

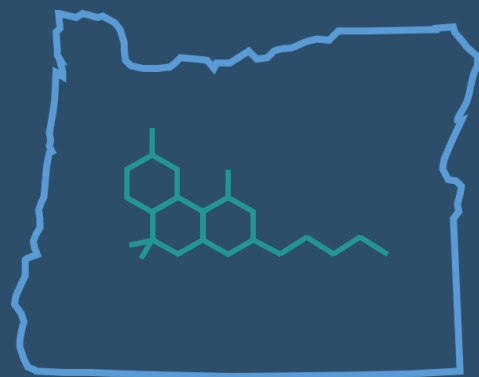
Insight Report



An Initial Assessment of Cannabis Production, Distribution, and Consumption in Oregon 2018 - An Insight Report

First Edition - Updated Version

August 6, 2018



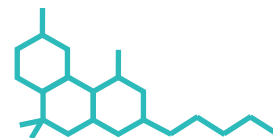
Oregon – Idaho High Intensity Drug Trafficking Area

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Prepared by the Oregon –Idaho High Intensity Drug Trafficking Area

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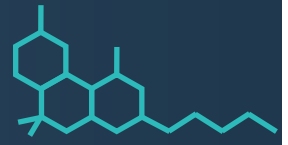
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Section I: Project Objectives, Research Design, and Analytic Scope

Report Purpose



Oregon has had a state-authorized medical cannabis system since 1998, and, in November 2014, Oregon voters approved the Control, Regulation, and Taxation of Marijuana and Industrial Hemp Act (commonly known as Measure 91) to legally commercialize non-medical retail cannabis in the state implemented as of July 2015. As a result, the Oregon-Idaho High Intensity Drug Trafficking Area (OR-ID HIDTA) initiated the Oregon Cannabis Insight Report in recognition of the need to continuously examine the effects of cannabis production, distribution, and consumption in Oregon. The OR-ID HIDTA established a research framework based on shared concerns – areas of common interest to both the federal and state government – and then impartially gathered and examined readily available data, which is relevant to those concerns. Thereby, this project establishes an empirical foundation on which ongoing strategic analyses can be conducted. This research effort does not purport to be a policy evaluation or policy performance review; rather this assessment provides a verifiable analysis of assorted information and data, which has been centralized as part of this research effort.

Research Design

When establishing the research’s scope, the OR-ID HIDTA employed the now historic United States Department of Justice’s (USDOJ) “Cole Memo” and letter of the law codified by Measure 91, which, when combined, clearly defined areas of shared concern. Despite the rescission of the Cole Memo, the areas of concern (Enforcement Priorities) it identified became the bedrock of Oregon’s Ballot Measure 91. According to the August 29, 2013 memorandum by former USDOJ Deputy Attorney General James M. Cole, specific areas of concern are ¹:

- *Preventing the distribution of marijuana to minors;*
- *Preventing revenue from the sale of marijuana from going to criminal enterprises, gangs, and cartels;*
- *Preventing the diversion of marijuana from states where it is legal under state law in some form to other states;*
- *Preventing state-authorized marijuana activity from being used as a cover or pretext for the trafficking of other illegal drugs or other illegal activity;*
- *Preventing violence and the use of firearms in the cultivation and distribution of marijuana;*
- *Preventing drugged driving and the exacerbation of other adverse public health consequences associated with marijuana use;*

1.Cole, James M. 2013. "Guidance Regarding Marijuana Financial Crimes." *U.S. Department of Justice*. August 29. Accessed September 26, 2016. <https://www.justice.gov/sites/default/files/usao-wdwa/legacy/2014/02/14/DAG%20Memo%20-%20Guidance%20Regarding%20Marijuana%20Related%20Financial%20Crimes%202%2014%2014%20%282%29.pdf>.

Report Purpose

- *Preventing the growing of marijuana on public lands and the attendant public safety and environmental dangers posed by marijuana production on public lands; and*
- *Preventing marijuana possession or use on federal property.*

Oregon's Measure 91 follows similarly²:

- *Eliminate the problems caused by the prohibition and uncontrolled manufacture, delivery, and possession of marijuana within Oregon;*
- *Prevent the distribution of marijuana to persons under 21 years of age;*
- *Prevent the revenue from the sale of marijuana from going to criminal enterprises, gangs, and cartels;*
- *Prevent the diversion of marijuana from this state to other states;*
- *Prevent marijuana activity that is legal under state law from being used as a cover or pretext for the trafficking of other illegal drugs or other illegal activity;*
- *Prevent violence and the use of firearms in the cultivation and distribution of marijuana;*
- *Prevent drugged driving and the exacerbation of other adverse public health consequences associated with the use of marijuana;*
- *Prevent the growing of marijuana on public lands and the attendant public safety and environmental dangers posed by marijuana production on public lands; and*
- *Prevent the possession and use of marijuana on federal property.*

The guidance issued by former Deputy Attorney General James M. Cole was officially rescinded by the January 4th, 2018 Memorandum from Attorney General Jeff Sessions³, which stated that:

In the Controlled Substances Act, Congress has generally prohibited the cultivation, distribution, and possession of marijuana. 21 U.S.C. § 801 et seq. It has established significant penalties for these crimes. 21 U.S.C. § 841 et seq. These activities also may serve as the basis for the prosecution of other crimes, such as those prohibited by the money laundering statutes, the unlicensed money transmitter statute, and the Bank Secrecy Act. 18 U.S.C. §§ 1956-57, 1960; 31 U.S.C. § 5318. These statutes reflect Congress's determination that marijuana is a dangerous drug and that marijuana activity is a serious crime.

In deciding which marijuana activities to prosecute under these laws with the Department's finite resources, prosecutors should follow the well-established principles that govern all federal prosecutions. Attorney General Benjamin Civiletti originally set forth these principles in 1980, and they have been refined over time, as reflected in chapter 9-27 .000 of the U.S. Attorneys' Manual. These principles require federal prosecutors deciding which cases to prosecute to weigh all relevant considerations, including federal law

2.State of Oregon. "Measure 91 - the Control, Regulation, and Taxation of Marijuana and Industrial Hemp Act." *Oregon Recreational Marijuana*. 2014. <http://www.oregon.gov/olcc/marijuana/Documents/Measure91.pdf> (accessed June 21, 2018).

3.Sessions, Jefferson B. 2018. Memorandum for All United States Attorneys. Memorandum, Washington D.C.: United States Department of Justice.

Report Purpose

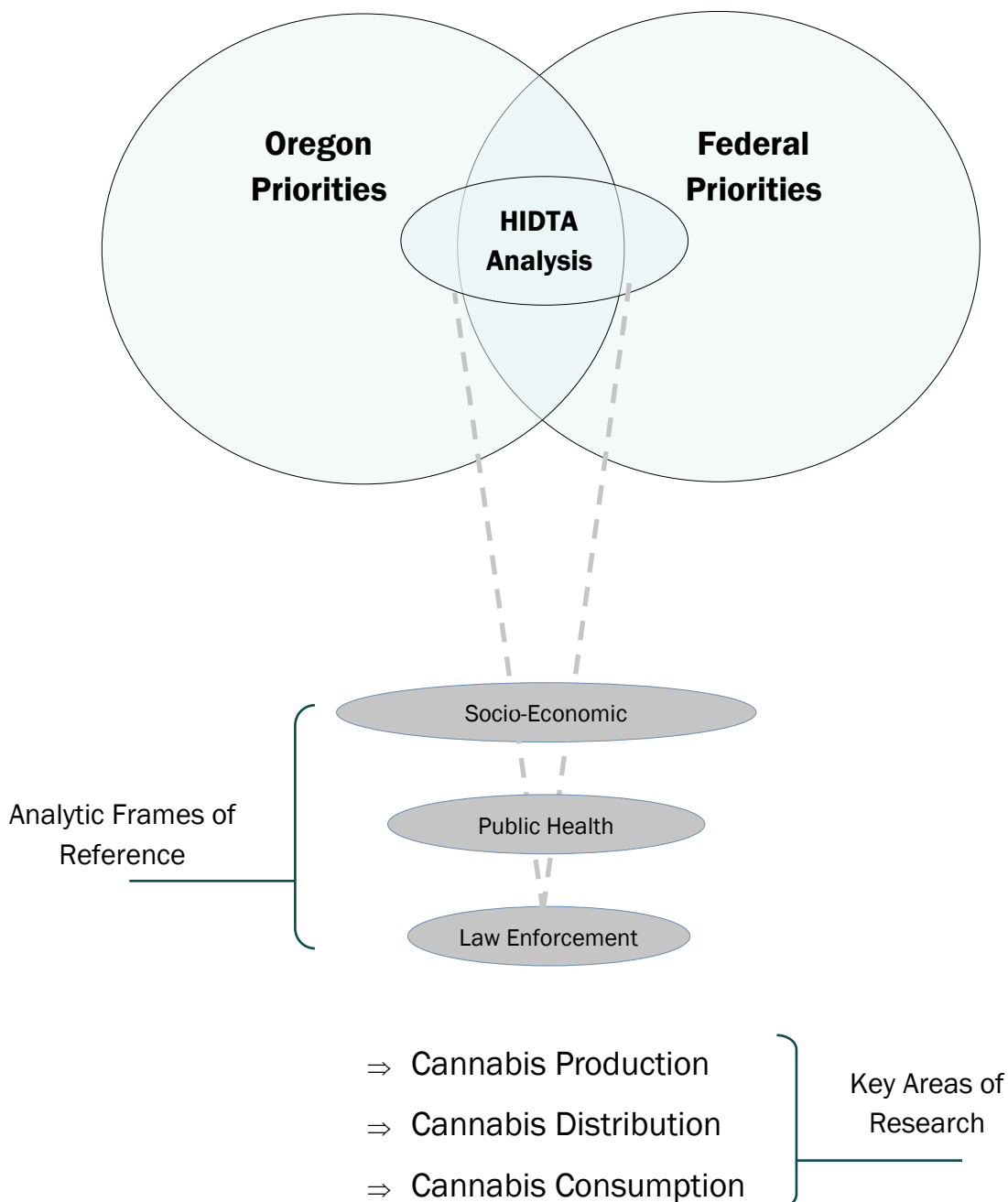
enforcement priorities set by the Attorney General, the seriousness of the crime, the deterrent effect of criminal prosecution, and the cumulative impact of particular crimes on the community.

Given the Department's well-established general principles, previous nationwide guidance specific to marijuana enforcement is unnecessary and is rescinded, effective immediately. This memorandum is intended solely as a guide to the exercise of investigative and prosecutorial discretion in accordance with all applicable laws, regulations, and appropriations. It is not intended to, does not, and may not be relied upon to create any rights, substantive or procedural, enforceable at law by any party in any matter civil or criminal.

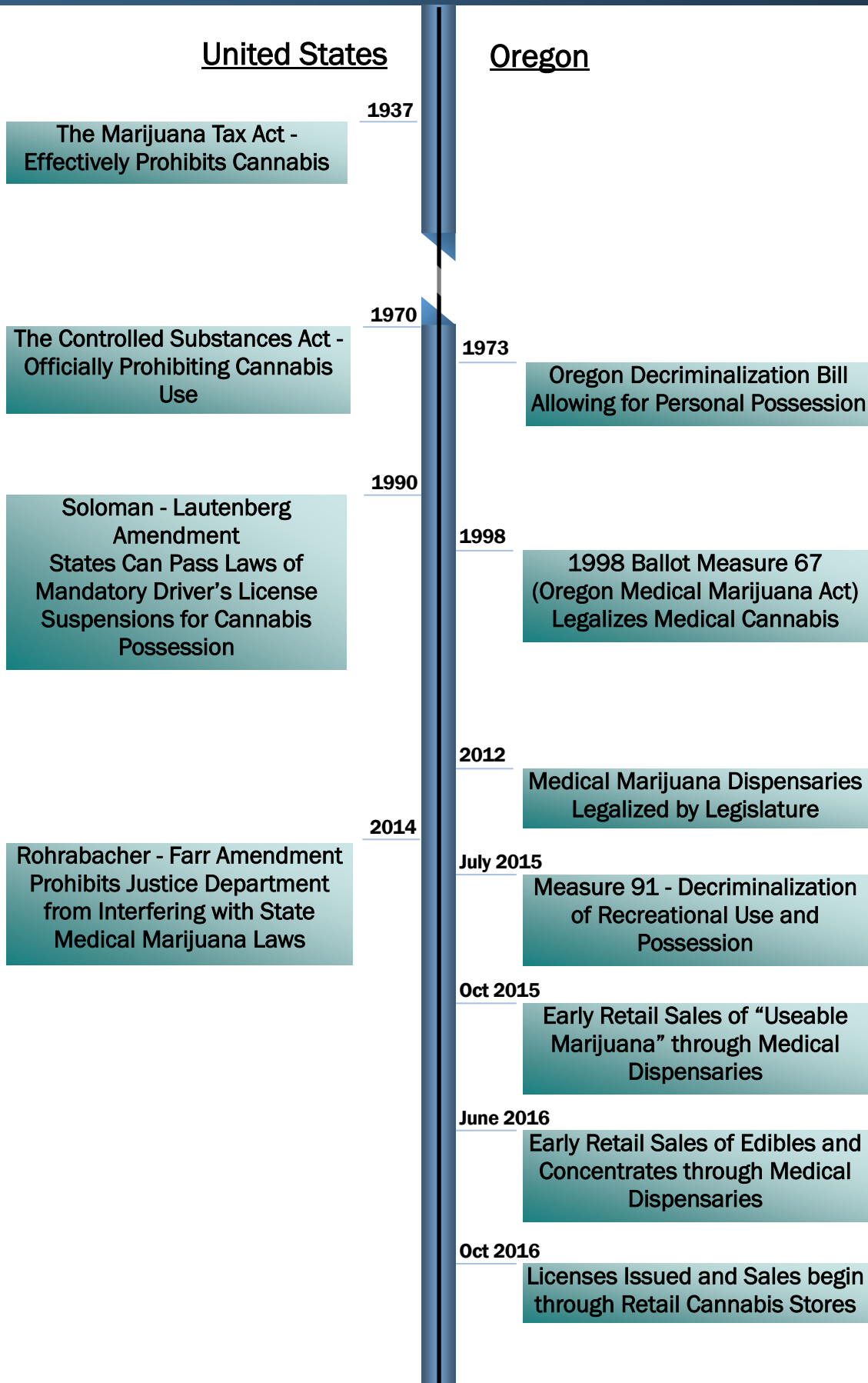
The criteria listed above was used as the basis for hierarchal structured argumentation and problem formulation. In this process, OR-ID HIDTA broke larger, more complicated intelligence questions into manageable individual research topics, upon which, comprehensive research design was established.

Report Scope and Analytic Framework

The OR-ID HIDTA recognized the differences in United States Code and Oregon Revised Statutes, and therefore chose to focus research efforts on the shared areas of concern that were identified in the now obsolete federal guidance and subsequently crystallized into state law, along with the relevant considerations for potential prosecution outlined by the U.S. Attorneys' Manual. The overlapping areas of interest were evaluated through three primary frames of reference that centered on production, distribution, and consumption of cannabis by using a mixture of reliable direct and indirect data sources. All sources were evaluated using prescribed analytic standards from the Director of National Intelligence outlined in Intelligence Community Directives.



History of Cannabis Legality at Federal and Oregon State Levels



Section II: Key Findings

This section outlines key findings from the research that is covered in this assessment. The section has three subsections that are divided into socio-economic, public health, and law enforcement perspectives. For additional context into the research and analysis shown below, please refer to the parent section from which these are derived.

Key Socio-Economic Perceptive Findings

Production Essential Elements of Information - On Pages 15—19

Oregon’s estimated current annual production capacity exceeds 911,000 kg (2 million lb), far outpacing annual state consumption demands, which itself is between 84,400 to 169,000 kg (186,100 to 372,600 lb)ⁱ. Oregon’s estimated current annual production capacity is capable of producing approximately \$6.7 billion worth of cannabis. In the period immediately following state-sanctioned legalization, Oregon had approximately 417,000 active cannabis users (roughly 10% the state’s population) of varying usage frequency. As of August 2018, within the state-sanctioned market, there is about one cannabis grow site for every 25 users - reflecting current population estimates. Additionally, as a result of cannabinoid extract production, the Oregon Burn Center spent \$9.6 million for initial acute care treating inpatient burn victims from July 2015 through January 2018. In the same period of time, law enforcement investigated 64 clandestine cannabinoid extraction laboratories, 21 of which (33%) resulted in explosion or fire. As a result of overproduction, impoverished counties that are heavily engaged in the cultivation of cannabis, such as Jackson, Josephine, and Lane; face a critical economic risk from collapsing cannabis prices. Cannabis production is resource intensive, on average a mature plant consumes 22.7 liters of water daily (more than a vineyard grapevine) and a single kilogram of finished flower requires 5.2 megawatt hours yearly (twice the average yearly consumption of a refrigerator), resulting in the release of 4.5 metric tons of carbon dioxide (equal to the average yearly emissions of a passenger car). Due to historic use of and the exponential growth of cannabis cultivation, the Rogue River Basin is under acute hydrologic strain.

Production

Distribution Essential Elements of Information - On Pages 20—22

As of August 2018, there are 574 retailers and 126 wholesalers actively licensed by OLCC, with an additional 352 retailers and 223 wholesalers applications awaiting agency review. Currently in Oregon, analysis indicates that there are higher concentrations of state-sanctioned cannabis distributors in lower-income communities and historically disenfranchised areas – a potentially temporary trend. The highest concentrations of recreational retailers are found in Multnomah, Lane, Marion, and Jackson Counties. Coinciding with the exponential growth of state-sanctioned cannabis markets, there has been an aggressive expansion of sub-sector digital currencies tailored for cannabis services. In Q-3 of 2017 alone, at least \$88 million related to the distribution of cannabis was routed through financial institutions in Oregon.

Distribution

i. Refer to Section II of the Technical Appendix for methods used to estimate Total State Production capacity and Total State Consumption rate.

Consumption Essential Elements of Information - On Pages 22 and 23

Among the roughly 417,000 cannabis users in Oregon, approximately 128,000 are multiple daily users.ⁱⁱ The single largest portion of cannabis users are between the ages of 25 and 44; this population of roughly 164,000 individuals accounts for an approximate annual consumption of at least 38,400 kg (84,600 lb). Statewide, cannabis users consume an estimated 84,000 to 169,000 kg (185,100 to 372,600 lb) annually – a market value of up to \$1.3 billion in sales. And according to figures published from the Oregon Department of Revenue in July 2018, the state has collected \$173.1 million cumulatively in the last three fiscal years from “marijuana taxes.” Yet, a glut of cannabis stockpiles stemming from overproduction has caused a 50% annual price drop since 2016. Epidemiological research indicates that cannabis consumption is higher among medical users, who are exempt from excise taxation. As of 2018, only 31% of available cannabis inventory was distributed, leaving 69% unconsumed within the state-sanctioned recreational system.

ii. Multiple daily use is more than one use per-day.

Key Public Health Findings

Production Essential Elements of Information - On Pages 26 and 27

Production

Between July 2015 and January 2018, the Oregon Burn Center provided inpatient initial care to 71 burn victims as a result of cannabinoid extract production, at least one of whom died. Medical staff at the Oregon Burn Center noticed a seasonal increase of cannabinoid extract burn victims during winter months – hypothesized to be a result of decreased air circulation and potentially increased post-harvest processing. A discernable public health risk is emerging among cannabis testing laboratories from a trade-off between accuracy and expense; reduced cost gives reduced accuracy.

Distribution Essential Elements of Information - On Pages 27—30

Distribution

In 2016 and 2017, 54.8% of adult Oregonians reported exposure to cannabis advertising in the last 30 days, while only 29% of them reported having seen information about the health risks of cannabis use. As of 2017, 37.2% of 8th graders and 49.5% of 11th graders in Oregon reported exposure to online cannabis advertising in the last 30 days. Currently, Oregon allows cannabis advertising on media platforms where less than 30% of viewership is underage, which is twice the recommended threshold by experts in prevention and reduction. Additionally, it is unclear how audiences are identified or what entity carries the responsibility for ensuring cannabis advertising is permissible. By 2016, cannabis was reported as easier to access than cigarettes among 11th graders in Oregon.

Consumption Essential Elements of Information - On Pages 30—33

Consumption

Following state-sanctioned legalization, in 2016, 11% of current adult cannabis users self-reported less frequent use, while 64% self-reported comparable use, and 25% self-reported more frequent use. As of 2017, 6.7% of 8th graders and 20.9% of 11th graders self-reported cannabis use in the last 30 days.ⁱⁱⁱ Perception of risk from weekly cannabis use among both 8th and 11th graders decreased between 2014 and 2016, though the change was not statistically significant. By 2017, nearly one in five 8th and 11th graders reported living in a household with an adult who uses cannabis. Between October 2015 and October 2016, the rate of cannabis-related emergency department visits increased 85% from 3.4 per 1000 to 6.3 per 1000. Cannabis-related calls to the Oregon Poison Control Center rose from 103 in 2014 to 348 by 2016; tachycardia^{iv} was the most commonly reported clinical effect. Among impaired driving fatalities, analysis of toxicology results from 2010 through 2015 indicates that an average of 5% of drivers involved in traffic fatalities were THC positive. Yet, in the same period, only 38% of traffic fatalities were subject to a toxicology screening. Additional traffic fatality data indicates that there was a 50% increase in motor-vehicle involved pedestrian fatalities between 2013 and 2016 – information gaps remain as to why this occurred, further evaluation is required to determine the roots causes of this increase.

iii. Current use of cannabis means any use of a marijuana preparation, in any form, within the last 30 days. This is the standard definition on national and state health surveys for both youth and adults.

iv. Abnormally rapid heart beat.

Key Law Enforcement Findings

Production Essential Elements of Information - On Pages 36 and 37

As recently as 2016, illicit cannabis cultivation on public lands persisted unabated, despite the emergence of the state-sanctioned cannabis production market. From 2011 through 2016, 84% of trespass illicit grow sites were found on U.S. Forest Service lands. In 2016 alone, over 26,500 plants – worth \$362 million – were removed from public lands across Oregon. In all, from 2011 through 2016, statewide illicit grow sites produced \$2.1 billion worth of cannabis. Aside from illicit grow operations, law enforcement in Oregon investigated at least 64 clandestine cannabinoid extract laboratories between July 2015 and January 2018, 21 of which resulted in a fire or explosion.

