana in Canada (Miller, 2020), and 40% of users in Canada reported that they had obtained marijuana illegally since it was legalized (Turvill, 2020). An investigation by Radio-Canada found connections to organized crime in the Canadian legal marijuana market (Denis, 2018).

After Canada expanded the sales of THC products, emergency department visits and hospitalizations of children exposed to marijuana increased nine-fold (Neustaeter & Favare, 2022).

RECOMMENDATIONS

Policy makers and the public need real-time data on both the consequences of legalization and related monetary costs. Meanwhile, we should pause future legalization efforts and implement public health measures such as potency caps in places that have legalized. In addition, the industry's influence on policy should be significantly curtailed. SAM recommends research efforts and data collection focus on the following categories:

1. Emergency room and hospital admissions related to marijuana.
2. Marijuana potency and price trends in the "legal" and illegal markets.
3. School incidents related to marijuana, including studies involving representative datasets.
4. Extent of marijuana advertising toward youth and its impact.
5. Marijuana-related car crashes, including THC levels even when testing positive for alcohol.
6. Mental health effects of marijuana.
7. Admissions to treatment and counseling intervention programs.
8. Cost of implementing legalization from law enforcement to regulators.
9. Cost of mental health and addiction treatment related to increased marijuana use.
10. Cost of needing, but not receiving, treatment.
11. Effect on the market for alcohol and other drugs.
12. Cost to workplace and employers, including impact on employee productivity.
13. Effect on minority communities, including arrests, placement of marijuana establishments, and quality of life indicators.
14. Effect on the environment, including water and power usage.

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