Production

Distribution Essential Elements of Information - On Pages 38—40

Illicit distribution of cannabis has persisted after the emergence of the state-sanctioned market. Between July 2015 and January 2018, 6,602 kg (14,550 lb) of trafficked Oregon cannabis was seized en route to 37 states - worth more than \$48 million. During that period of time, Oregon cannabis was most frequently illicitly exported to Minnesota, Florida, Wisconsin, Missouri, Virginia, Illinois, Arkansas, Iowa, Maryland, and Texas. By aggregate volume of exported cannabis, however, the states of Virginia, Ohio, Wisconsin, New York, Missouri, Florida, New Jersey, Texas, and Illinois were the most common destinations. The majority of illicitly exported Oregon cannabis was linked to Jackson, Multnomah, Josephine, Lane, Deschutes, and Washington counties. SUVs are more commonly used in the trafficking of Oregon cannabis than passenger cars. In-bound monetary seizures determined to be related to the out-of-state distribution of Oregon cannabis have aggregated to nearly \$1.7 million from July 2017 through March 2018 at the Port of Portland International Airport. In the same period of time, \$861k worth of cannabis products were interdicted during attempted exportation at the Port of Portland International Airport. Among in-bound monetary seizures, the largest amounts originated from Chicago Illinois, Dallas Fort-Worth Texas, Atlanta Georgia, Phoenix Arizona, and Los Angeles California – over \$718k was seized from Chicago and Dallas alone. As of 2018, Oregon cannabis products were found on multiple public internet markets (Online Classifieds), and clandestine marketplaces online. The most commonly used digital currencies accepted by vendors of Oregon cannabis on clandestine marketplaces were Bitcoin, Bitcoin Cash, Ethereum, Monero, and Litecoin. Financial analysis of statewide regulatory reporting by financial institutions from Q-3 2017 indicates that 22.72% of all reported suspicious activity was cannabis-related.

Distribution

Consumption Essential Elements of Information - On Pages 40 and 41

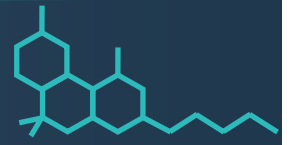
Between 2014 and 2016, statewide totals of Drug Recognition Expert (DRE)^v examinations that resulted in a cannabis impaired opinion – all of which were validated by toxicological result – increased 66.28%, coming to a total of 991 by 2016. From 2013 through 2015, among those of legal age to legally consume cannabis in the state, the majority of cannabis-related DRE examinees fell between the ages of 21 to 31 years-old. In the same period, however, roughly 20% of cannabis-related DRE examinees were under 21 years-old.

Consumption

v. Drug Recognition Experts are police officers trained to recognize impairment in drivers under the influence of drugs other than, or in addition to, alcohol.

Section III: A Risk Based Socio-Economic Analysis

Section Summary



This section presents finished intelligence findings related to the production, distribution, and consumption of cannabis associated with Oregon through a socio-economic prism. This majority of the analysis is centered on verifiable information and accessible data from the period after July 2015 — when feasible.

Essential Elements of Information from Section

Production

- Oregon has an estimated annual production capacity that exceeds 911,000 kg (2 million lb) – far beyond the estimated annual consumption demands, which are between 84,400 to 169,000 kg (186,100 to 372,600 lb)
- In terms of value, Oregon’s estimated annual production capacity can yield roughly \$6.7 billion worth of cannabis (appraised internally).
- Following state-sanctioned cannabis legalization, Oregon had approximately 417,000 active cannabis users – of all ages – of varying usage frequency.
- In the current state-sanctioned market, there is roughly one for grow site for every 25 users.
- Between July 2015 and January 2018, the Oregon Burn Center spent \$9.6 million for initial inpatient care on cannabinoid extract burn victims.
- In the same period of time, law enforcement investigated 64 clandestine cannabinoid extraction laboratories (all were operating illegally), 21 of which (33%) resulted in explosion or fire.
- As a result of overproduction, impoverished counties that are heavily engaged in the cultivation of cannabis, such as Jackson, Josephine, and Lane, face a critical economic risk from collapsing cannabis prices.
- Cannabis production is resource intensive, on average a mature plant consumes 22.7 liters of water daily and a single kilogram of indoor finished flower requires 5.2 megawatt hours of electricity yearly, resulting in the release of 4.5 metric tons of carbon dioxide.
- Due to historic use and the exponential growth of cannabis cultivation, the Rogue River Basin in Southern Oregon is under acute hydrologic strain.

Distribution

- As of August 2018, there are 574 retailers and 126 wholesalers actively licensed by OLCC, with an additional 352 retailers and 223 wholesalers applications awaiting agency review.
- Currently in Oregon, analysis indicates that there are higher concentrations of state-sanctioned cannabis distributors in lower-income communities and historically disenfranchised areas – a potentially temporary trend.

Essential Elements of Information Continued

Distribution

- The highest concentrations of recreational cannabis retailers are found in Multnomah, Lane, Marion, and Jackson Counties.
- Coinciding with the exponential growth of state-sanctioned cannabis markets, there has been an aggressive expansion of sub-sector digital currencies tailored for cannabis services.
- In Q-3 of 2017 alone, at least \$88 million related to the distribution of cannabis was routed through financial institutions in Oregon.

Consumption

- Among the roughly 417,000 cannabis users in Oregon, approximately 128,000 are multiple daily users.
- The single largest portion of cannabis users are between the ages of 25 and 44 (roughly 164,000 individuals); accounting for approximately 38,400 kg (84,600 lb) in annual consumption.
- Statewide, cannabis users consume an estimated 84,000 to 169,000 kg (186,100 to 372,600 lb) annually - observations from OLCC fall within this range - a market valued at up to \$1.3 billion in annual sales.
- As of July 2018, according to figures published from the Oregon Department of Revenue, the state has collected \$173.1 million cumulatively in the last three fiscal years from “marijuana taxes.”
- A glut of cannabis stockpiles stemming from overproduction has caused a 50% annual price drop since 2016.
- Epidemiological research indicates that cannabis consumption is higher among medical users, who are exempt from excise taxation.
- As of 2018, only 31% of available cannabis inventory was distributed, leaving 69% unconsumed within the state-sanctioned recreational system.

Analysis of Cannabis Production in Oregon

Production

Oregon continues to be a source of high-grade cannabis, producing more than the state-sanctioned internal market can consume. Although there is no singular source for direct information on Total State Production (TSP) - both legal and illegal - OR-ID HIDTA reviewed and analyzed a mixture of indirect indicators to form a logical estimate. Sources included publicly available information from the Oregon Liquor Control Commission (OLCC) and registrant data from the Oregon Medical Marijuana Program (OMMP), in addition to Law Enforcement Sensitive (LES) data on illicit grow sites. The culmination of these distinct sources resulted in a probable estimate of annual TSP for 2016 and 2017. Using this model, Oregon can produce up to 911,500 kg (approx. 2 million lb) of cannabis annually.¹⁻⁹ (See Figure 1)

Distribution

Figures furnished by OLCC fall within the estimated range, showing 498,952 kg (approx. 1 million lb) of available inventory of “usable marijuana.”¹⁰ The value of Oregon’s annual TSP rests at roughly \$6.7 billion at current average end-user prices in Oregon - calculated at the time of the writing.^{11, 12} (See Technical Appendix Section III)

Consumption

A static snapshot of information reported by OLCC from August 2018 indicates that there are 1,073 active licensed cannabis producers, with 1,282 pending applications awaiting agency review.¹³ On May 30, 2018, OLCC announced that applications received after June 15, 2018 would be delayed in order to process recreational license renewals and previously submitted recreational license applications.¹⁴ Additionally, data from July 2018 indicates that there are 15,933 grow sites registered with OMMP - down from 20,025 in January 2018.¹⁵ Current

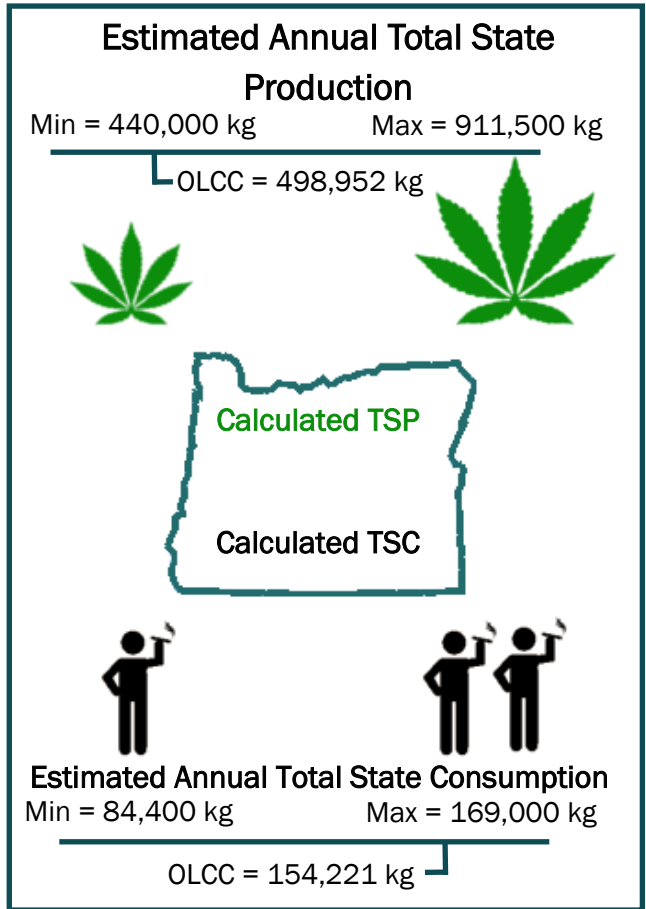


Figure 1: Comparison of Estimated Annual TSP and Estimated Annual TSC - See Technical Appendix for More Information; Includes Reported Observed Available Inventory and Distribution from 2018 OLCC Audit

1. Statistical Report. Accessed June 15, 2017. https://www.dea.gov/ops/cannabis_2015.pdf.
 2. Crawford, Seth S. 2014. "Estimating the Quasi-Underground: Oregon's Informal Marijuana Economy." *Humboldt Journal of Social Relations* (36): 131.
 3. Selsky, Andrew. 2018. "Tons of Legal Marijuana Leave Regulators Awash in Data." *The Washington Post*. April 26. Accessed April 26, 2018. https://www.washingtonpost.com/business/technology/oregon-marijuana-lots-of-data-few-to-analyze-and-check-it/2018/04/26/e98eaf12-491f-11e8-8082-105a446d19b8_story.html?noredirect=on&utm_term=.1c7841fbd2c.
 4. Oregon Liquor Control Commission. 2016. "Dispensary Survey Results: A Snapshot of Current Practices and Conditions." Accessed September 21, 2016. http://www.oregon.gov/olcc/docs/commission_minutes/2015/DispensarySurveyResults.pdf.
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 6. Escondido, Nico. 2015. Nico's Nuggets: Plant Yields, Seeds and More. December 4. Accessed August 31, 2017. <http://hightimes.com/grow/nicos-nuggets-plant-yields-seeds-more/>
 7. Caulkins, Jonathan P. Estimated Cost of Production for Legalized Cannabis. Working Paper, RAND, 2010, Pg. 10.
 8. Gettman, Jon. "Marijuana Production in the United States 2006." Drug Science Organization. 2006. <http://www.drugscience.org/Archive/bcr2/estproc.html> (accessed September 5, 2017)
 9. Oregon Health Authority. "The Oregon Medical Marijuana Program Statistical Snapshot [Series 2016—2018]." *Oregon Health Authority Medical Marijuana Program*.
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 11. Drug Enforcement Administration. 2017. *El Paso Intelligence Center*. Accessed August 20, 2017. <https://www.dea.gov/ops/intel.shtml#EPIC>
 12. Price of Weed. 2018. "Price of Weed, a Global Price Index for Marijuana." *Price of Weed*. January 5. <http://www.priceofweed.com/>
 13. Oregon Liquor Control Commission. 2018. "Oregon.gov." *Marijuana License Applications*. August 1, 2018. http://www.oregon.gov/olcc/marijuana/Documents/mj_app_stats_by_county.pdf (accessed August 6, 2018).
 14. - "News Release." *OLCC*. May 30. Accessed August 6, 2018. https://www.oregon.gov/olcc/docs/news/news_releases/2018/Application_temp_stop_final.pdf.
 15. Oregon Health Authority. "The Oregon Medical Marijuana Program Statistical Snapshot July 2018." *Oregon Health Authority Medical Marijuana Program*. Accessed August 6, 2018.

comprehensive data is not available on illicit cannabis grow sites as Oregon chose not to apply for funding from the Drug Enforcement Administration's Domestic Cannabis Eradication and Suppression Program (DCE/SP). Nevertheless, as recently as 2016 over 26,000 plants were removed from 18 sites on public land across the state.¹⁶ A mixed-methods analysis of self-reported user rates from the Oregon Behavioral Risk Factor Surveillance System (Oregon BRFSS) Oregon Health Authority (OHA), National Survey on Drug Use and Health (NSDUH), and Oregon Student Wellness Survey (OSWS), indicates that there are some 417,000 cannabis users in Oregon of varying frequency - consistent with 10% of the state population estimates from 2017.¹⁷⁻¹⁹ This information means that the ratio of state-sanctioned grow sites to users has changed from one to 19 in early 2018 to roughly one grow site for every 25 users in August 2018. (See Figure 2)

As a commodity, the raw value of Oregon's cannabis production exceeds that of any other agricultural commodity produced.^{20, 21} Yet, there is a scarcity of precise information on employment rates involved in cannabis production. The totality of cannabis production in Oregon is opaque and crosses regulatory boundaries, extending into the so-called "informal marijuana economy."^{22, 23} According to information from the Oregon Governor's Cannabis Policy Advisor, as of June 2017 there were over 12,394 OLCC "worker permits" issued with wages anticipated to exceed \$315 million annually before taxes and benefits - assuming consistent employment and uniform wage distribution.²⁴ Another estimate from former State Economist Beau Whitney places average hourly wages in Oregon's "cannabis sector" at \$12.13 hourly on the retail side.²⁵

Ratio of Cannabis Users to State -Sanctioned Grow Sites

Oregon Has



1 Grow Site
For Every

25 Cannabis Users



Single Annual Per-Plant Yield



1 Plant



1.2 kg (2.64 lb)
of Finished
Cannabis Flower

Figure 2: Ratio of Cannabis Grow Sites in Oregon Q-3 2018, Calculated Using Health Survey Data and State Reported Statistics from OMMP and OLCC¹⁶⁻¹⁸ and²⁶ and Average Annual Per-Plant Yield - See Technical Appendix on Yield

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18. Oregon Health Authority. 2016. 2016 Oregon Student Wellness Survey. *Annual Public Health Survey Results, Portland: Oregon Health Authority*

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20. Mapes, Jeff. 2015. "Oregon's Big Marijuana Harvests: How Do You Bring All That Pot into the Legal Market?" Oregonlive/ the Oregonian. May 23. Accessed August 31, 2017. http://www.oregonlive.com/maps/index.ssf/2015/05/oregons_big_marijuana_harvests.html

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22. Crawford, Seth S. 2014. "Estimating the Quasi-Underground: Oregon's Informal Marijuana Economy." *Humboldt Journal of Social Relations* (36)

23. The Associated Press. 2018. "Oregon Officials Struggle to ID which Cannabis Grows Are Legal." *Leafly*. February 21. Accessed March 8, 2018. <https://www.leafly.com/news/politics/oregon-officials-struggle-to-id-which-cannabis-grows-are-legal>

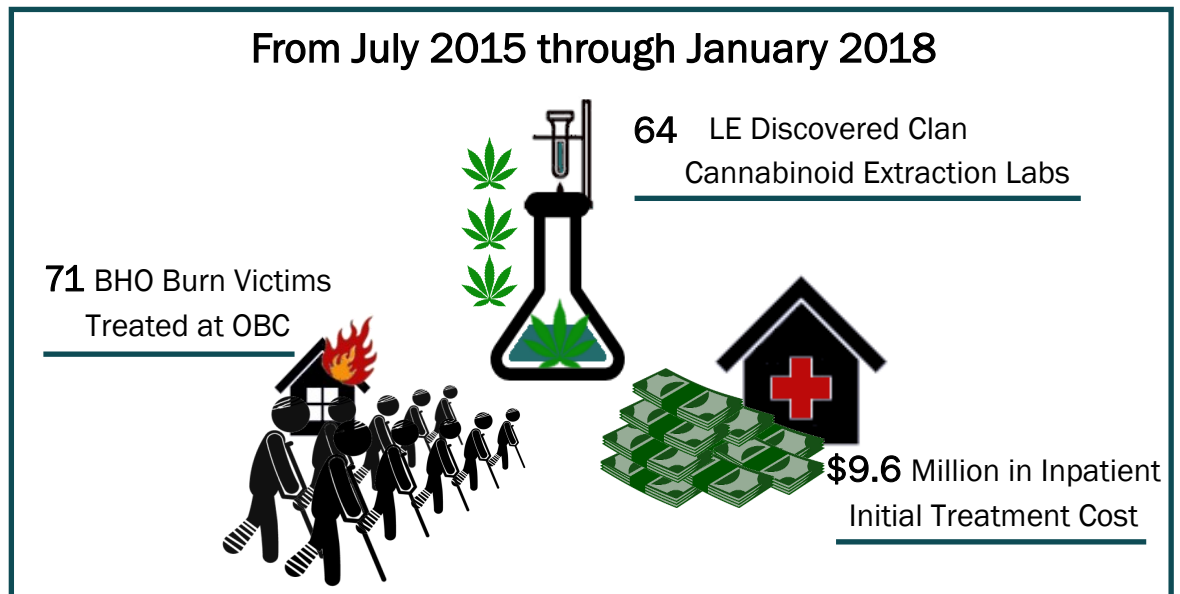
24. Rhoades, Jeff. 2017. "Oregon Marijuana Regulation." *Office of Oregon Governor Kate Brown*. June 9. Accessed August 8, 2018. https://drive.google.com/file/d/0BzMvBq_LbaUUbfpselFHTUxzMjA/view

25. Ibid

The distribution of OLCC and OMMP grow sites spans the state, with clustering around the Portland Metro Area and several of the most poverty stricken counties.^{26–28} The most recent data from the United States Census Bureau indicates that Oregon has a median household income of \$53,270 and a per capita income in the last 12 months of \$28,822, with 13.3% of Oregonians living in poverty.²⁹ The risk of price collapse within the state's cannabis market is a particularly acute hazard in counties such as Jackson, Josephine, and Lane, where median household incomes fall between \$38,000 and \$45,000 and unemployment rates range from 6.0% to 7.8%.^{30, 31} Josephine County was identified by the Oregon Secretary of State (OR SOS) as being particularly vulnerable to financial distress and has the second highest number of total grow sites (OMMP and OLCC) of any county in the state.^{31–33}

Adam Koh, of Cannabis Benchmarks, highlighted some potential causes driving cannabis prices to hit rock-bottom in Oregon, including a lack of production limits, relative absence of vertical integration, and market overproduction.³⁴ Meanwhile, a tangible cost derived from cannabis production in Oregon arises from the illicit manufacture of cannabis concentrates - butane hash oils (BHO). Open source and law enforcement reporting indicate that there are many methods for producing cannabinoid extracts and concentrates. The most common technique, however, employs the highly combustible solvent butane.³⁵ From July 2015 through January 2018, there were 64 clandestine cannabis concentrate labs discovered by law enforcement personnel.³⁶ (See Figure 3) In the same period, the Legacy Emmanuel Oregon Burn Center provided treatment to 71 BHO burn victims - costing upwards of \$9.6 million.³⁷ (See Figure 3)

Figure 3: Total Number of Burn Victims Resulting from the Manufacture of BHO and Associated Cost of Initial Acute Care in Oregon From July 2015 through January 2018 - See Technical Appendix for Analytic Procedures. Total Clandestine Cannabinoid Extraction Labs Found in Oregon as Reported to El Paseo Intelligence Center (EPIC) for July 2015 through January 2018.



26. Oregon Liquor Control Commission. 2018. "Oregon.gov." *Marijuana License Applications*. June 29, 2017. http://www.oregon.gov/olcc/marijuana/Documents/mj_app_stats_by_county.pdf (accessed January 30, 2018).

27. Oregon Health Authority. "The Oregon Medical Marijuana Program Statistical Snapshot [Series]." *Oregon Health Authority Medical Marijuana Program*. Accessed January 3, 2018.

28. United States Census Bureau. 2015. United States QuickFacts. July 1. Accessed August 23, 2016. <https://www.census.gov/quickfacts/map/PST045215/00>.

29. Ibid

30. Ibid

31. Atkins, Jeanne P, and Mary Wenger. 2016. *Oregon Counties: 2016 Financial Condition Review*. Audit Report, Salem, Oregon: Oregon Secretary of State.

32. Oregon Liquor Control Commission. 2018. "Oregon.gov." *Marijuana License Applications*. June 29, 2017. http://www.oregon.gov/olcc/marijuana/Documents/mj_app_stats_by_county.pdf (accessed January 30, 2018).

33. Oregon Health Authority. "The Oregon Medical Marijuana Program Statistical Snapshot [Series]." *Oregon Health Authority Medical Marijuana Program*. Accessed January 3, 2018.

34. Kennedy, Bruce. 2018. "Wholesale Cannabis Prices Tumbled in 2017 - And They Have Yet to Hit Rock Bottom." *The Cannabist*. March 8. Accessed March 10, 2018. <https://www.thecannabist.co/2018/03/08/marijuana-prices-2017-cannabis-benchmarks/100103/>.

35. Drug Enforcement Administration. 2016. 2016 National Drug Threat Assessment Summary. Annual Threat Assessment, U.S. Department of Justice - DEA: 119.

36. Drug Enforcement Administration. 2017. El Paso Intelligence Center. Accessed August 20, 2017. <https://www.dea.gov/ops/intel.shtml#EPIC>

37. Legacy Emmanuel Oregon Burn Center. 2013-2017. "BHO Burn Victims." Legacy Emmanuel Oregon Burn Center. Accessed 2016 and 2018

Cannabis production requires the use of finite natural resources, affecting the economic sustainability of unrestrained cannabis cultivation in the state.^{38–40} According to research published in the *Journal of Environmental Science and Technology*, cannabis cultivation consumes 5.2 MWh/y/kg of electricity and produces roughly 4.6 metric ton of CO₂/kg of product.⁴¹ (See Figure 4) The researchers highlight the fact that no significant studies have been conducted on which to base assessments of the probable consequences of large-scale cannabis production, leaving information gaps on the potential impacts of this industry on indoor and outdoor air quality from highly reactive organic compounds.⁴² Nationally,

it has been estimated that cannabis cultivation facilities account for a power density equivalent to that of data centers and that illicit grow operations account for 1% of the U.S. average energy usage.⁴³ Even in terms of water consumption, definitive information varies about the water needs of cannabis cultivation with estimates ranging widely from 1 to 15 gallons daily.⁴⁴ According to research published by Scott Bauer, however, a mature cannabis plant can consume upwards of 22.7 liters of water per-day during the growing season – grape vines tend to use 12.64 liters of water per-day by comparison.⁴⁵ (See Figure 4)

Although total environmental impact is a concern, the risk of water consumption and resource strain is acutely

Relative Resource Consumption of Cannabis Cultivation

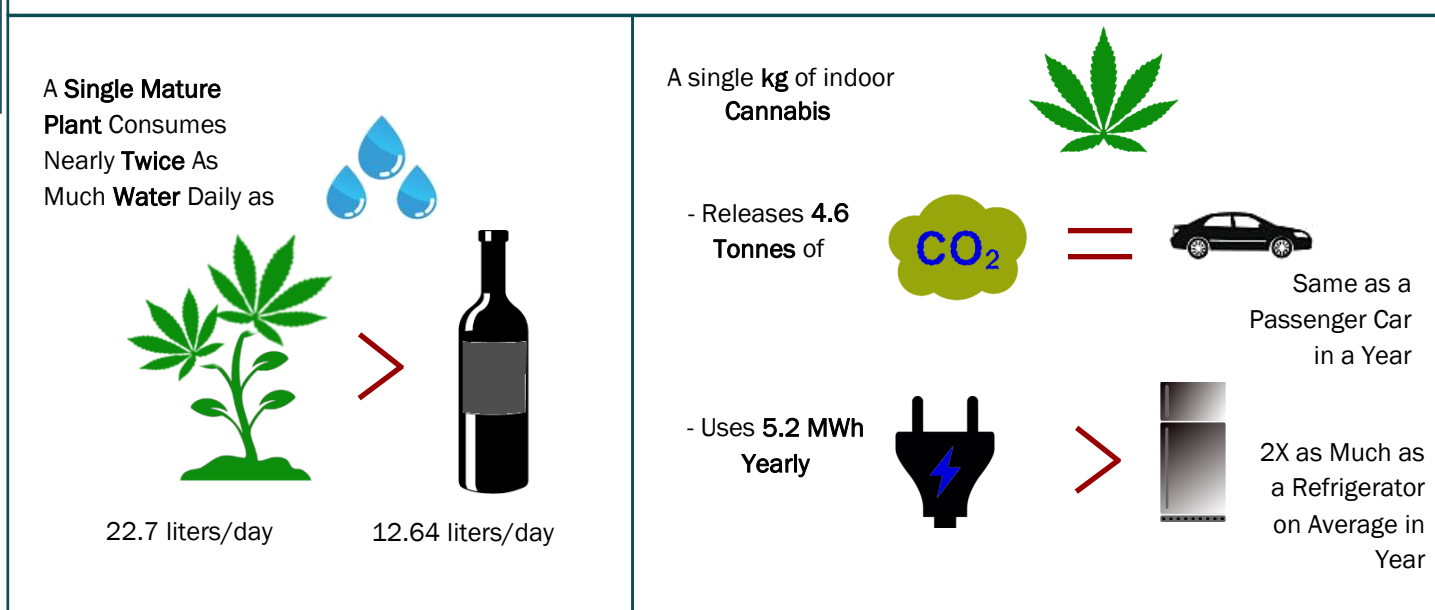


Figure 4: The resource requirements of cannabis production; comparative data on carbon dioxide from EPA and energy consumption from EnergyStar^{46, 47}

38. Butsic, Van, and Jacob C Brenner. 2016. *Cannabis (Cannabis Sativa or C. Indica) Agriculture and the Environment: A Systematic, Spatially-Explicit Survey and Potential Impacts*. Environmental Impact Summary, IOP Science: 1-2.

39. United States. Environmental Protection Agency. 1997. *The Economics of Sustainability*. Distance Learning Module, Washington D.C.: U.S. EPA.

40. Harkinson, Josh, Brett Brownell, and Julia Lurie. "24 Mind-Blowing Facts About Marijuana Production in America." *Mother Jones*. March/April 2014. <http://www.motherjones.com/environment/2014/03/marijuana-pot-weed-statistics-climate-change> (accessed July 5, 2016).

41. Ashworth, K, and W Vizuete. 2017. "High Time to Assess the Environmental Impacts of Cannabis Cultivation." *Environmental Science and Technology* 2531-2533.

42. Ibid

43. Ibid

44. Bauer, Scott, Jennifer Olson, Adam Cockrill, Michael Van Hattem, Linda Miller, Margaret Tauzer, and Gordon Leppig. 2015. "Impacts of Surface Water Diversions for Marijuana Cultivation on Aquatic Habitat in Four Northwestern California Watersheds." *PLoS One*.

45. Ibid

46. United States Environmental Protection Agency. 2018. EPA - Green Vehicle Guide. March. Accessed July 4, 2018. <https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle>.

47. EnergyStar. 2018. Energy Star Most Efficient 2018 - Medium, Large, and X-Large Refrigerators. Accessed July 4, 2018. <https://www.energystar.gov/most-efficient/me-certified-refrigerators>.

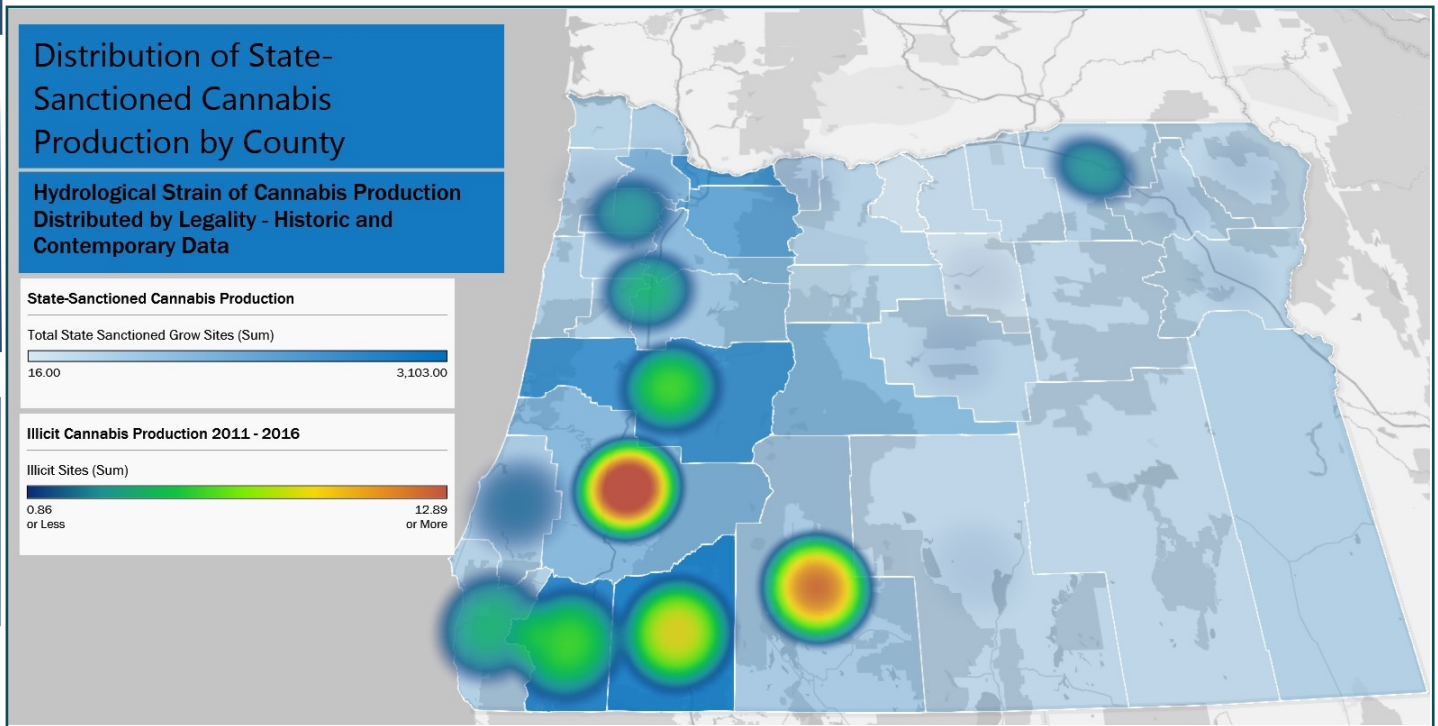
significant in areas of high-volume cannabis cultivation such as the Rogue River Basin. ^{48, 49} (See Map 1)

Research from the OR SOS found that there is scant reliable reporting and collection of water supply data - only 20% of water rights holders are subject to mandatory reporting of consumption to the Water Resource Department.⁵⁰ The SOS report also indicates that agriculture activities constitute an estimated 85% of water use in the state, but are not subject to required reporting of water use.⁵¹

Production

Distribution

Consumption



Map 1 Geographic Distribution of State-Sanctioned Cannabis Cultivation Sites 2018 and the Distribution of Illicit Cannabis Cultivation sites 2011 through 2016 Plotted for Analysis of Hydrological Demand. From 2011 through 2016, Illicit Cannabis Cultivation Consumed an Average of 442,200 Gallons of Water Daily - Worth 122 Olympic Swimming Pools

An additional aspect that merits consideration is the increasing corporatization and market consolidation of cannabis production in the state, which may affect the boom in tax revenue.⁵² In an interview with GQ, molecular and evolutionary biologist Mowgli Holmes emphasized the activity of BioTech Institute LLC, which has been hurriedly registering highly restrictive utility patents on the cannabis plant.^{53–55} The State's policy toward cannabis lacks economic protectionism for native companies in Oregon and has made it possible for large out-of-state cannabis conglomerates to overrun local growers.⁵⁶ The combination of patent-trolling and corporatization could dramatically change the market landscape in the near future – potentially disrupting state tax revenue and impeding the long-term sustainability of small companies in Oregon.

48.Mann, Damian. 2016. "Officials Worry Water Will Go to Pot." *Mail Tribune*. December 19. Accessed December 26, 2016. <http://www.mailtribune.com/news/20161219/officials-worry-water-will-go-to-pot>.

49.Drug Enforcement Administration (DEA). 2016. "Oregon Domestic Cannabis Eradication and Suppression Program (DCE/SP)." *Reported Statistics 2011 to 2016*. DEA. Accessed November 18, 2016. <https://www.dea.gov/ops/cannabis.shtml>.

50.Atkins, Jeanne P, and Mary Wenger. 2016. Oregon Water Resources Department: *Enhancing Sustainability Efforts and Agency Planning Needed to Better Address Oregon's Water Supply Needs*. Audit, Salem: Oregon Secretary of State.

51.Ibid

52.Kaplan, Jennifer. 2018. "Canadian Company Seeks to be the Starbucks of American Marijuana." *The Cannabist*. March 27. Accessed 30 March, 2018. <https://www.thecannabist.co/2018/03/27/canada-marijuana-golden-leaf-starbucks/102501/>.

53.Janis, Mark D. 2001. "Sustainable Agriculture, Patent Rights, and Plant Innovation." *Indiana Journal of Global Legal Studies* 91-117.

54.Chicago Lewis, Amanda. 2017. "The Great Pot Monopoly Mystery." *GQ*. August 23. Accessed August 24, 2017. <https://www.gq.com/story/the-great-pot-monopoly-mystery>

55.Korfhage, Matthew. 2017. "Portland Companies are Fighting a Secret Plot to Monopolize Cannabis." *The Portlander - Willamette Week*. December 20. Accessed December 26, 2017. <http://www.wweek.com/cannabis/2017/12/20/portland-companies-are-fighting-a-secret-plot-to-take-over-all-of-cannabis/>.

56.Schaneman, Bart. 2018. "'Decimated' by Oversupply, Oregon Wholesale Prices for Outdoor-Grown Trim, Flower for Oil Drop to \$50 a Pound." *Marijuana Business Daily*. January 31. Accessed February 9, 2018. <https://mjbizdaily.com/decimated-oversupply-oregons-wholesale-marijuana-prices-drop-50-pound/>.

Analysis of Cannabis Distribution Related to Oregon

Production

As of August 2018, there are 574 retailers and 126 wholesalers actively licensed by OLCC, with an additional 352 retailers and 223 wholesalers applications awaiting agency review.⁵⁷

Distribution

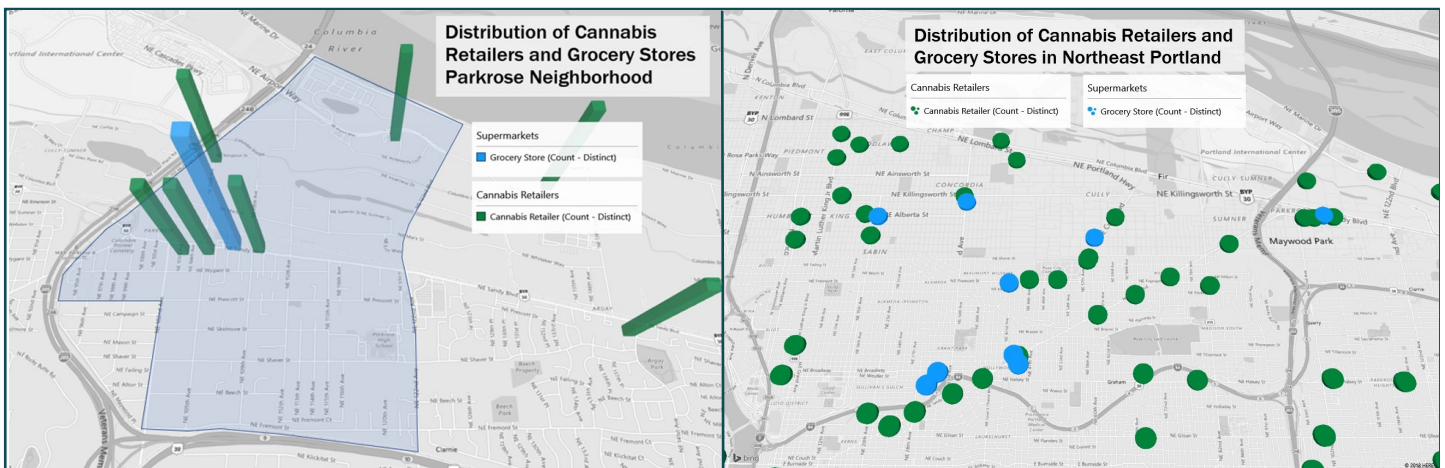
Meanwhile, according to data from July 2018, there are 15,592 “caregivers” registered with OMMP.⁵⁸ The highest concentrations of OLCC retailers are found in Multnomah, Lane, Marion, and Jackson Counties.⁵⁹ The social experiment of state-sanctioned cannabis legalization is disproportionately manifesting in communities of lower socio-economic status - a trend that has been characterized as temporary.^{60, 61} While this trend may be temporary, evidence indicates that there is a high concentration of cannabis retailers operating within communities of lower economic status, such as upper Northeast Portland. (See Map 2 & 3)

Consumption

The Portland neighborhood of Parkrose is an

instructive microcosm in this regard, where the majority of people live within “easy walking distance” of a cannabis retailer, but are over a mile away from a full-service supermarket.⁶² Considerable information gaps on the socio-economic composition of Oregon’s cannabis market remain. Thus, the micro-temporal analysis of cannabis retailer concentrations should be thoroughly studied, as there has been a concern voiced from within the cannabis market that the cannabis sector embodies disparity of opportunity.⁶³

Many businesses have developed a niche within the cannabis sector by facilitating access to financial services – vendor payment, payment processing, depository services, and digital tokens. OR-ID HIDTA surveyed commonly used sector-specific digital currencies and found that many offer services that allow retailers to circumvent banking regulations. PotCoin (POT), CannabisCoin (CANN), DopeCoin (DOPE),



Map 2 and Map 3 Distribution Recreational Cannabis Retailers and Full-Service Grocery Stores in Northeast Portland and Parkrose Neighborhood

57. Oregon Liquor Control Commission. 2018. "Oregon.gov." Marijuana License Applications. August 1, 2018. http://www.oregon.gov/olcc/marijuana/Documents/mj_app_stats_by_county.pdf (accessed August 6, 2018).

58. Oregon Health Authority. "The Oregon Medical Marijuana Program Statistical Snapshot July 2018." *Oregon Health Authority Medical Marijuana Program*. Accessed August 6, 2018

59. Oregon Liquor Control Commission. 2018. "Oregon.gov." Marijuana License Applications. August 1, 2018. http://www.oregon.gov/olcc/marijuana/Documents/mj_app_stats_by_county.pdf (accessed August 6, 2018).

60. McVey, Eli. 2017. "Chart: Recreational Marijuana Stores Are Clustered in Low-Income Areas of Denver, Seattle." *Marijuana Business Daily*. July 31. Accessed April 1, 2018. <https://mjbizdaily.com/chart-recreational-marijuana-stores-clustered-low-income-areas-denver-seattle/>.

61. Smith, Phillip. 2017. "Why Are Pot Shops Mainly in Poor Neighborhoods?" *The Daily Chronic*. August 9. Accessed August 11, 2017. <http://www.thedailychronic.net/2017/75557/pot-shops-mainly-poor-neighborhoods/>.

62. Diehl, Caleb. 2018. "In Some Portland Neighborhoods, It's Easier to Find Weed than Food." *Oregon Business*. February 2. Accessed April 3, 2018. <https://www.oregonbusiness.com/article/cannabis/item/18186-in-some-portland-neighborhoods-it-s-easier-to-find-weed-than-food>.

63. Jan, Tracy, and Fenit Nirappil. 2017. "Battling the Racial Roadblocks to Joining the Legalized Marijuana Trade." *The Washington Post*. June 2. Accessed October 22, 2017. https://www.washingtonpost.com/business/economy/battling-the-racial-roadblocks-to-joining-the-legalized-marijuana-trade/2017/06/02/7321de02-416f-11e7-9869-bac8b446820a_story.html?noredirect=on&utm_term=.5e06e822c506

Production

Distribution

Consumption

HempCoin (THC), and CannaCoin (CCN) are among the most widely used.⁶⁴ (See Figure 5) These designer digital monies promise to reduce the cash-on-hand issue associated with commercial cannabis retailers. Yet, many of these digital currencies "...aren't well suited for consumer-end cannabis purchases..." due to the slow transaction time, high fees, and currency volatility.⁶⁵ The debit payment platform CanPay debuted services in cannabis dispensaries across Oregon in 2017, and links directly to a consumer's bank account – potentially reducing the risk of cash-intensive transactions and increasing financial data.⁶⁶ Information gaps exist on the extent of adoption of CanPay among retail cannabis centers in Oregon.

Yet as the normalization of cannabis transactions continues to grow, there is an emergence of potentially suspicious financial activity growing in parallel, bringing with it a wave of novel financial crimes. During the third quarter of 2017 alone, information acquired through regulatory reporting indicates that at least \$88 million related to cannabis retail sales was routed through financial institutions in the state.⁶⁷ In the same period, at least \$2.7 million of cannabis related activity was routed through depository institutions for financial services related to the cannabis sector in Oregon.⁶⁸ Revenue generated from cannabis distribution continues to be placed into the licit economy by a number of methods, some of which misrepresent the nature of the source of funds to secure full access to financial services.⁶⁹ Endemic financial crimes can destabilize local economies by eroding stability in the state-sanctioned legitimate cannabis sector.⁷⁰

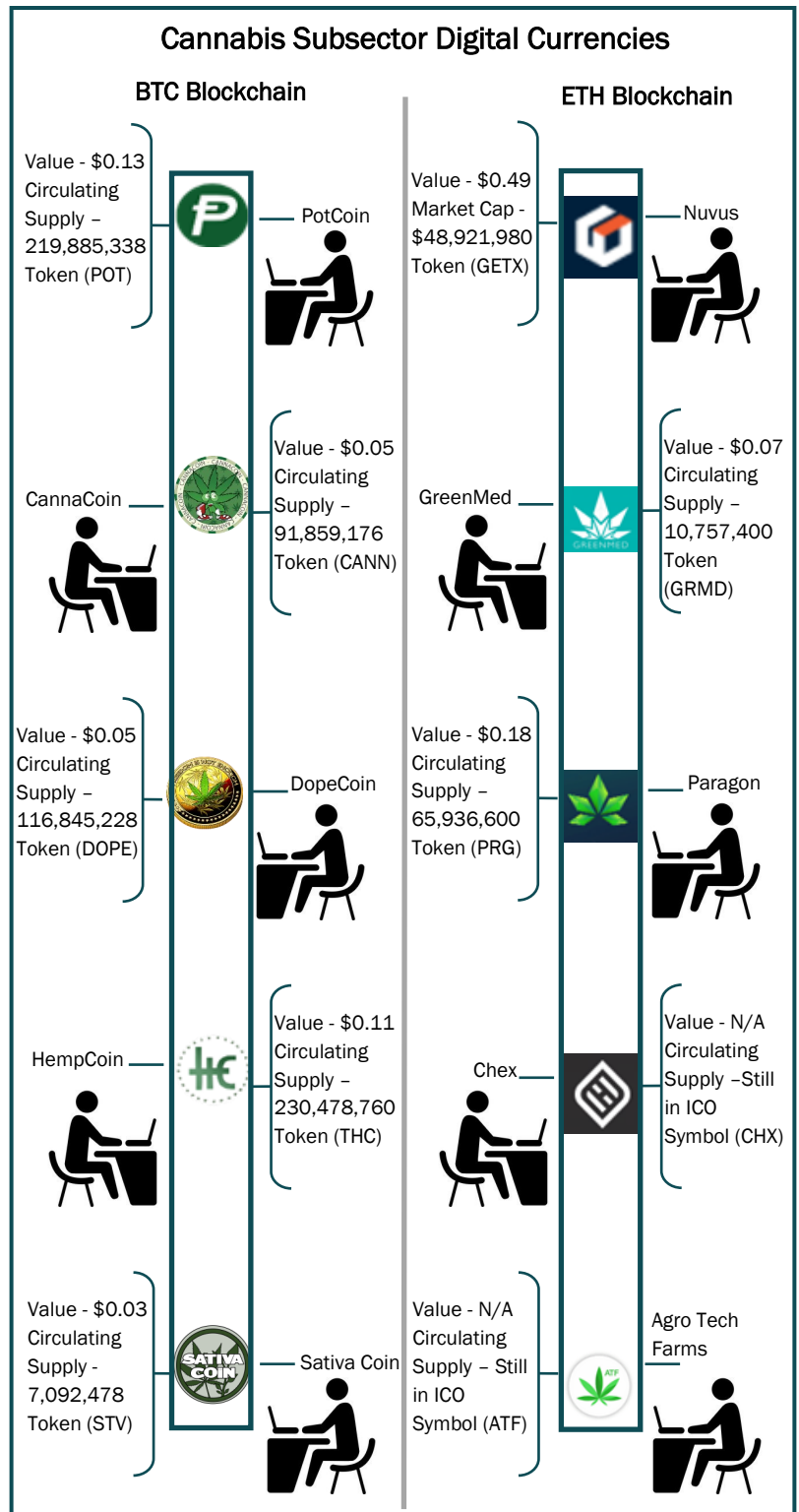


Figure 5: A Selection of Cannabis Subsector Digital Currencies Bases off BTC and ETH Blockchains; Values Retrieved from Online Databases of Digital Currencies, May 2018

64. Krishna, Mrinalini. 2018. "Top 5 Marijuana Cryptocurrencies."

Investopedia. April 20. Accessed April 21, 2018. <https://www.investopedia.com/news/top-marijuana-cryptocurrencies/>.

65. Stangel, Matt. 2018. "Oregon Grew More Cannabis Than Customers Can Smoke. Now Shops and Farmers Are Left with Mountains of Unwanted Bud."

Willamette Week. April 19. Accessed April 24, 2018. <http://www.wweek.com/news/2018/04/18/oregon-grew-more-cannabis-than-customers-can-smoke-now-shops-and-farmers-are-left-with-mountains-of-unwanted-bud/>.

66. Peterson, Susie. 2017. "Oregon Dispensaries Have a New Payment Solution." *Daily Marijuana Observer*. June 29. Accessed February 3, 2018. <https://www.dailymarijuanaobserver.com/single-post/2017/06/29/Oregon-Dispensaries-Get-a-Payment-Solution>

67. Department of the Treasury Financial Crimes Enforcement Network. 2018

68. Ibid

69. Ibid

70. McDowell, John, and Gary Novis. 2001. "The Consequences of Money Laundering and Financial Crime." *Economic Perspectives - An Electronic Journal of the U.S. Department of State* 6-8.

Financial crimes frequently use front companies to co-mingle funds and can offer products at unreasonably low prices compared to legitimate entities.⁷¹ Effectively, this crowds out law-abiding

entities – undermining the free market principles of legitimate business.⁷² Additionally, financial crimes can result in liquidity shortages at depository institutions, leading to destabilization.^{73, 74}

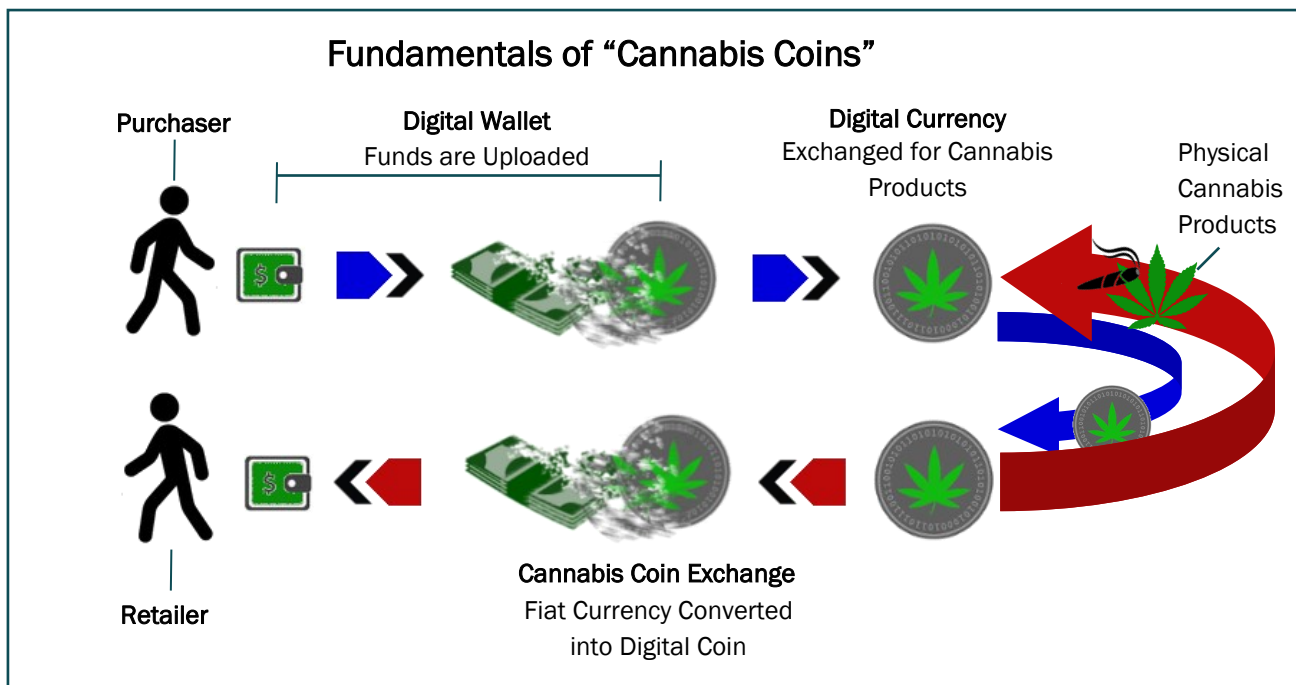


Figure 6: The Basic Exchange Cycle of a Cannabis Sector Digital Currency

Analysis of Cannabis Consumption in Oregon

OR-ID HIDTA arrived at an estimate of the domestic cannabis user population using a mixed-methods analysis of self-reported user rates from health surveys. According to these data sources, there are roughly 417,000 cannabis users in Oregon of varying frequency that account for internal demand.^{75,76} The largest portion of users - ages 25 through 44 - are thought to annually consume roughly 38,400 kg (84,600 lb) of cannabis.⁷⁷⁻⁷⁹ In total, "active users" in the state

are estimated to annually consume between 84,000 kg to 169,000 kg (186,100 to 372,600 lb) of cannabis (representing TSC) - worth between \$623 million and \$1.3 billion in sales.^{80, 81} Recent price drops in cannabis, however, reveal a market volatility that could result in revenue reductions for businesses involved in the cannabis sector, and, consequently, state tax revenue. As of July 2018, according to figures published from the Oregon Department of Revenue, "marijuana taxes" have generated \$173.1 million

71. Quirk, Peter J. 1997. "Money Laundering: Muddying the Macroeconomy." *Finance and Development* 7-9

72. McDowell, John, and Gary Novis. 2001. "The Consequences of Money Laundering and Financial Crime." *Economic Perspectives - An Electronic Journal of the U.S. Department of State* 6-8

73. Ibid

74. Quirk, Peter J. 1997. "Money Laundering: Muddying the Macroeconomy." *Finance and Development* 7-9

75. United States Census Bureau. 2015. United States QuickFacts. July 1. Accessed August 23, 2016. <https://www.census.gov/quickfacts/map/PST045215/00>.

76. Dilley, Ph.D., M.E.S., Julia, Caislin Firth, M.P.H., Erik Everson, M.P.H., and Julie Maher, Ph.D. 2016. "Marijuana use, attitudes and health effects in Oregon." *Marijuana Report* (Oregon Health Authority - Oregon Public Health Division) 48. <https://public.health.oregon.gov/PreventionWellness/marijuana/Documents/oha-8509-marijuana-report.pdf>.

77. Ibid

78. Conrad, Chris. A Guide to the Production and Use of Medical Marijuana. Industry White Paper, El Sobrante: Safe Access Now, 2015.

79. Kilmer, Beau, and Greg Ridgeway. 2016. "Bayesian Inference for the Distribution of Grams of Marijuana in a Joint." *Drug and Alcohol Dependence* 175-180.

80. Drug Enforcement Administration. 2017. *El Paso Intelligence Center*. Accessed August 20, 2017. <https://www.dea.gov/ops/intel.shtml#EPIC>

81. Pirce of Weed. 2016. *Price of Weed, a Global Price Index for Marijuana*. Accessed April 5, 2016 - April 5, 2018. <http://www.priceofweed.com/>.

Production

Distribution

Consumption

cumulatively in the last three fiscal years for the state.⁸² Recent articles point to a looming potential market decimation from oversupply, with state prices undergoing a 50% annualized price drop since 2016.⁸³

Approximately one quarter of total adult cannabis users - roughly 3% of the Oregon adult population - report using cannabis medicinally.^{84, 85} These roughly 124,000 consumers rank near the top of consumption rates and are tax exempt, leaving roughly 88% of active users as a taxable consumer base.^(See Figure 7) 86, 87 It is worth mentioning that immediately following legalization there was a

significant increase in consumption rates among current adult cannabis users, jumping from 29% in 2014 to 36% in 2015.⁸⁸ Data from a 2016 state survey supports this trend indicating that about 28% of adults self-reported more frequent cannabis use since legalization.⁸⁹ Yet, overall the percentage of Oregon adults who used cannabis did not change significantly between 2014 and 2015 - a possible indication of a limited consumer base in the state.⁸⁹ Direct information from within the state-sanctioned recreational system indicates that 2018 inventory stood at over 498,951 kg (1 million lb) of cannabis - enough for 113 grams for every Oregonian - of which only 154,221 kg (339,000 lb) was purchased from distributors.⁹⁰⁻⁹²

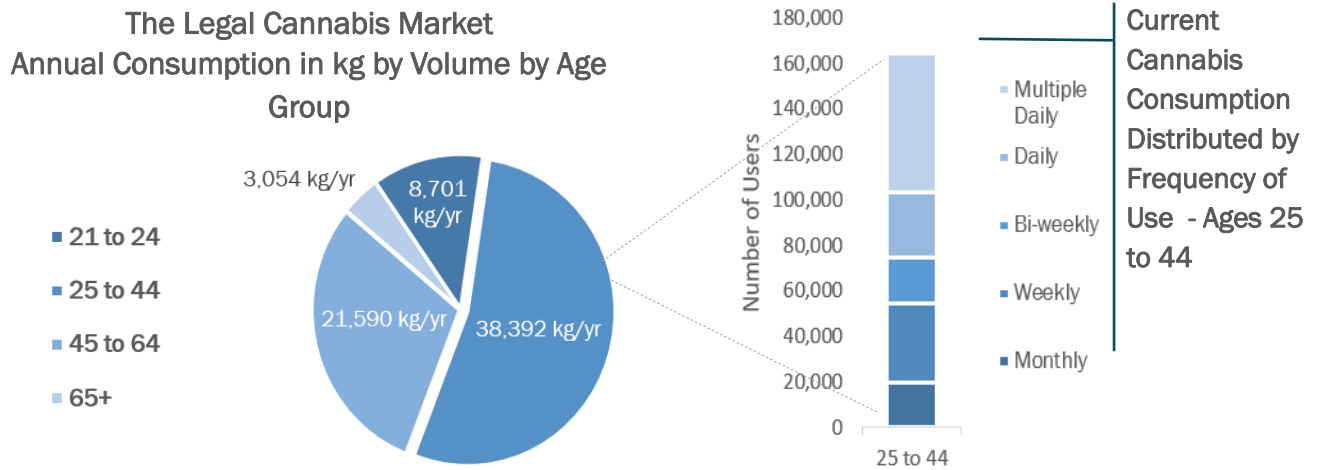


Figure 7: Annual Consumption Rate Distributed by Age Shown in Volume with Largest Portion Distributed by Use Frequency Shown in Population

82. Oregon Department of Revenue Research Section. 2018. "Oregon Marijuana Tax Statistics." *Oregon.gov*. July 20. Accessed July 22, 2018. <https://www.oregon.gov/DOR/programs/gov-research/Pages/research-marijuana.aspx>.

83. Schaneman, Bart. 2018. "Decimated' by Oversupply, Oregon Wholesale Prices for Outdoor-Grown Trim, Flower for Oil Drop to \$50 a Pound." *Marijuana Business Daily*. January 31. Accessed February 9, 2018. <https://mjbizdaily.com/decimated-oversupply-oregons-wholesale-marijuana-prices-drop-50-pound/>.

84. Dilley, Ph.D., M.E.S., Julia, Caislin Firth, M.P.H., Erik Everson, M.P.H., and Julie Maher, Ph.D. 2016. "Marijuana use, attitudes and health effects in Oregon." *Marijuana Report* (Oregon Health Authority - Oregon Public Health Division) 48. <https://public.health.oregon.gov/PreventionWellness/marijuana/Documents/oha-8509-marijuana-report.pdf>.

85. Oregon Health Authority. "The Oregon Medical Marijuana Program Statistical Snapshot [Series]." Oregon Health Authority Medical Marijuana Program. Accessed January 3, 2018.

86. Oregon Department of Revenue. "Marijuana Tax Implementation Timeline." *Oregon.gov*. 2016. <http://www.oregon.gov/DOR/programs/businesses/Documents/marijuana-tax-timeline.pdf> (accessed June 30, 2016).

87. Dilley, Ph.D., M.E.S., Julia, Caislin Firth, M.P.H., Erik Everson, M.P.H., and Julie Maher, Ph.D. 2016. "Marijuana use, attitudes and health effects in Oregon." *Marijuana Report* (Oregon Health Authority - Oregon Public Health Division) 48. <https://public.health.oregon.gov/PreventionWellness/marijuana/Documents/oha-8509-marijuana-report.pdf>.

88. Ibid.

89. The Oregon Public Health Division. October 2016. "Prevention Panel Survey, Health Prevention & Chronic Disease Prevention Section." *Oregon Health Authority*.

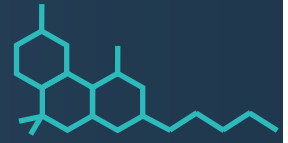
90. Dilley, Ph.D., M.E.S., Julia, Caislin Firth, M.P.H., Erik Everson, M.P.H., and Julie Maher, Ph.D. 2016. "Marijuana use, attitudes and health effects in Oregon." *Marijuana Report* (Oregon Health Authority - Oregon Public Health Division) 48. <https://public.health.oregon.gov/PreventionWellness/marijuana/Documents/oha-8509-marijuana-report.pdf>.

91. Stangel, Matt. 2018. "Oregon Grew More Cannabis Than Customers Can Smoke. Now Shops and Farmers Are Left with Mountains of Unwanted Bud." *Willamette Week*. April 19. Accessed April 24, 2018. <http://www.wweek.com/news/2018/04/18/oregon-grew-more-cannabis-than-customers-can-smoke-now-shops-and-farmers-are-left-with-mountains-of-unwanted-bud/>.

92. Selsky, Andrew. 2018. "Tons of Legal Marijuana Leave Regulators Awash in Data." *The Washington Post*. April 26. Accessed April 26, 2018.

Section IV: A Risk Based Public Health Analysis

Section Summary



This section presents finished intelligence findings related to the production, distribution, and consumption of cannabis associated with Oregon through a public health prism. This majority of the analysis is centered on verifiable information and accessible data from the period after July 2015 — when feasible.

Essential Elements of Information from this Section

- Production
- Between July 2015 and January 2018, the Oregon Burn Center provided inpatient initial care to 71 burn victims as a result of cannabinoid extract production, at least one of whom died.
 - Medical staff at the Oregon Burn Center noticed a seasonal increase of cannabinoid extract burn victims during winter months – hypothesized to be a result of decreased air circulation and potentially increased post-harvest processing.
 - A discernable public health risk is emerging among cannabis testing laboratories from a trade-off between accuracy and expense; reduced cost gives reduced accuracy.

- Distribution
- In 2016 and 2017, 54.8% of adult Oregonians reported exposure to cannabis advertising in the last 30 days, while only 29% of them reported having seen information about the health risks of cannabis use.
 - As of 2017, 37.2% of 8th graders and 49.5% of 11th graders in Oregon reported exposure to online cannabis advertising in the last 30 days.
 - Currently, Oregon allows cannabis advertising on media platforms where less than 30% of viewership is underage, which is twice the threshold recommended by experts in prevention and reduction.
 - It is unclear how audiences are identified or what entity carries the responsibility for ensuring cannabis advertising is permissible on a given media platform.
 - By 2016, cannabis was reported as easier to access than cigarettes among 11th graders in Oregon.

- Consumption
- Following state-sanctioned legalization, in 2016, 11% of current adult cannabis users self-reported less frequent use, while 64% self-reported comparable use, and 25% self-reported more frequent use.
 - As of 2017, 6.7% of 8th graders and 20.9% of 11th graders self-reported cannabis use in the last 30 days, a slight decrease from 2016.
 - Perception of risk from weekly cannabis use among both 8th and 11th graders decreased between 2014 and 2016, though the change was not statistically significant.

Essential Elements of Information Continued

Consumption

- By 2017, nearly one in five 8th and 11th graders reported living in a household with an adult who uses cannabis.
- Between October 2015 and October 2016, the rate of cannabis-related emergency department visits increased 85% from 3.4 per 1000 to 6.3 per 1000 .
- Cannabis-related calls to the Oregon Poison Control Center rose from 103 in 2014 to 348 by 2016; tachycardia (rapid heartbeat) was the most commonly reported clinical effect.
- Among impaired driving fatalities, analysis of toxicology results from 2010 through 2015 indicates that an average of 5% of drivers involved in traffic fatalities were THC positive.
- Yet, in the same period, only 38% of traffic fatalities were subject to a toxicology screening.
- Additional traffic fatality data indicates that there was a 50% increase in motor-vehicle involved pedestrian fatalities between 2013 and 2016.

Analysis of Cannabis Production in Oregon

Production

Distribution

Consumption

There remains a limited amount of verifiable information on the ways by which cannabis production affects public health in Oregon – making a comprehensive understanding difficult. At the time of this writing, OR-ID HIDTA reviewed readily available public health information in an attempt to identify knowledge gaps and critical areas for research. From this effort, OR-ID HIDTA determined that the majority of verifiable information comes from acute care centers – namely trauma centers. In this regard, data furnished by the Oregon Burn Center (OBC) provides a verifiable, direct-link to cannabis production. Other sources such as emergency rooms and the Oregon Poison Control were consulted, but events documented by these facilities cannot be definitively attributed to cannabis production.

Reliable information obtained from the OBC indicates that the injuries sustained from producing cannabis extracts and concentrates

represent a tangible social cost from cannabis production in Oregon. According to data from the OBC, from July 2015 through January 2018 there were 71 inpatient hospitalizations from butane hash-oil production in Oregon treated by the Oregon Burn Center’s inpatient care – at least one of whom died.¹ (See Figure 8)⁴ The majority of the victims were male and had an average age of 39 years-old, and 11 of the 71 patients tested positive for cocaine and methamphetamine.² The population had an average of severe burns over 13.70% of their body (known as Total Burn Surface Area) and spent 12 days in the hospital on average for initial acute care.³ Staff at the Oregon Burn Center identified a seasonal fluctuation – reflected in data – that spikes in the winter months (Q1 and Q4), suspected to be a result of decreased air circulation during the extraction processes using highly flammable butane. (See Figure 8)⁴ According to OBC staff, there are burn patients suspected to be involved in butane hash-oil extraction who are treated as outpatients, but, this data could not be evaluated in a timely manner. Therefore, the scope of this analysis does not include outpatients.

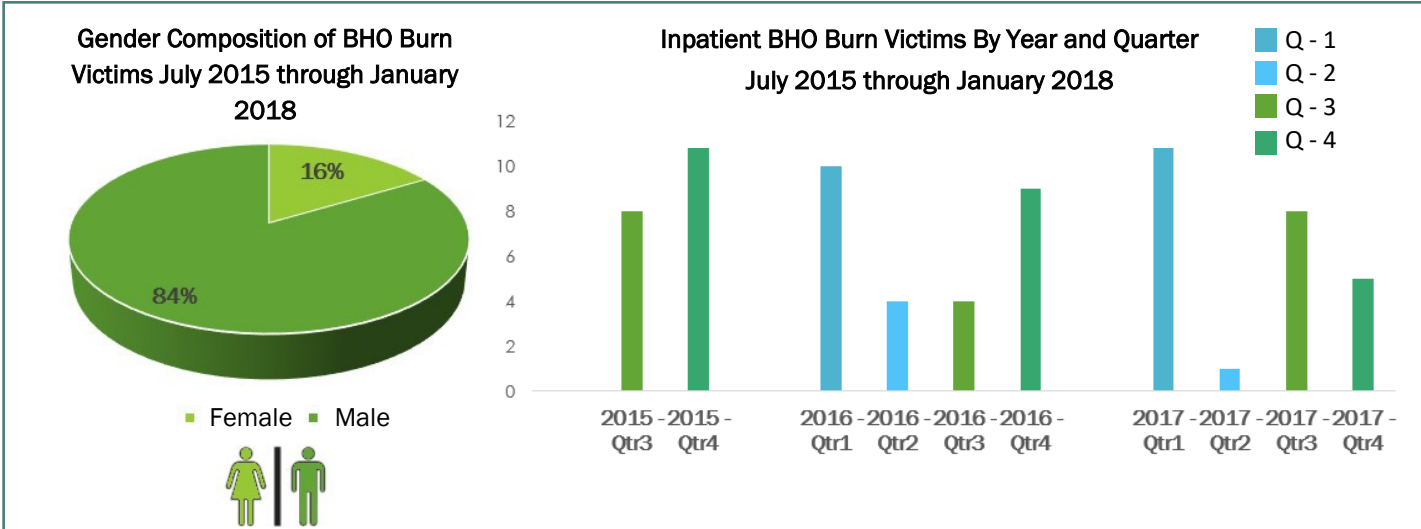


Figure 8: Distribution of BHO Burn Victims by Gender and Quarterly Rates

1.Legacy Emmanuel Oregon Burn Center. 2013-2017. "BHO Burn Victims." *Legacy Emmanuel Oregon Burn Center*. Accessed 2016 and 2018
 2.Ibid
 3.Ibid
 4.Ibid

Production

Distribution

Consumption

The concern of contamination or adulteration during production poses a risk for those involved in cannabis manufacture as well as those who consume it.⁵ Additional direct-indicators of acute health concerns stemming from cannabis production could not be objectively verified at the time of this assessment, but, information was requested regarding pesticide use in cannabis production from the Oregon Department of Agriculture. Publicly available information indicates that as recently as March 2017, cannabis samples distributed through the state-sanctioned system contained pesticide residue that exceeded prescribed limits.⁶ Samples tested from this time failed for elevated levels of pyrethrin – a mix of organic compounds derived from chrysanthemum flowers – which is used in organic products but can be toxic to humans in high concentrations.⁷ There is currently no nationally accepted standard for product testing and there is a trade-off between accuracy and expense; testing labs are incentivized to provide affordable, favorable testing assessments for producers, resulting in less reliable results.⁸ Oregon’s testing laboratory structure lacks meaningful oversight and the testing of secondary cannabis products – extracts, concentrates – makes it harder for the user to distinguish fact from fiction in the purported testing results.⁹ Even testing for THC content is inconsistent, as there is not uniform distribution through a cannabis flower and the batch can be a

blend.^{10, 11} Limited information was made available from state agencies regarding pesticide testing results for cannabis in Oregon, leaving information gaps. The concern of production contamination or adulteration remains a risk for those involved in cannabis production as well as those who consume it – especially those who are immunocompromised.

Analysis of Cannabis Distribution Related to Oregon

There is a scarcity of comprehensive information related to the influence of cannabis distribution on public health in Oregon. In this arena, research published in the American Journal of Public Health provides some reliable insight into public exposures to cannabis advertising. Researchers found limited exposure among adult Oregonians about health risks associated with cannabis use, with roughly five times more daily exposure to advertising for cannabis than health risk messaging.¹² According to the American Public Health Association, restrictions on cannabis advertising can have profound health effects by mitigating harmful behavior in an era of increased availability.¹³ Oregon allows for cannabis advertising on media platforms where less than 30% of the audience is younger than 21 years old – twice the threshold recommended by peer-reviewed research on prevention and reduction.^{14, 15} Rules on cannabis advertising prohibit the use of advertising that is attractive to minors, promotes excessive use, promotes

5. Jikomes, Nick, and Michael Zoorob. 2018. "How Will You Know If There's E.Coli in Your Marijuana? No One's Figured Out How to Test and Regulate It Yet." *The Washington Post*. March 19. Accessed March 20, 2018. https://www.washingtonpost.com/news/monkey-cage/wp/2018/03/19/how-will-you-know-if-theres-e-coli-in-that-marijuana-states-havent-figured-out-how-to-test-and-regulate-it-yet/?noredirect=on&utm_term=.6b50ec8ca02c.

6. The Associated Press. 2017. "Oregon Issues First Marijuana Recall over High Pesticide Levels." *The Cannabist*. March 21. Accessed April 1, 2017. <https://www.thecannabist.co/2017/03/21/oregon-marijuana-pesticide-recall-level/75920/>.

7. Ibid

8. Jikomes, Nick, and Michael Zoorob. 2018. "How Will You Know If There's E.Coli in Your Marijuana? No One's Figured Out How to Test and Regulate It Yet." *The Washington Post*. March 19. Accessed March 20, 2018.

9. Harris, Zach. 2017. "Inconsistencies in Oregon's Cannabis Testing Labs Are Causing Retail Confusion." *Merry Jane*. June 19. Accessed June 22, 2017. <https://merryjane.com/news/oregon-cannabis-testing-problems>.

10. Mesh, Aaron. 2015 - updated 2017. "Testing Trainwreck - Four Labs Return Very Different Potency Results from the same Marijuana Batch." *Willamette Week*. February 24. Accessed March 1, 2017. <http://www.wweek.com/portland/article-24133-testing-trainwreck.html>.

11. Ferrer, D.G. 2015. *Technical Report: Oregon Health Authority Process to Determine Which Types of Contaminants to Test for in Cannabis Products and Levels for Action*. Technical Report, Portland, Oregon: Oregon Health Authority.

12. Fiala, Steven C, Julia A Dilley, Caislin L Firth, and Julie E Maher. 2018. "Exposure to Marijuana Marketing After Legalization of Retail Sales: Oregonians' Experiences, 2015 - 2016." *American Journal of Public Health* 120 - 127.

13. American Public Health Association. 2014. "APHA." *Regulating Commercially Legalized Marijuana as a Public Health Priority*. November 18. Accessed April 9, 2018. <https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2015/01/23/10/17/regulating-commercially-legalized-marijuana-as-a-public-health-priority>.

14. Committee on Developing a Strategy to Reduce and Prevent Underage Drinking. 2004. *National Research Council and Institute of Medicine Reducing Underage Drinking: A Collective Responsibility*. White Paper, Washington D.C.: National Academies Press.

15. Oregon Liquor Control Commission. 2016. "ORS 475B.025." *OLCC*. Accessed April 6, 2018. http://www.oregon.gov/olcc/marijuana/Documents/Rules/OAR_845_025_Division25_RecreationalMarijuanaRules.pdf.

Production

Distribution

Consumption

activity that is illicit under Oregon law, or presents a significant risk to public health and safety.¹⁶ Supplementary restrictions include provisions to limit deceptive marketing and false advertising.¹⁷ Yet, it is unclear how audiences are identified or which entity bears the responsibility of proof for ensuring cannabis advertising is permissible – resulting in deficient enforcement of Oregon’s advertising regulations.¹⁸

From a position of public health, the distribution of cannabis among certain populations is heavily related to the accessibility of the substance. According to the 2016 Oregon Student Wellness Survey, 8th graders report that cannabis has an ease of access comparable to that of cigarettes, while alcohol remains easier.^{19,20} Among 11th graders, cannabis was reported as being easier to access than cigarettes – with a moderate increase of access between 2014 and 2016 – and was comparable to that of alcohol.²¹ As of the fall of 2016, nearly half of adult Oregonians reported a cannabis retailer in their neighborhood and more than half reported seeing cannabis-related advertising in their community in the past month.²² (See Figure 9) Over 37% of 8th graders and 49% of 11th graders in Oregon schools report exposure to online cannabis advertising in the last 30 days.²³ (See Figure 9) Yet, only 29% of adult Oregonians report having seen information about the health risks of cannabis use.²⁴ The regulation of retail cannabis has been identified as a public health priority by the American Public Health Association, which has called on federal, state, and local government to limit advertising.²⁵

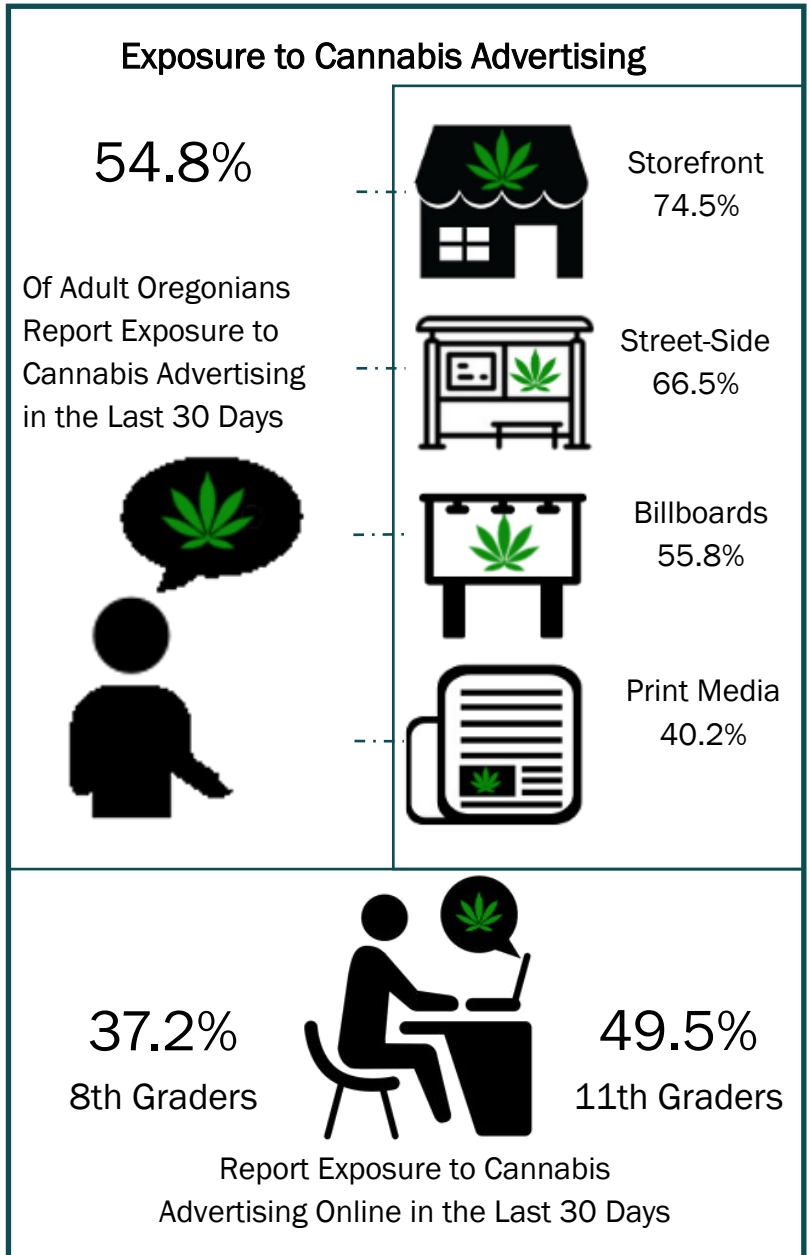


Figure 9: Most Common Means of Exposure to Cannabis Advertising and Selection of Oregon Adults, 8th, and 11th Graders

16.Ibid

17.Fiala, Steven C, Julia A Dilley, Caislin L Firth, and Julie E Maher. 2018. "Exposure to Marijuana Marketing After Legalization of Retail Sales: Oregonians' Experiences, 2015 - 2016." American Journal of Public Health 120 - 127.

18.Ibid

19.Oregon Health Authority. 2016. 2016 Oregon Student Wellness Survey. Annual Public Health Survey Results, Portland: Oregon Health Authority

20.Dilley Julia, Caislin Firth, Erik Everson, and Julie Maher. Marijuana report: Marijuana use, attitudes and health effects in Oregon. Public Health Impact Report, Portland: Oregon Public Health Division, Oregon Health Authority, 2016.

21.Ibid

22.Ibid

23.Oregon Health Authority. 2018. 2017 Oregon Healthy Teens Survey. Annual Survey Results, Portland, Oregon: Oregon Health Authority.

24.The Oregon Public Health Division. 2016. Prevention Panel Survey, Health Prevention & Chronic Disease Prevention Section. Annual Summary, Portland: OHA

25.American Public Health Association. 2014. "APHA." Regulating Commercially Legalized Marijuana as a Public Health Priority. November 18. Accessed April 9, 2018. <https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2015/01/23/10/17/regulating-commercially-legalized-marijuana-as-a-public-health-priority>.

Production

Distribution

Consumption

State law established limiting the acquisition of cannabis by minors as a priority. Initial compliance testing from OLCC, however, found that several cannabis retailers sold product to minors.^{26, 27} Follow up testing found that many of the violators corrected deficiencies and passed subsequent inspections.²⁸ Analysis credits increased penalties as being the main deterrent against minors acquiring cannabis products from state-sanctioned retailers.^{29,30} A significant portion of younger users acquire cannabis through trade or purchase from local peer-to-peer distribution networks, according to reliable information obtained from the National Survey on Drug Use and Health (NSDUH).³¹ (See Figure 10)

There are many proclaimed therapeutic applications for cannabis and cannabinoids, and meta-research from the National Academies of Sciences, Engineering, and Medicine indicates that there is substantive evidence for therapeutic treatment of chronic pain in adults, as well as nausea, and multiple sclerosis spasticity.^{32–34} Yet, there is insufficient evidence to support or refute the therapeutic value of cannabis for cancers, cancer-associated anorexia cachexia and anorexia nervosa, irritable bowel syndrome, epilepsy, spasticity from spinal cord injuries, chorea and certain neuropsychiatric symptoms associated with Huntington’s disease, motor system symptoms associated with Parkinson’s disease and levodopa-induced dyskinesia, dystonia, schizophrenia, or as a substitute for other addictive substances.³⁵

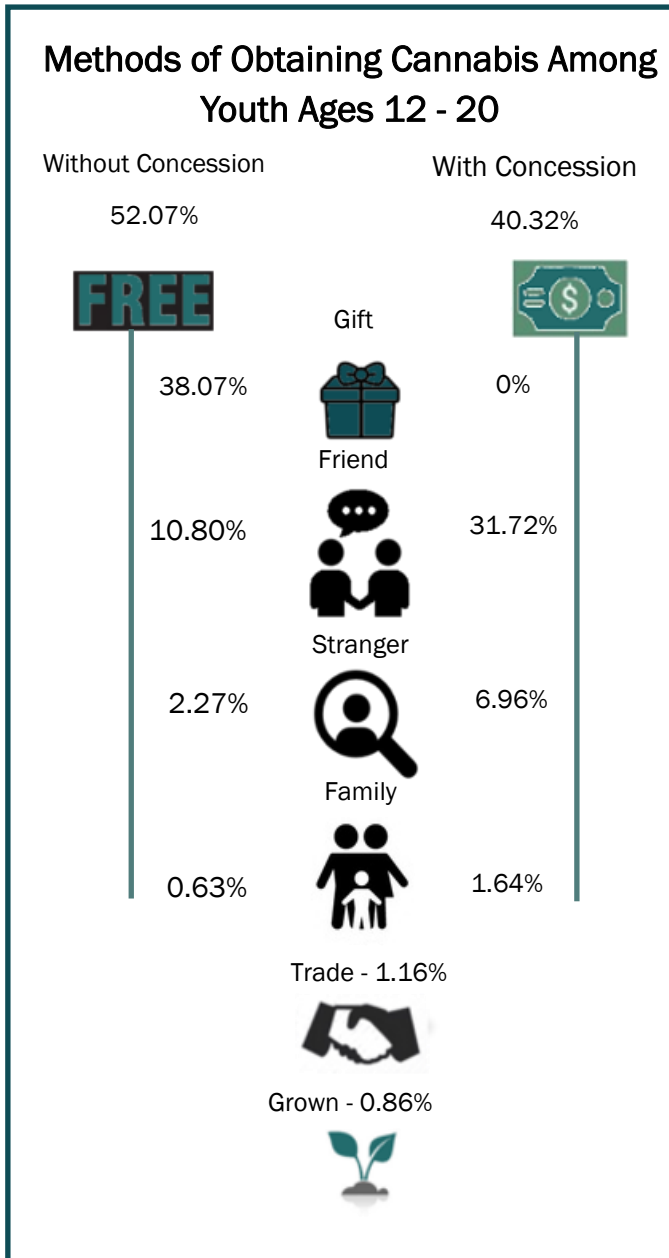


Figure 10: Sources and Methods of Acquiring Cannabis Nationally Among Ages 12-20, NSDUH

26. Bach, Jonathan. 2018. "Fewer Pot Retailers Caught Selling to Marijuana to Minors in Oregon Stings." *Statesman Journal*. February 22. Accessed April 15, 2018. <https://www.statesmanjournal.com/story/news/2018/02/22/fewer-pot-retailers-caught-selling-marijuana-minors-oregon-stings/365326002/>.

27. Mansur, Keith. 2018. "Oregon Dispensaries Improve Compliance on Minor Sales but Failures Still High." *Oregon Cannabis Connection*. February 22. Accessed April 15, 2018. <https://www.ocnnewspaper.com/oregon-dispensaries-improve-compliance-minor-sales-failures-still-high/>.

28. Ibid

29. Lindsey, Nick. 2018. "Oregon Dispensaries Cracking Down on Minors Trying to Buy Weed." *High Times*. March 30. Accessed April 14, 2018. <https://hightimes.com/news/oregon-dispensaries-cracking-down-minors-trying-buy-weed/>.

30. Davenport, Steven, Jonathan P Caulkins, and Mark A.R. Kleiman. 2015. "Controlling Underage Access to Legal Cannabis." *Case Western Reserve Law Review*: 556.

31. Substance Abuse and Mental Health Services Administration. 2004 to 2014. *National Survey on Drug Use and Health (NSDUH)*. Accessed October 2016. <http://datafiles.samhsa.gov/study-series/national-survey-drug-use-and-health-nsduh-nid13517>

32. Ben Amar, Mohamed. "Cannabinoids in Medicine: A Review of their Therapeutic Potential." *Journal of Ethnopharmacology*, 2006: 1-25.

33. Gavura, Scott. 2018. "Medical Marijuana: Where Is the Evidence?" *Science-Based Medicine*. January 11. Accessed January 13, 2018. <https://sciencebasedmedicine.org/medical-marijuana-where-is-the-evidence/>.

34. National Academies of Sciences, Engineering, and Medicine. 2017. *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research. Meta-Analysis*, Washington D.C.: National Academies Press.

35. United Nations Office on Drugs and Crime. 2017. *Market Analysis of Plant-Based Drugs - World Drug Report*. Annual Threat Assessment, Vienna, Austria: UNODC.

Research suggests that exposures to cannabis advertising will be prevalent in the post-legalization period and is not limited to those who are of legal age to recreationally consume cannabis.³⁶ Due to the recognized positive association between industry marketing and decreased perception of risk, advertising exposure will likely increase the appeal of cannabis.³⁷ Advertising is an effective method to increase market acceptance and appeal, but in the absence of thoughtful policies to restrict exposure, advertisements will likely influence younger audiences.³⁸ Longitudinal studies would be advantageous to better understand these practices as they relate to public health in Oregon.

Analysis of Cannabis Consumption Related to Oregon

In the period immediately following legalization, adult cannabis use in Oregon was higher than the national average, and according to the most currently available health survey data this has not changed.³⁹⁻⁴¹ Reliable data from the period since legalization indicates that there has been a statistically significant increase of frequency of use among current adult cannabis users from 29%

in 2014 to 36% in 2015.⁴² Data from a 2016 state survey supports this trend, indicating that about 28% of adults self-reported more frequent cannabis use.^{43,44} According to self-reported health survey data, cannabis consumption when pooled into age groups, indicates that the largest portion of heaviest users fall between 25 to 44 years old - a population of roughly 189,000 individuals.^{45,46} Within this grouping, approximately 37% of the population self-report multiple daily use.⁴⁷ As of 2016, 11% of current adult cannabis users self-reported less frequent use, while 64% self-reported comparable use-frequency to the period prior to state-sanctioned legalization.⁴⁸ Yet, 25% of current adult cannabis users self-reported more frequent use post state-sanctioned legalization.⁴⁹

According to the Oregon Healthy Teens Survey (OHTS) from 2017, 6.7% of 8th graders and 20.9% 11th graders report using cannabis within the last 30 days.⁵⁰ Data from the OSWS, indicates that in 2016, 8% of 8th graders and 22% 11th graders reported cannabis use in within the last 30 days.⁵¹ Among both 8th and 11th graders, risk perception of weekly cannabis use decreased slightly between 2014 to 2016 - the change was not statistically significant.⁵² According to the 2017 OHTS, nearly one in five 8th and 11th graders reported living in a household with an adult who uses cannabis.⁵³

36.Fiala, Steven C, Julia A Dilley, Caislin L Firth, and Julie E Maher. 2018. "Exposure to Marijuana Marketing After Legalization of Retail Sales: Oregonians' Experiences, 2015 - 2016." American Journal of Public Health 120 - 127.

37.Ibid

38.Ibid

39.Substance Abuse and Mental Health Services Administration (SAMHSA). *Behavioral Health Trends in the United States: Results from the 2014 National Survey on Drug Use and Health*. Results from National Survey, RTI International on behalf of the U.S. Department of Health and Human Services, 2015.

40.Substance Abuse and Mental Health Services Administration. *2004 to 2014. National Survey on Drug Use and Health (NSDUH)*. Accessed October 2016. <http://datafiles.samhsa.gov/study-series/national-survey-drug-use-and-health-nsduh-nid13517>

41.Dilley Julia, Caislin Firth, Erik Everson, and Julie Maher. *Marijuana report: Marijuana use, attitudes and health effects in Oregon*. Public Health Impact Report, Portland: Oregon Public Health Division, Oregon Health Authority, 2016.

42.Ibid

43.Ibid

44.The Oregon Public Health Division. 2016. "Prevention Panel Survey, Health Prevention & Chronic Disease Prevention Section." Oregon Health Authority, October.

45.Dilley, Ph.D., M.E.S., Julia, Caislin Firth, M.P.H., Erik Everson, M.P.H., and Julie Maher, Ph.D. 2016. "Marijuana use, attitudes and health effects in Oregon." Marijuana Report (Oregon Health Authority - Oregon Public Health Division) 48. <https://public.health.oregon.gov/PreventionWellness/marijuana/Documents/oha-8509-marijuana-report.pdf>.

46.United States Census Bureau. 2015. United States QuickFacts. July 1. Accessed August 23, 2016. <https://www.census.gov/quickfacts/map/PST045215/00>.

47.Substance Abuse and Mental Health Services Administration. *2004 to 2014. National Survey on Drug Use and Health (NSDUH)*. Accessed October 2016. <http://datafiles.samhsa.gov/study-series/national-survey-drug-use-and-health-nsduh-nid13517>

48.Dilley Julia, Caislin Firth, Erik Everson, and Julie Maher. *Marijuana report: Marijuana use, attitudes and health effects in Oregon*. Public Health Impact Report, Portland: Oregon Public Health Division, Oregon Health Authority, 2016.

49.Ibid

50.Oregon Health Authority. 2018. *2017 Oregon Healthy Teens Survey. Annual Survey Results*, Portland, Oregon: Oregon Health Authority.

51.Oregon Health Authority. 2016. *2016 Oregon Student Wellness Survey. Annual Public Health Survey Results*, Portland: Oregon Health Authority.

52.Dilley Julia, Caislin Firth, Erik Everson, and Julie Maher. *Marijuana report: Marijuana use, attitudes and health effects in Oregon*. Public Health Impact Report, Portland: Oregon Public Health Division, Oregon Health Authority, 2016.

53.Oregon Health Authority. 2018. *2017 Oregon Healthy Teens Survey. Annual Survey Results*, Portland, Oregon: Oregon Health Authority.

Production

Distribution

Consumption

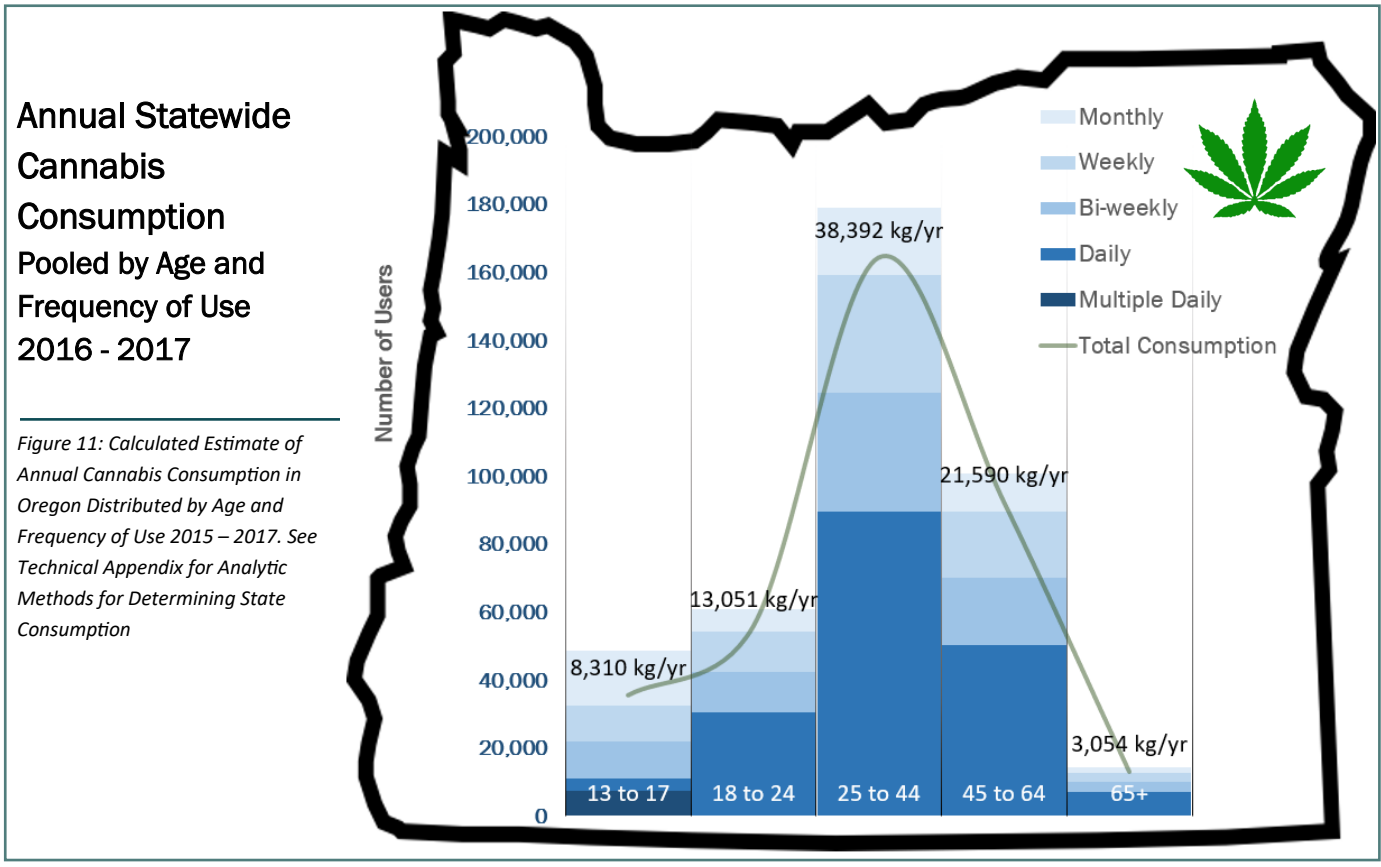


Figure 11: Calculated Estimate of Annual Cannabis Consumption in Oregon Distributed by Age and Frequency of Use 2015 – 2017. See Technical Appendix for Analytic Methods for Determining State Consumption

OSWS information indicates that higher frequency use – defined as more than 40 times a month – is more common among 11th graders than 8th graders.⁵⁴

Information collected through Oregon’s Electronic Surveillance System for the Early Notification of Community-Based Epidemics (ESSENCE), demonstrates that there was an increase of emergency department visits with cannabis (marijuana) included in the diagnostic code beginning in October 2015. (See Figure 12 on Next Page)⁵⁵ Between October 2015 and October 2016, the rate of cannabis-related diagnostic codes in emergency department visits rose 85% from 3.4 per 1000 to 6.3 per 1000 with 11,488 individual visits in that period. (See Figure 12)⁵⁶ Within this population, the majority of the patients were male and were between 18 and 25 years-old.⁵⁷

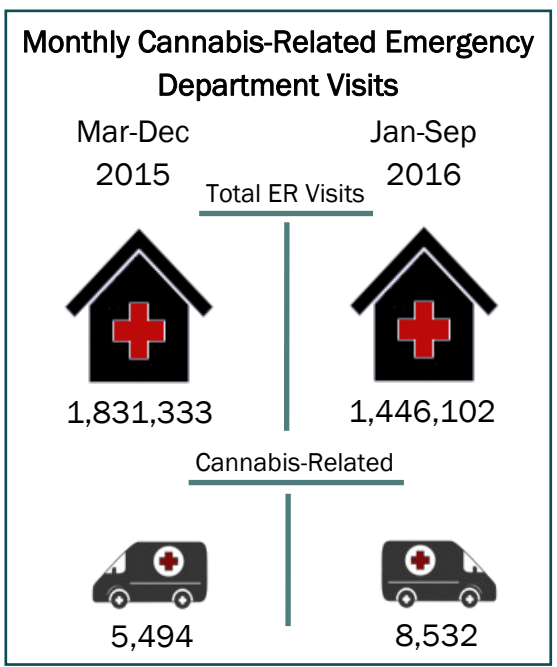


Figure 12: Cannabis-Related Emergency Department Visits 2015 –2016 as Reported by the Oregon Health Authority

54. Oregon Health Authority. 2016. 2016 Oregon Student Wellness Survey. Annual Public Health Survey Results, Portland: Oregon Health Authority.
 55. Dilley Julia, Caislin Firth, Erik Everson, and Julie Maher. Marijuana report: Marijuana use, attitudes and health effects in Oregon. Public Health Impact Report, Portland: Oregon Public Health Division, Oregon Health Authority, 2016.
 56. Ibid
 57. Ibid

Production

Distribution

Consumption

Data from the Oregon Poison Control Center (OPC) and analysis from the Oregon Health Authority provides a fairly reliable indirect health-related indication of unintended acute effects from cannabis exposure or consumption.^{58, 59} “Marijuana-Related” calls to the OPC increased exponentially from 2014 through 2016, with 348 by the end of the year 2016.⁶⁰

(See Figure 13) According to the OPC, the most commonly reported site of exposure was in a patient’s residence.⁶¹ According to publicly available information from the OPC, calls regarding cannabis exposure grew most dramatically in the 21 years and older population - representing 60% of all calls.⁶² Among “Marijuana-Related” calls to the OPC, tachycardia (rapid heartbeat) was the most frequently reported clinical effect.⁶³ (See Figure 13)

Nationally, cannabis is the most common illicit drug detected in drivers and is associated with increased crash risk.⁶⁴ Cannabis, however, is often used in combination with other substances, making it critical to isolate reliable data on cannabis-related traffic fatalities among drivers. In an effort to isolate cannabis-related traffic fatalities among drivers in Oregon, OR-ID HIDTA analyzed data extracted from the Fatal Analysis Reporting System (FARS). According to FARS, on average among drivers, 5% of traffic fatalities were exclusively related to cannabis in Oregon, from 2010 through 2015, but, 62% of traffic fatalities were not subject to a toxicology screening.⁶⁵ (See Figure 14 Located on Next Page) Total statewide traffic fatalities increased in 2016 from 2015, in particular

58.Oregon Health Authority - Oregon Public Health Division. 2017. *Marijuana-Related Calls to the Oregon Poison Center*. Data Summary, Portland, Oregon: Oregon Health Authority.
 59.Dilley Julia, Caislin Firth, Erik Everson, and Julie Maher. Marijuana report: Marijuana use, attitudes and health effects in Oregon. Public Health Impact Report, Portland: Oregon Public Health Division, Oregon Health Authority, 2016.
 60.Dilley Julia, Caislin Firth, Erik Everson, and Julie Maher. *Marijuana report: Marijuana use, attitudes and health effects in Oregon*. Public Health Impact Report, Portland: Oregon Public Health Division, Oregon Health Authority, 2016.
 61.Oregon Health Authority - Oregon Public Health Division. 2017. *Marijuana-Related Calls to the Oregon Poison Center*. Data Summary, Portland, Oregon: Oregon Health Authority.
 62.Ibid
 63.Oregon Health Authority - Oregon Public Health Division. 2017. *Marijuana-Related Calls to the Oregon Poison Center*. Data Summary, Portland, Oregon: Oregon Health Authority.
 64.Hartman, Rebecca L, Jack E Richman, Charles Hayes, and Marilyn A Huestis. 2016. "Drug Recognition Expert (DRE) Examination Characteristics of Cannabis Impairment." Accident Analysis and Prevention 220.
 65.Hartman, Rebecca L, Jack E Richman, Charles Hayes, and Marilyn A Huestis. 2016. "Drug Recognition Expert (DRE) Examination Characteristics of Cannabis Impairment." Accident Analysis and Prevention 220.

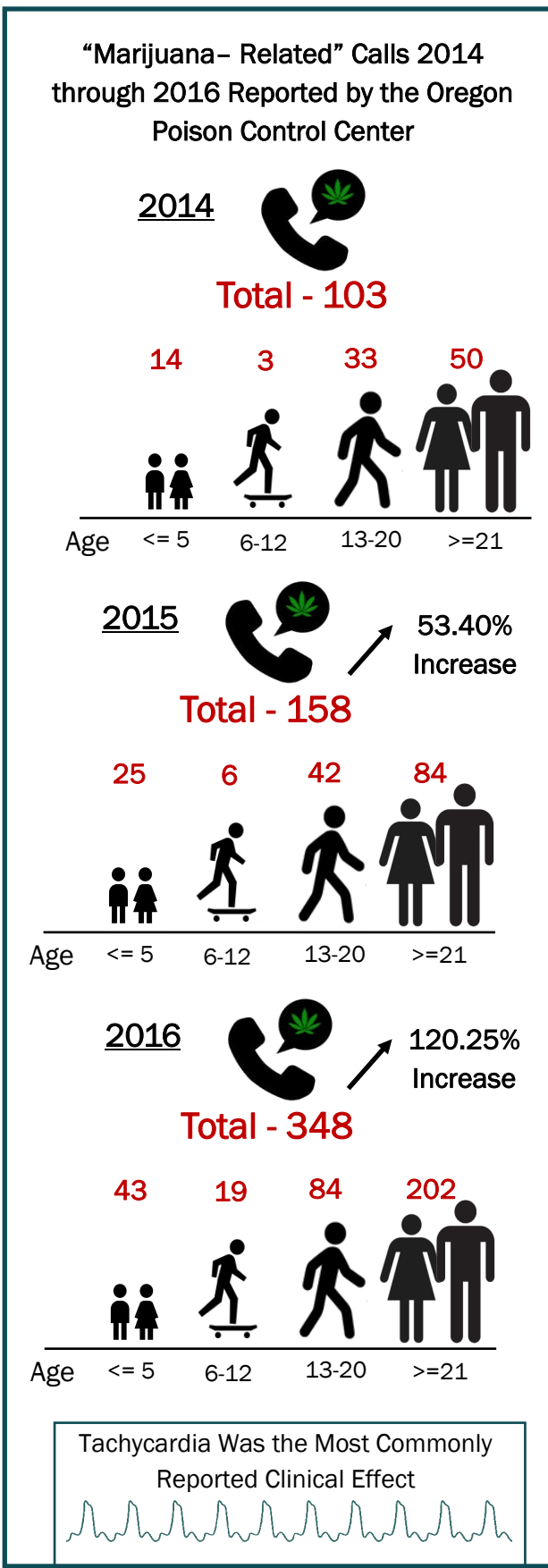


Figure 13: "Marijuana-Related" Calls Reported to Oregon Poison Control Center 2014 - 2016

pedestrian fatalities rose to 72 in 2016 — information gaps remain as to why this occurred, further evaluation would be advantageous to understand if there is any relationship to the state-sanctioned legalization of cannabis.⁶⁶ (See Figure 14)

And while there is currently no direct correlation or definitive link between cannabis use and pedestrian fatalities at either the state or national level, research published in 2018 by the Governors Highway Safety Association indicates that states with legalized recreational cannabis experienced a

collective 16.4% increase in pedestrian fatalities during the first six months of 2017 compared to the first six months of 2016, whereas all other states experienced a 5.8% decrease in pedestrian fatalities.⁶⁷ In terms of public health and safety, as well as awareness of laws, findings from researchers at the Oregon Health Authority published in 2016 indicated that between 21% to 34% of adult users drove within 3 hours of using cannabis, while 63% of Oregon adults self-report that they do not know when it is legal to drive after using cannabis.⁶⁸

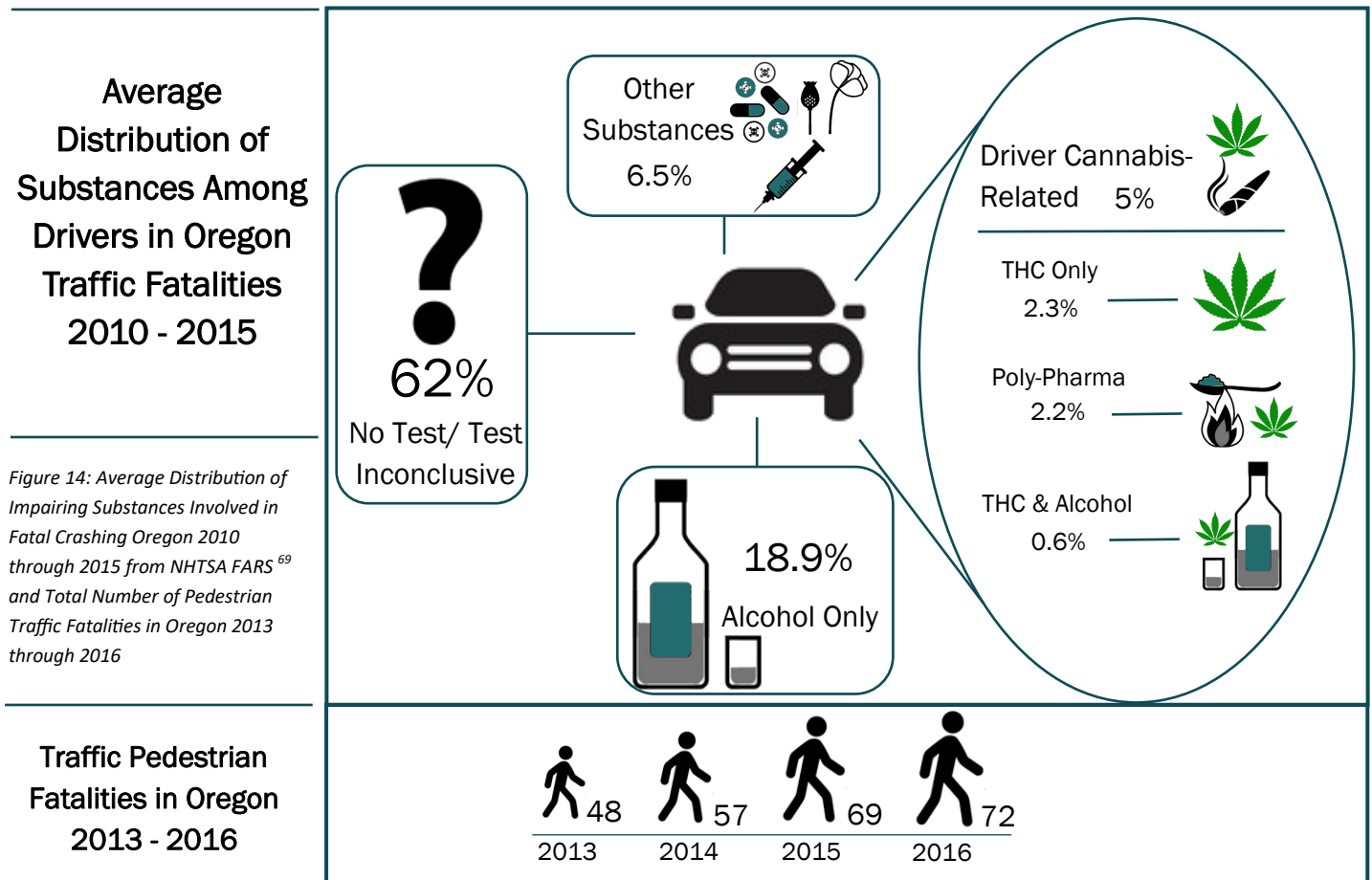


Figure 14: Average Distribution of Impairing Substances Involved in Fatal Crashing Oregon 2010 through 2015 from NHTSA FARS⁶⁹ and Total Number of Pedestrian Traffic Fatalities in Oregon 2013 through 2016

66.National Highway Traffic Safety Administration. 2018. *Traffic Safety Performance (Core Outcomes) Measures* for Oregon*. Washington D.C. <https://cdan.nhtsa.gov/SASStoredProcess/guest>.

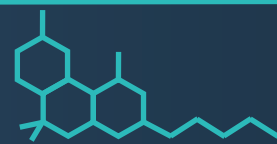
67.Governors Highway Safety Association. 2018. *Pedestrian Traffic Fatalities by State*. Data Summary, GHSA.

68.Dilley Julia, Caislin Firth, Erik Everson, and Julie Maher. *Marijuana report: Marijuana use, attitudes and health effects in Oregon*. Public Health Impact Report, Portland: Oregon Public Health Division, Oregon Health Authority, 2016.

69.National Highway Traffic Safety Administration. 2018. *Traffic Safety Performance (Core Outcomes) Measures* for Oregon*. Washington D.C. <https://cdan.nhtsa.gov/SASStoredProcess/guest>.

Section V: A Risk Based Law Enforcement Analysis

Section Summary



This section presents finished intelligence findings related to the production, distribution, and consumption of cannabis associated with Oregon through a law enforcement prism. This majority of the analysis is centered on verifiable information and accessible data from the period after July 2015 — when feasible.

Essential Elements of Information from this Section

Production

- As recently as 2016, illicit cannabis cultivation on public lands persisted unabated, despite the emergence of the state-sanctioned cannabis production market.
- From 2011 through 2016, 84% of illicit grow sites were found on U.S. Forest Service lands.
- In 2016 alone, over 26,500 plants – worth \$362 million – were removed from public lands across Oregon.
- In all, from 2011 through 2016, statewide illicit grow sites produced \$2.1 billion worth of cannabis.
- Law enforcement in Oregon investigated at least 64 clandestine cannabinoid extract laboratories between July 2015 and January 2018, 21 of which resulted in a fire or explosion.

Distribution

- Illicit distribution of cannabis has persisted after the emergence of the state-sanctioned market.
- Between July 2015 and January 2018, 6,602 kg (14,550 lb) of trafficked Oregon cannabis was seized en route to 37 states – worth more than \$48 million.
- During that period of time, Oregon cannabis was most frequently illicitly exported to Minnesota, Florida, Wisconsin, Missouri, Virginia, Illinois, Arkansas, Iowa, Maryland, and Texas.
- By aggregate volume of exported cannabis, the states of Virginia, Ohio, Wisconsin, New York, Missouri, Florida, New Jersey, Texas, and Illinois were the most common destinations.
- The majority of illicitly exported Oregon cannabis was linked to Jackson, Multnomah, Josephine, Lane, Deschutes, and Washington counties.
- SUVs are more commonly used in the trafficking of Oregon cannabis than passenger cars.
- In-bound monetary seizures determined to be related to the out-of-state distribution of Oregon cannabis have aggregated to nearly \$1.7 million from July 2017 through March 2018 at the Port of Portland International Airport.
- In the same period of time, \$861k worth of cannabis products were interdicted during attempted exportation at the Port of Portland International Airport.
- Among in-bound monetary seizures, the largest originated from Chicago, Illinois; Dallas Fort-Worth, Texas; Atlanta, Georgia; Phoenix, Arizona; and Los Angeles, California – over \$718k was seized from Chicago and Dallas alone

Essential Elements of Information Continued

Distribution

- As of 2018, Oregon cannabis products were found on multiple public internet markets, and clandestine online marketplaces.
 - The most commonly used digital currencies accepted by vendors of Oregon cannabis on clandestine marketplaces were Bitcoin, Bitcoin Cash, Ethereum, Monero, and Litecoin.
 - Financial analysis of statewide regulatory reporting by financial institutions from Q-3 2017 indicates that 22.72% of all reported suspicious activity was cannabis-related.
-

Consumption

- Between 2014 and 2016, statewide totals of Drug Recognition Expert (DRE) examinations that resulted in a cannabis impaired driving opinion – all of which were validated by toxicological results – increased 66.28%, coming to a total of 991 by 2016.
- From 2013 through 2015, among those of legal age to legally consume cannabis in the state, the majority of cannabis-related DRE examinees fell between the ages of 21 to 31 years-old.
- Among cannabis-related DRE examinees from the same dataset, roughly 20% were under 21 years-old.

Analysis of Cannabis Production

OR-ID HIDTA reviewed and analyzed a mixture of indirect indicators to form a logical estimate of TSP, which leaves 742,500 to 827,100 kg (1.6 to 1.8 million lb) of annual surplus cannabis above what the state currently consumes – a surplus valued up to \$7.9 billion on the national market at end-user prices.¹⁻⁸ In the context of abundant production, law enforcement personnel have found it difficult to determine the legal status of cannabis grow operations, extraction labs, and wholesalers as the state’s regulatory regime is understaffed and straddles two distinct state agencies – making reliable information about noncompliant extra-legal sites limited.^{9, 10}

As recently as 2016, reliable information on wholly illicit grow operations from the Domestic Cannabis Eradication and Suppression Program (DCE/SP) indicates that state-sanctioned cannabis legalization has not affected the operational footprint of Mexican National Drug Trafficking Organization cannabis cultivation on public lands in Oregon — limited evidence that black market cannabis cultivation continued in the period following state-sanctioned legalization.^{11, 12} Among the illicit grows eradicated from 2011

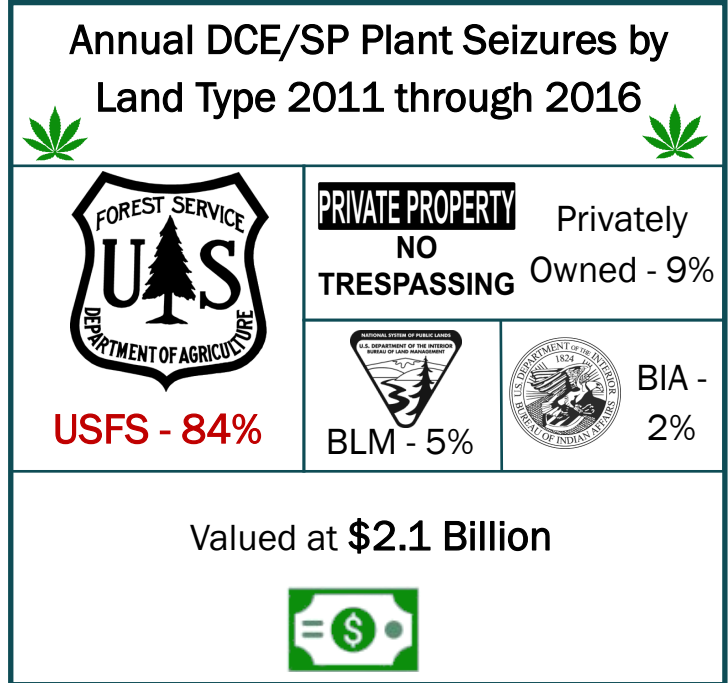


Figure 15: Distribution of Illicit Cannabis Grows by Land Type 2011 through 2016

through 2016, 84% were found on United States Forest Service lands, with over 26,500 plants removed, worth \$362 million in 2016 alone.¹³ These illicit grow operations scar Oregon’s distinct ecosystems, by employing excessive amounts of rodenticides and herbicides, clearing vegetation, and

1. Drug Enforcement Administration. 2015. *2015 Domestic Cannabis Eradication/Suppression Program Statistical Report*. Accessed July 21, 2016. https://www.dea.gov/ops/cannabis_2015.pdf.

2. Caulkins, Jonathan P. *Estimated Cost of Production for Legalized Cannabis*. Working Paper, RAND, 2010, Pg. 10 - 15

3. Escondido, Nico. 2015. *Nico's Nuggets: Plant Yields, Seeds and More*. December 4. Accessed August 31, 2017. <http://hightimes.com/grow/nicos-nuggets-plant-yields-seeds-more/>

4. Bergman, Robert. 2015. "How Much Marijuana Can One Plant Yield?" *Grasscity Magazine*. July. Accessed August 31, 2017. <https://magazine.grasscity.com/how-much-marijuana-can-one-plant-yield-600/>

5. Gettman, Jon. "Marijuana Production in the United States 2006." *Drug Science Organization*. 2006. <http://www.drugscience.org/Archive/bcr2/estproc.html> (accessed September 5, 2017)

6. Conrad, Chris. *A Guide to the Production and Use of Medical Marijuana*. Industry White Paper, El Sobrante: Safe Access Now, 2015, Pg. 11.

7. Crawford, Seth S. 2014. "Estimating the Quasi-Underground: Oregon's Informal Marijuana Economy." *Humboldt Journal of Social Relations* (36): 131.

8. Price of Weed. 2016. *Price of Weed, a Global Price Index for Marijuana*. Accessed April 8, 2018. <http://www.priceofweed.com/>

9. The Associated Press. 2018. "Oregon Officials Struggle to ID which Cannabis Grows are Legal." *Leafly*. February 21. Accessed March 8, 2018. <https://www.leafly.com/news/politics/oregon-officials-struggle-to-id-which-cannabis-grows-are-legal>.

10. Selsky, Andrew. 2018. "Tons of Legal Marijuana Leave Regulators Awash in Data." *The Washington Post*. April 26. Accessed April 26, 2018. https://www.washingtonpost.com/business/technology/oregon-marijuana-lots-of-data-few-to-analyze-and-check-it/2018/04/26/e98eaf12-491f-11e8-8082-105a446d19b8_story.html?noredirect=on&utm_term=.1c7841fbd2c.

11. Milestone, Jim F, Kevin Hendricks, Alan Foster, Jim Richardson, Sean Denniston, Athena Demetry, Matt Ehmman, Charles Covelier, David Schifsky, and David Fireman. 2011. "Continued Cultivation of Illegal Marijuana in the U.S. Western National Parks." *George Wright Society Conference on Parks, Protected Areas, and Cultural Sites*. Hancock, Michigan: The George Wright Society. 209-216.

12. Drug Enforcement Administration (DEA). 2016. "Oregon Domestic Cannabis Eradication and Suppression Program (DCE/SP)." Reported Statistics 2011 to 2016. DEA. Accessed November 18, 2016. <https://www.dea.gov/ops/cannabis.shtml>

13. Ibid

Production

Distribution

Consumption

clustering plants near water sources – disproportionately affecting ecologically critical areas.¹⁴

Aside from the persistent problem of illicit cultivation on public lands, the post-legalization period has seen the emergence of clandestine cannabinoid extraction labs in Oregon. From July 2015 (shown as Q3 and Q4 in Figure 16) through January 2018, law enforcement personnel documented the discovery of at least 64 clandestine cannabinoid extraction labs, 21 of which resulted in a fire and/or explosion.¹⁵ (See Figure 16) In 2016, 25 of these operations were found and in 2017, 32 were discovered.¹⁶ (See Figure 16)

These operations frequently employ highly volatile hydrocarbons as a solvent to dissolve and extract cannabinoids – usually THC.¹⁷ The resulting mixture is purged of the solvent leaving a highly potent THC resinoid that can be refined into products like “shatter”, “budder”, and “wax.”^{18 - 20} Equipment for these ad hoc labs and precursor solvents can be obtained online or from local retailers.²¹ The Drug Enforcement Administration cites butane as the most dangerous and most common solvent used in production of cannabinoid extracts.²² The tangible effects from these productions activities are evident by the 71 BHO burn victims treated at the Oregon Burn Center in the same period.²³

14.Butsic, Van, and Jacob C Brenner. 2016. *Cannabis (Cannabis Sativa or C. Indica) Agriculture and the Environment: A Systematic, Spatially-Explicit Survey and Potential Impacts*. Environmental Impact Summary, IOP Science: 1-2.

15.Drug Enforcement Administration. 2018. *El Paso Intelligence Center*. Accessed 2018. <https://www.dea.gov/ops/intel.shtml#EPIC>

16.Ibid

17.Drug Enforcement Administration. 2016. *2016 National Drug Threat Assessment Summary*. Annual Threat Assessment, U.S. Department of Justice - DEA: 119

18.Seattle Cannabis Co. 2015. "Cannabis Concentrates - Oils, Wax, Hash and More." Seattle Cannabis Co. February 1. Accessed October 27, 2016. <http://seattlecannabis.co/cannabis-concentrates-oils-wax-hash/>

19.Grasscity Forums. 2016. How to Make BHO to Pass Testing. Really Nice Wax/Shatter. August 11. Accessed October 27, 2016. <https://forum.grasscity.com/threads/how-to-make-bho-to-pass-testing-really-nice-wax-shatter.1122034/>.

20.Abad-Santos, Alexander. 2013. "The Amateur's Guide to Dabs." *The Atlantic*. May 13. Accessed October 26, 2016. <http://www.theatlantic.com/national/archive/2013/05/amateurs-guide-dabs/315221/>.

21.Precision Extraction Solutions. 2018. *Precision Extraction Solutions*. Accessed April 1, 2018. <https://precisionextraction.com/>.

22.Drug Enforcement Administration. 2016. *2016 National Drug Threat Assessment Summary*. Annual Threat Assessment, U.S. Department of Justice - DEA: 119

23.Legacy Emmanuel Oregon Burn Center. 2013-2017. "BHO Burn Victims." *Legacy Emmanuel Oregon Burn Center*. Accessed 2016 and 2018

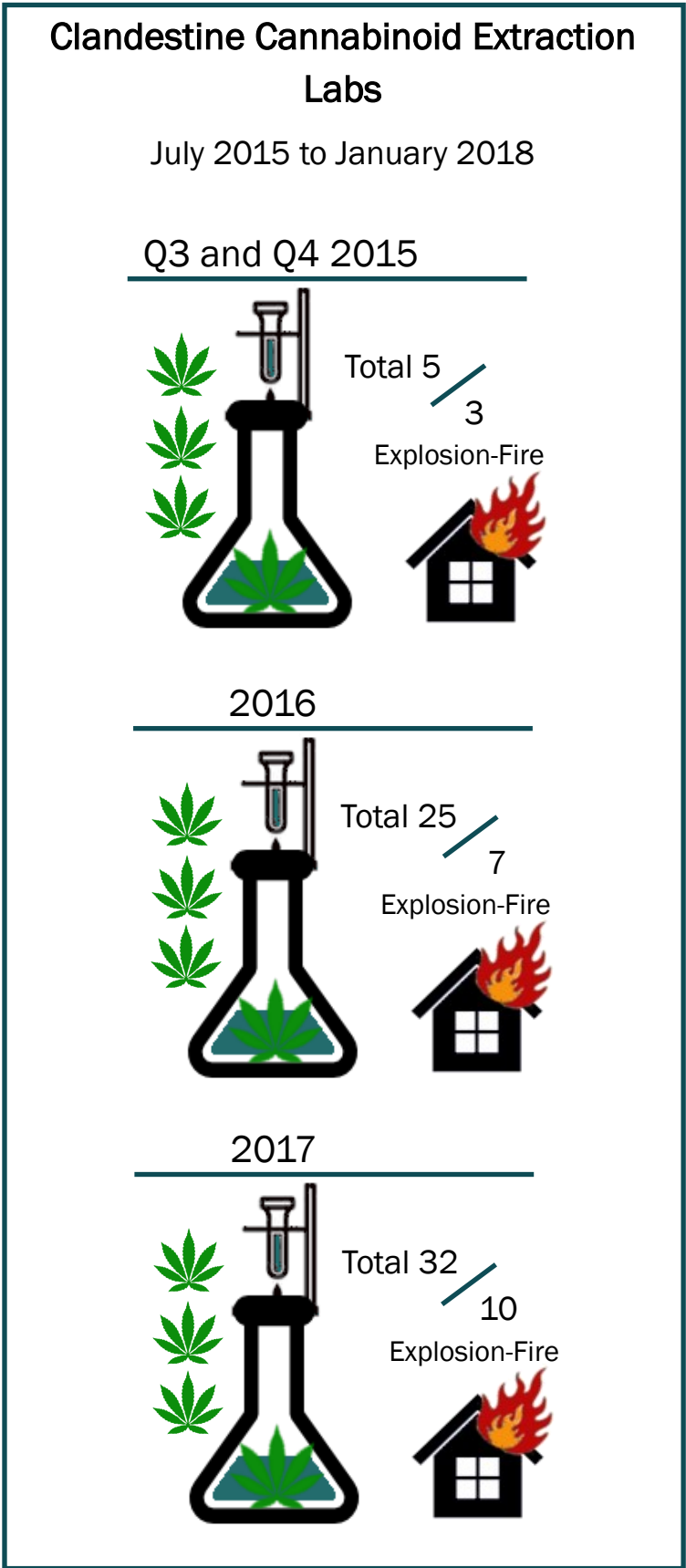


Figure 16: Clandestine Cannabinoid Extraction Labs July 2015 through January 2018

Analysis of Cannabis Distribution

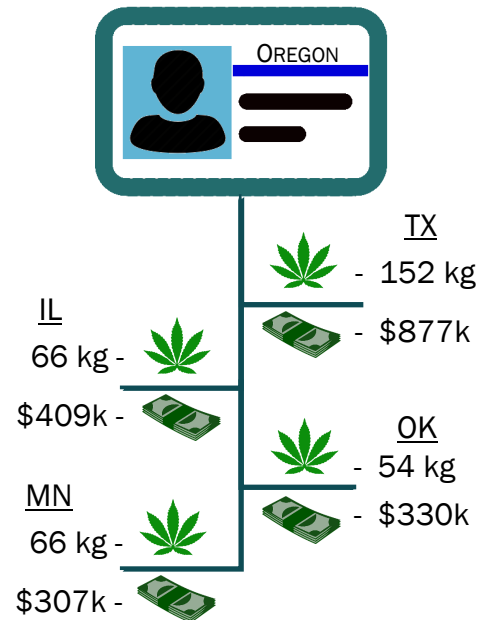
Relative to other data sources, there is a wealth of accessible and reliable data related to the illicit distribution of cannabis produced in Oregon available from law enforcement sources. The combination of out-of-state seizure data, in-bound monetary seizures, and internet-based sales of Oregon cannabis provide insight into the scope of illicit interstate cannabis trafficking from Oregon. Because Oregon produces more cannabis than can be consumed by local demand, preventing the exportation of cannabis is a priority and is wholly illegal at both the federal and state level.^{24 - 27}

According to a 2018 audit of OLCC inventory, 498,952 kg (1 million lb) of usable cannabis flower was available to sell, but only 31% (154,221 kg) was distributed to consumers within the state-sanctioned market.^{28, 29} Annual TSP is at least 911,500 kg (2 million lb), leaving abundant surplus cannabis available for the national market after domestic consumption is satiated – per OLCC there was a surplus of 344,730 kg (760,000 lb) unsold cannabis logged during the recent audit of the recreational system.^{30 - 36}

From July 2015 through January 2018, 6,602 kg (14,550 lb) of cannabis from Oregon (worth roughly \$48 million) was seized out-of-state, most frequently en route to Minnesota, Florida, Wisconsin, Missouri, Virginia, Illinois, Arkansas,

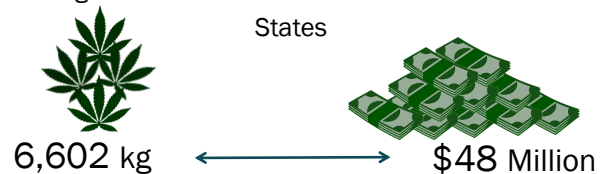
OR Drivers Licensees Trafficked OR-Cannabis to at Least 12 States

July 2015 through January 2018



From July 2015 through January 2018

Oregon Cannabis Was Seized En Route to 37 States



Figures 17 & 18: Selection of Oregon Cannabis Trafficking Activity by Oregon ID Holders and Total Sum of Oregon Cannabis Seizures July 2015 - Jan 2018

24.State of Oregon. "Measure 91 - the Control, Regulation, and Taxation of Marijuana and Industrial Hemp Act." *Oregon Recreational Marijuana*. 2014. <http://www.oregon.gov/olcc/marijuana/Documents/Measure91.pdf> (accessed June 21, 2016).

25.Sessions, Jefferson B. 2018. *Memorandum for All United States Attorneys*. Memorandum, Washington D.C.: United States Department of Justice.

26.Cole, James M. 2013. "Guidance Regarding Marijuana Financial Crimes." U.S. Department of Justice. August 29. Accessed September 26, 2016. <https://www.justice.gov/sites/default/files/usao-wdwa/legacy/2014/02/14/DAG%20Memo%20-%20Guidance%20Regarding%20Marijuana%20Related%20Financial%20Crimes%202014%2014%20%282%29.pdf>.

27.Stangel, Matt. 2018. "Oregon Grew More Cannabis Than Customers Can Smoke. Now Shops and Farmers Are Left with Mountains of Unwanted Bud." *Willamette Week*. April 19. Accessed April 24, 2018. <http://www.wweek.com/news/2018/04/18/oregon-grew-more-cannabis-than-customers-can-smoke-now-shops-and-farmers-are-left-with-mountains-of-unwanted-bud/>.

28.Ibid

29.Selsky, Andrew. 2018. "Tons of Legal Marijuana Leave Regulators Awash in Data." *The Washington Post*. April 26. Accessed April 26, 2018. https://www.washingtonpost.com/business/technology/oregon-marijuana-lots-of-data-few-to-analyze-and-check-it/2018/04/26/e98eaf12-491f-11e8-8082-105a446d19b8_story.html?noredirect=on&utm_term=.1c7841fbd2c.

30.Substance Abuse and Mental Health Services Administration. 2004 to 2014. *National Survey on Drug Use and Health (NSDUH)*. Accessed October 2016. <http://datafiles.samhsa.gov/study-series/national-survey-drug-use-and-health-nsduh-nid13517>

31.Oregon Health Authority. 2016. 2016 Oregon Student Wellness Survey. *Annual Public Health Survey Results, Portland: Oregon Health Authority*

32.Oregon Health Authority. 2018. *2017 Oregon Healthy Teens Survey*. Annual Survey Results, Portland, Oregon: Oregon Health Authority.

33.United States Census Bureau. 2015. *United States QuickFacts*. July 1. Accessed August 23, 2016. <https://www.census.gov/quickfacts/map/PST045215/00>.

34.Kilmer, Beau, and Greg Ridgeway. 2016. "Bayesian Inference for the Distribution of Grams of Marijuana in a Joint." *Drug and Alcohol Dependence* 175-180.

35.Crawford, Seth S. 2014. "Estimating the Quasi-Underground: Oregon's Informal Marijuana Economy." *Humboldt Journal of Social Relations* (36): 118-137.

36.Selsky, Andrew. 2018. "Tons of Legal Marijuana Leave Regulators Awash in Data." *The Washington Post*. April 26. Accessed April 26, 2018. https://www.washingtonpost.com/business/technology/oregon-marijuana-lots-of-data-few-to-analyze-and-check-it/2018/04/26/e98eaf12-491f-11e8-8082-105a446d19b8_story.html?noredirect=on&utm_term=.1c7841fbd2c.

Production

Distribution

Consumption

Iowa, Maryland, and Texas – listed in descending order of the upper third quartile.³⁷ By raw volume of exported cannabis, the largest aggregate destinations are Virginia, Ohio, Wisconsin, New York, Missouri, Florida, New Jersey, Texas, and Illinois – also in descending order of the upper third quartile.³⁸ In total, from July 2015 to January 2018 Oregon marijuana was interdicted en route to 37 states.³⁹ The Oregon counties of Jackson, Multnomah, Josephine, Lane, Deschutes, and Washington are most heavily associated with

exportation activities – determined by using network analysis, frequency, and volume of seizures.⁴⁰ SUVs have become more frequently employed in the illicit exportation of Oregon’s cannabis by highway, accounting for a greater aggregate seizure volume than sedans.⁴¹ (See Figure 19)

In-bound monetary seizures determined to be related to the trafficking/exportation of Oregon cannabis have aggregated to nearly \$1.7 million from July 2017 through March 2018 at the Port of Portland International Airport.⁴² Meanwhile, over \$861k worth

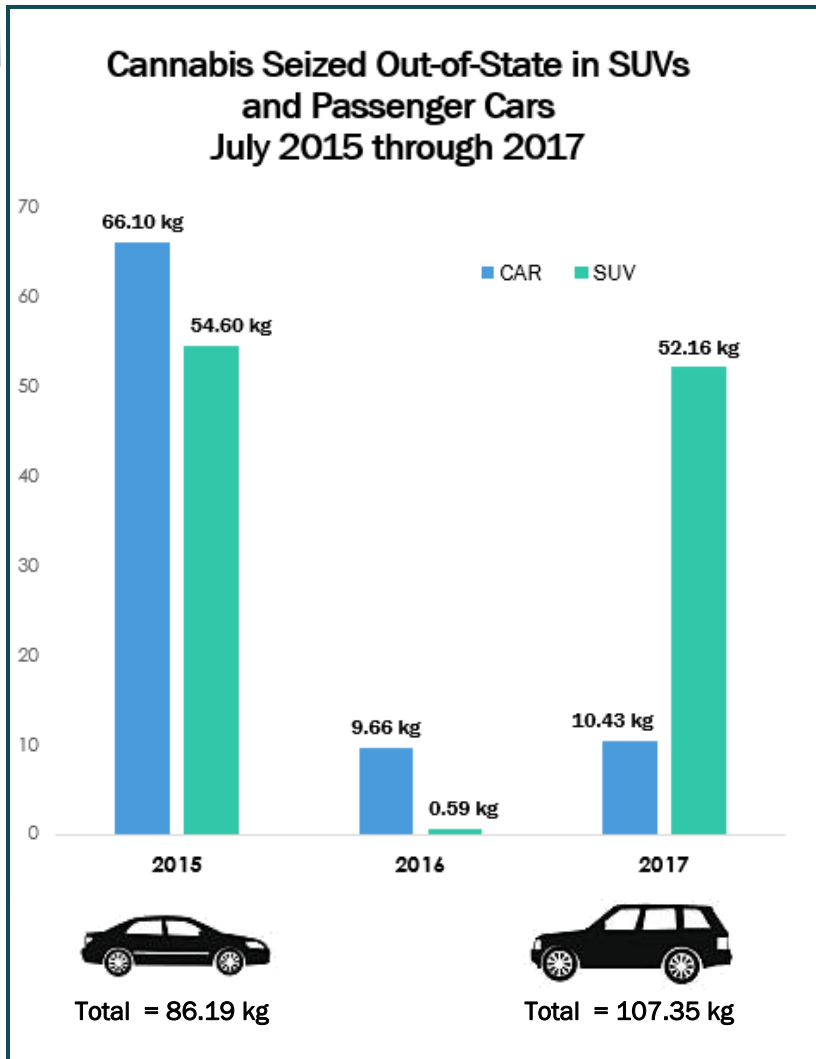


Figure 19: Distribution of Most Common Vehicles Found Trafficking Oregon Cannabis July 2015 through 2017 — Determined by Aggregate Volume



Figure 20: Upper Third Quartile of Inbound Monetary Seizures Associated with Cannabis Trafficking

37. Drug Enforcement Administration. 2018. *El Paso Intelligence Center*. Accessed January 21, 2018. <https://www.dea.gov/ops/intel.shtml#EPIC>

38. Ibid

39. Ibid

40. Ibid

41. Ibid

42. Port of Portland Police. July 2017 through March 2018. "Cannabis Cash Seizures." Port of Portland Police

of cannabis products were interdicted during attempted exportation at the Port of Portland International Airport.^{43 - 45} Among in-bound monetary seizures, the largest originated from Chicago Illinois (ORD), Dallas Fort-Worth Texas (DFW), Atlanta Georgia (ATL), Phoenix Arizona (PHX), and Los Angeles California (LAX) – over \$718k was seized from Chicago and Dallas alone.

⁴⁶ (See Figure 20 Located on Previous Page)

The illicit distribution of cannabis continues to take place on many internet markets on both the open internet and deep websites. As of the date of this writing, Craigslist websites for Oregon host advertisements for cannabis flower, shatter, and oils, clones, seeds, specialty equipment, and property for grow sites.⁴⁷ On the two most popular

deep web marketplaces – Dream Market and Wall St. Market – dozens of vendors claimed to have access to Oregon cannabis products.^{48, 49} On these online markets, the most commonly accepted digital currencies were Bitcoin, Bitcoin Cash, Ethereum, Monero, and Litecoin.^{50, 51}

According to OR-ID HIDTA analysis of financial regulatory reporting from 2017, the majority of aboveboard cannabis-related financial activity was routed through financial institutions with purported business activity within agricultural, retail, and financial services.⁵² Additional analysis of data from law enforcement sensitive sources, indicates that the most commonly used money laundering schemes related to the distribution of Oregon cannabis have been electronic funds transfers, real estate deals, funnel accounts, and tax evasion⁵³

Reliable information will continue to grow on the financial mechanics of cannabis-related activity as regulatory reporting increases in-parallel with access to financial services. The most recent figures published by the Financial Crimes Enforcement Network indicate that there were 117,369 “Marijuana-Related” Suspicious Activity Reports filed in the 4th quarter of 2017 nationwide.⁵⁴

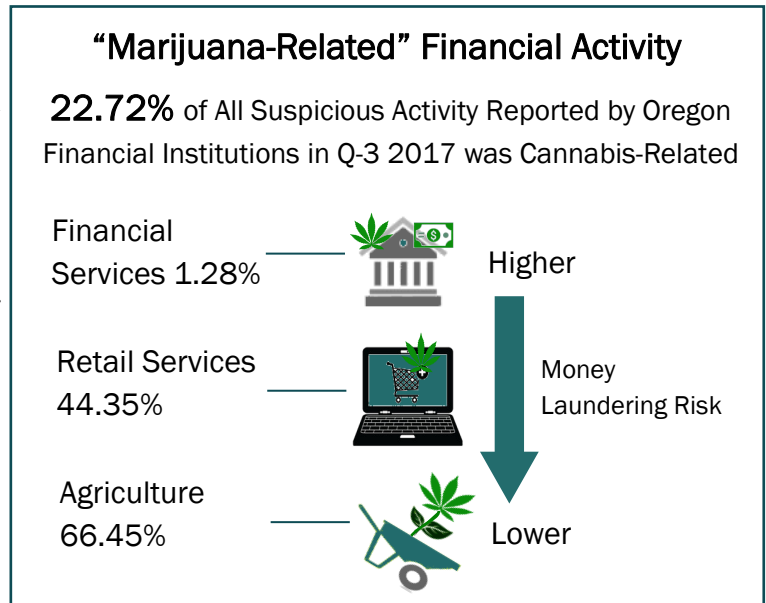


Figure 21: Risk-Rated Distribution of Cannabis Related Activity Reported As Suspicious Activity from Q-3 2017

Analysis of Cannabis Consumption

Policing impaired driving remains the most tangible effect related to cannabis consumption for law enforcement in Oregon. According to information from the Oregon State Police (OSP), from 2014 through 2016 the total number of cannabis related Drug Recognition Expert (DRE) opinions rose from 596 in 2014 to 991 in 2016 – representing an increase of 66.28% in a limited

43.Ibid

44.Price of Weed. 2017. "Price of Weed, a Global Price Index for Marijuana." Price of Weed. September 5. Accessed September 5, 2017. <http://www.priceofweed.com/>

45.Drug Enforcement Administration. 2018. *El Paso Intelligence Center*. Accessed January 21, 2018. <https://www.dea.gov/ops/intel.shtml#EPIC>

46.Port of Portland Police. July 2017 through March 2018. "Cannabis Cash Seizures ." Port of Portland Police

47.Craigslist. 2018. Craigslist . Accessed April 25, 2018. <https://portland.craigslist.org/>.

48.Dream Market. 2018. Dream Market. Accessed March 8, 2018. <http://5gc3hz66uifzzgwu.onion/?ai=1675>.

49.Wall Street Market. 2018. Wall Street Market. Accessed March 8, 2018. <http://wallst4qihu6lvsa.onion/signup?ref=276>.

50.Ibid

51.Dream Market. 2018. Dream Market. Accessed March 8, 2018. <http://5gc3hz66uifzzgwu.onion/?ai=1675>.

52.Department of the Treasury Financial Crimes Enforcement Network. 2018

53. LES -Department of the Treasury Financial Crimes Enforcement Network. 2018

54.United States Department of Treasury - Financial Crimes Enforcement Network. 2018. *Marijuana Banking Update*. Statistical Update, Washington D.C.: FinCEN.

data set.⁵⁵ Historical information provided by OSP from 2013 through 2015, indicates that among those above the legal age for cannabis consumption in Oregon, the majority of cannabis-related DRE examinees fell between the ages of 21 to 31 years-old.⁵⁶ Yet, in the same dataset, the 20% of the cannabis-related DRE examinees were under 21 years-old.⁵⁷ An overwhelming body of

empirical evidence demonstrates serious performance reductions from THC, yet many cannabis users believe they are able to compensate for these and drive safely.⁵⁸ Because Oregon does not have a *per se* limit (defined legal threshold) for THC impairment, DRE exams are crucial for preventing cannabis impaired driving and mitigating the potential for associated traffic fatalities.⁶⁰

Production

Distribution

Consumption

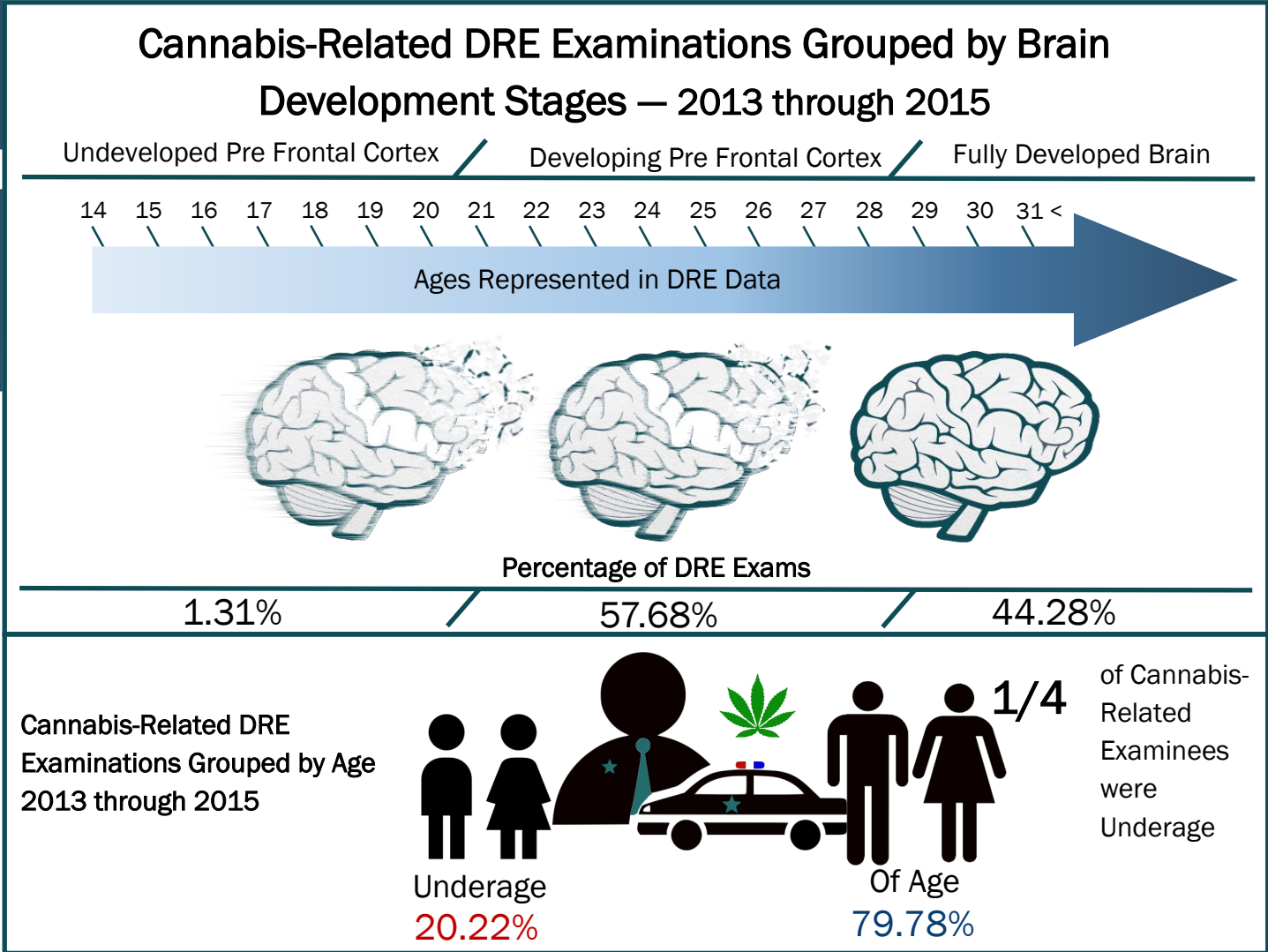
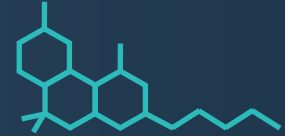


Figure 22: DRE Examinations 2013 - 2015 Distributed by Age Group and Stages of Brain Development

55. Oregon State Police. 2010 to 2016. "Drug Recognition Expert Examinations." OSP.
 56. Ibid
 57. Ibid
 58. Hartman, Rebecca L, and Marilyn A Huestis. 2013. "Cannabis Effects on Driving Skills." *Clinical Chemistry* 489.
 59. Terry, P, and K.A. Wright. 2005. "Self-Reported Driving Behaviour and Attitudes Towards Driving Under the Influence of Cannabis Among Three Different User Groups in England." *Addictive Behaviors* 619-626.
 60. Logan, Barry PhD, Sherri PhD Kacinko, and Douglas PhD Beirness. 2016. *An Evaluation of Data from Drivers Arrested for Driving Under the Influence in Relation to Per Se Limits for Cannabis*. Research Report, Washington DC: AAA Foundation for Traffic Safety.

Section VI: Additional Areas of Research

Purpose and Objective



This section outlines additional areas of research for which there was not a reliable body of data and evidence to sufficiently evaluate. These areas of study span issues of public-health, law enforcement, and socio-economics in the state.

Drug-Related School Suspensions and Expulsions

OR-ID HIDTA reviewed available information published by the Oregon Department of Education on “disciplinary incidents” in public schools, but the data reliability could not be sufficiently evaluated in a timely manner for application in this assessment. Due to this limitation, the data was cataloged and will be retained for future evaluation.

Cannabis-Related Investment Fraud

Oregon’s cannabis industry has become a high-risk ripe target for investment fraud. The Portland based Cannacea Medical Marijuana Dispensary was involved in falsifying licensing to solicit capital and worked with Green Rush Consulting to locate unwitting investors.¹ The entity exploited the burgeoning cannabis industry in the state to entice investors to back an illegitimate company, securing a quarter million dollars in fraudulent gains. Also according to the U.S. Securities and Exchange Commission (SEC), cannabis investors fell prey to “pump and dump” schemes and lost up to \$23.3 billion in 2014 alone.² According to the U.S. SEC, “Fraudsters often exploit the latest

innovation, technology, product, or growth industry—in this case marijuana—to lure investors with the promise of high returns.”^{3,4} These cases exemplify the range of crimes taking root in Oregon’s cannabis sector. Oregon’s cannabis businesses are cash intensive operations, and as such are easy targets for robbery and financial exploitation.

Nexus to Violent Crimes

Financial crimes notwithstanding, cannabis is an attractive target for robbery and as recently as December 2016 a state-licensed cannabis producer was targeted for a violent armed robbery.⁵ In the aforementioned case, a well-known cannabis grower in Jackson County was assaulted, bound, and his harvest was taken by armed assailants.

The expanding myriad of cannabis related support services and specialties poses a challenge to law enforcement and regulators. Other prominent cannabis production states have had cases of sexual exploitation and forced labor linked to cannabis grows. In California’s Emerald Triangle so-called “bud-trimmers or trimmigrants” have been raped, trafficked, and abused by cannabis growers.⁶ Although there is no credible indication that this form of human trafficking

1. Crombie, Noelle. 2016. "State Slaps Portland Dispensary Owner with \$40,000 Fine in Fraud Inquiry." *The Oregonian/OregonLive*. July 29. Accessed February 6, 2017. http://www.oregonlive.com/marijuana/index.ssf/2016/07/state_slaps_portland_dispensar.html.

2. Sapient Investigations Inc. 2015. "High Times for Fraud." *Sapient Investigations Newsletters*. February 10. Accessed November 22, 2016. <https://sapientinvestigations.com/spi-news/high-times-for-fraud/>.

3. Consumer Reports. 2015. "Why Marijuana Stocks Might Go Up in Smoke." *Consumer Reports Money*. June 28. Accessed January 15, 2017. <http://www.consumerreports.org/cro/news/2015/06/why-marijuana-stocks-might-go-up-in-smoke/index.htm>.

4. Sapient Investigations Inc. 2015. "High Times for Fraud." *Sapient Investigations Newsletters*. February 10. Accessed November 22, 2016. <https://sapientinvestigations.com/spi-news/high-times-for-fraud/>.

5. Crombie, Noelle. 2016. "Masked Intruders Hit Legal Marijuana Grow -- First Violent Crime at Licensed Pot Farm." *The Oregonian/OregonLive*. December 29. Accessed January 27, 2017. http://www.oregonlive.com/marijuana/index.ssf/2016/12/authorities_investigating_assa.html.

6. Walter, Shoshana. 2016. "In Secretive Marijuana Industry, Whispers of Abuse and Trafficking." *Reveal News*. September 8. Accessed January 28, 2017. <https://www.revealnews.org/article/in-secretive-marijuana-industry-whispers-of-abuse-and-trafficking/>.

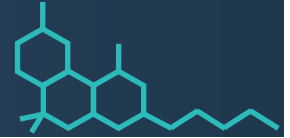
is happening in Oregon, monitoring trends in the cannabis labor force would be advisable.

Classical “Marijuana-Related” Arrests

OR-ID HIDTA reviewed data from Oregon Uniform Crime Reporting and Oregon National Incident-Based Reporting System Resource for

criminal drug offenses and arrests. Due to recent legislative changes, modifications to the state-wide data collection, and the lag to the criminal code updates following legislative shifts, correlative analysis was deemed to be inappropriate at this time. Thus, this criminal justice information was cataloged for future analysis for applications in new research.

Section VII: Technical Appendix



Purpose and Objective

This appendix provides essential information regarding analytic models and key methodology used in this assessment developed from the review of 310 individual information sources. Additionally this section provides information on the initial limitations noticed during the course of this research.

Part I – Initial Limitations and Caveats

Former DOJ Deputy Attorney General James M. Cole established clear requirements and expectations for states that have chosen to enact a state-sanctioned commercial cannabis market, which were subsequently crystallized into Oregon law - before being officially rescinded by Attorney General Jeff Sessions in January 2018. This assessment is intended to serve as initial evaluation of relevant issues associated with cannabis production, distribution, and consumption in the context of Oregon as of 2018, with its state-sanctioned cannabis legalization against the larger context of federal prohibition. Thus, the analysis of this assessment is strictly static, built upon reliable contemporary information, and does not attempt to forecast the evolution of “marijuana legalization.” To further the collective body of knowledge, on-going monitoring of the indicators evaluated herein and emergent data will be required for future assessments.

Comprehensive data on cannabis related traffic fatalities was not available at the time of this publication, as roughly one third of all fatalities in Oregon are subject to toxicology screening. Information related to cannabis is highly heterogeneous (multifaceted) and decentralized across a number of distinct

databases - maintained by many different public and private parties. Thus, to facilitate future research into state efficacy with federal enforcement priorities - outlined in state law - there should be collaborative approaches to data standardization, information centralization, and intelligence sharing. Public health drug use surveys provide the only verifiable information on cannabis consumption for Oregon, but these could be revised to better evaluate self-reported consumption. Allowing for certain publicly funded education institutions to opt-out of participation diminishes the reliability of these sources and reduces the sample pools.

Data accessibility hindered the refinement of analytic models on production and consumption from the state-sanctioned recreational production system. In place of primary source information, the OR-ID HIDTA capitalized upon publicly available information that referenced statistics from OLCC. Observed product stocks reported in OLCC’s system fell within existing OR-ID HIDTA estimates and can be used to further refine estimates of Total-State Production in the future. The analytic models used to evaluate production capacity reflect a snapshot of estimated production capacity between 2015 through 2017. The exponential growth of cannabis cultivators in Oregon following the state-sanctioned legalization means that production capacity for 2018 is all but certainly higher than the models used herein.

Additionally, the inaccessibility to sales figures – an indirect indication of consumption rates in Oregon – makes it difficult to evaluate accurately the current level of cannabis consumption in the state. The decentralization and compartmentalization of state-housed data raised many questions about limited-reporting of reliable information on consumption and production.

Fundamentally, improving existing data sources and fostering emergent data sources and research will improve the collective understanding of state-sanctioned cannabis legalization’s effects in Oregon. The OR-ID HIDTA, with the assistance of key stakeholders and cooperation with state agencies, will continue to evaluate this subject.

Part II – Analytic Models of Cannabis Production and Consumption Oregon

Estimates of average harvest per-plant yield vary widely. Unconfirmed initial data from OLCC indicates that an average per-plant yield of roughly 0.68 kg is reasonable, but limitations in data reduce the accuracy of this approximation. For the purposes of this research, an Average Annual Plant Yield (AAPY) of 1.2 kg (2.64 lb), which is a hybrid model native to this report, was employed. This AAPY accounts for multiple individual harvests throughout a calendar year and the different growth cycles associated with indoor, greenhouse, and outdoor cultivation systems. This model was developed on the heels of an expansive literature review from independent research bodies, cannabis community forums, and other publicly available information.^{1,2} Central among these sources was extensive work from Jonathan P. Caulkins at RAND’s Drug Policy Research Center, who cites three different indoor cultivation methods, which can annually yield 4.76 kg (10.5 lb) to 207.29 kg (457 lb); crop harvest yield not per-plant.³ Isolating individual factors that contribute to plant yield is challenging, nevertheless, plant genetics, lighting (arguably the single most important element), and grower technique all play a central role in harvest yields.⁴

Understanding the relationship between plant yields and lighting is most apparent in indoor cannabis grows, where there is direct linkage between light wattage and single harvest plant yields.^{5,6} Research indicates that indoor per-plant harvest yields range from 40g to 100g using a 200 watt Compact Florescent Lamps (CFL) in a cubic

meter grow cabinet to 250 g to 1000 g using a 1000 watt High-Pressure Sodium (HSP) in a cultivation space of 5.6 m.⁷ Although outdoor per-plant harvest yields tend to be larger than indoor ones, the inverse is true when comparing average annual per-plant yields as the rapid rate of harvest among indoor grows raises annual output.⁸ The larger per-plant harvest yield in outdoor plants is arguably a result of the bigger plant canopy size; a single rounded plant canopy of 76.2 cm covers roughly 1.5 m³ and research from Jonathan P. Caulkins cites a probably per-plant harvest yield of 1.13 kg.^{9,10}

Additional downward bias was incorporated into this model by calculating production capacity using the mean of Oregon Medical Marijuana Program (OMMP) thresholds for patients, growers, and grow sites, with the underlying assumption that all of these sites are operating at current legal thresholds and in full compliance with program limitations. Namely, this component of over-all state production assumes all OMMP registrants are compliant with the thresholds as outlined by OAR’s 333-008-0080 and 333-008-0025

Further off-setting was done by excluding “house-hold” recreational grows from calculations of state production capacity. Additionally, the lower boundary of production capacity was calculated by taking initial capacity calculations and diminishing it by two-thirds. The factor for multiplying state production was determined by using a mean of 2016 through 2017 OMMP registrant data for patients, growers, and grow sites.¹¹ This research assumes that the Oregon Liquor Control Commission (OLCC) survey conducted in 2014

provides an accurate estimation of growing methods' distribution in Oregon and remains representative of current cultivation preferences.¹² This model could be further refined if data was made available from OLCC on the distribution of licensed producers by tier, average harvest yield, and harvest frequency. The downward bias that suppresses overestimates of production capacity in the current analytic model will be revised to accommodate the exponential growth of production in the state from 2016 through 2018 once reliable information is made available.

This research employs a domestic consumption model that was developed using data collated from Oregon Health Authority, National Survey on Drug Use and Health, Oregon Healthy Teens, Oregon Student Wellness, and Oregon Behavioral Risk Factor Surveillance System to estimate state

cannabis consumption in 2016 and 2017. Data derived from these sources were used to develop an indigenous (unique to this research effort) reasonable dosage unit estimate for cannabis use, which was then multiplied according to the usage rates in pooled surveyed age-groups—effectively creating stratified user demand models. The pooled subgroups were further refined to reflect proportionality according to the larger state population at the time of the survey. By breaking down survey demographics into age ranges and adjusting for the population of Oregon in 2016 and 2017, then calculating consumption of each individual age group using daily dosage unit of 1.2 g (based off research from RAND Corporation in 2013).¹³ This indigenous model was weighted against established research and analysis done by Dr. Seth Crawford and additional published research from RAND Corp, which provide a range of .32g per-joint up to 3.25g per-dosage unit.^{14, 15}

Part III – Analytic Models of Cannabis Value in Oregon and from Oregon

Given the volume of Oregon's estimated annual surplus for 2016 - 2017 was up to 827 tonnes, this analytic model was subsequently used to calculate the value of Oregon's surplus cannabis within external markets. This was calculated after surveying nation-wide user price data for recent cannabis purchases.¹⁶ By employing an analysis of destinations of Oregon diversion data, a weighted price per-gram was formulated to reflect the average national value of Oregon's cannabis.¹⁸ The average price of cannabis in each jurisdiction across the United States and Canada was determined by using active data scrapping of statistically significant self-reported user prices,

cross-referencing DEA pricing information from field offices, and prices retrieved from clandestine drug markets online. Using this methodology, the weighted average for Oregon cannabis on the national informal economy was determined to be USD 10.67 per gram for the time of this publication.^{17, 18} Due to the stratification of illicit distribution networks and need to preserve a return-on-investment for actors involved in the illicit cannabis trade, the total real value of exported cannabis varies widely. Research into the dark-net sales of cannabis indicate that costs are considerably reduced for the end-user, but these could represent a small percentile of the national illicit cannabis trade of Oregon sourced cannabis nationwide.

Technical Appendix Endnotes

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