
# DIVERSION OF MEDICAL MARIJUANA IN OREGON

A PRIVATEER HOLDINGS WHITEPAPER

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# EXECUTIVE SUMMARY

Using data from law enforcement reports, economic statistics and peer-reviewed journals, Privateer Holdings estimated the total amount of marijuana produced each year under the Oregon Medical Marijuana Program (OMMP). The findings strongly suggest that more than 323,000 pounds of marijuana produced each year under the state program is likely diverted to the illegal market.

The analysis shows:

- **Oregon produces an excess of more than 323,000 pounds of medical marijuana each year.** By a conservative estimate, Oregon growers produce a total of approximately 408,000 pounds of medical marijuana each year. Using the consumption average of 1.5 grams per day, Oregon's medical marijuana patients should only require approximately 85,000 pounds per year.
- **It would be virtually impossible for Oregon medical marijuana patients to consume this oversupply.** A 2009 Rand study found the heaviest marijuana users consume approximately 1.2 grams per day. The Canadian government estimated daily consumption at 1.5 grams daily. Oregon's medical marijuana patients would have to consume 7.2 grams per day to use up all of the available supply produced for them.
- **Oregon produces enough medical marijuana to serve all of the medical marijuana patients in Arizona, Colorado, Oregon and Washington.** Using the consumption average of 1.5 grams per day, Oregon's annual production of approximately 408,000 pounds would meet the demand of medical marijuana patients in OR, CO, WA and AZ combined.[1]
- **A $904 million illicit market that is not regulated or taxed.** At a $175 per ounce street value, as estimated by the Oregon State Legislative Revenue Office, the retail value of surplus medical marijuana produced in Oregon is $904 million.
- **A robust illegal distribution network exists.** Oregon's informal marijuana economy already provides easy access to diverted medical cannabis. Continued diversion at this rate will lead to lost tax revenues that would otherwise be generated through a regulated recreational marketplace.
- **Comparable regulation of both recreational and medical markets will be essential.** Restructuring the medical marijuana production in Oregon with regulations ensuring that growers can meet *but not greatly exceed the needs* of marijuana patients will help foster the growth of a legitimate recreational market. Failing to regulate medical productions will ensure continued flow into the black market.

# INTRODUCTION

The lack of oversight under current regulations creates an opportunity for registered growers to divert a significant amount of medical marijuana to the illicit market. At the end of 2014, there were 35,768 registered grow sites in Oregon. Presently, producers of medical marijuana are not required to report the amount of marijuana grown. If Oregon regulators do not implement stronger controls before the launch of the recreational market, the incentive increases for growers to divert medical marijuana to the recreational or illicit markets. This off-market diversion will result in lost tax revenue from the recreational marijuana program and more money for criminals and cartels operating illegally. It will also likely generate negative publicity for the Oregon state government.

1 (Marijuana Policy Project. 2015)

# SIZE OF OREGON MEDICAL MARKET

## CULTIVATION OF MARIJUANA BY REGION

There are thirty-six counties in Oregon. According to the Oregon High Intensity Drug Trafficking Area (HIDTA) annual drug threat assessment, the majority of marijuana grown in the southwest part of the state is cultivated outdoors.[2] Law enforcement statistics from 2013 on marijuana eradication show nearly 95% of all seizures from outdoor grow sites occurred in Douglas, Lane, Jackson and Josephine Counties.[3]

These counties hold special significance for the production of medical marijuana in Oregon for several reasons. First, the climate and geography of southern Oregon are all ideally suited to the outdoor cultivation of marijuana. Second, all of these counties are located on state borders or along the Interstate-5 corridor (a major drug trafficking route).[4] Third, these sparsely populated counties have limited resources available to law enforcement with which to regulate a large number of small scale grows.

## METHODOLOGY

In order to calculate the amount of marijuana produced under the OMMP, several factors were required. First, the number of plants used to supply medical marijuana was fixed using the official limit of six plants per patient. Second, the differences from indoor versus outdoor yields meant that the proportion of indoor to outdoor operations had to be determined. Third, a range of outdoor production yields were compared in order to accurately capture the total production.

The Oregon Health Authority snapshot of registered medical marijuana grow sites and Oregon HIDTA production figures were used to generate an estimate of the proportions of marijuana cultivated from outdoor and indoor grows each year.[5] The Oregon HIDTA assessment notes that almost all of the operations in the southern counties are outdoor grows. There may be a number of indoor grows also operating in the southern counties. However, it is safe to assume that this figure is offset by outdoor grows in the 32 other counties. Furthermore, outdoor cultivation is less costly and involves simpler production methods; consequently, the true proportion of grow sites located outdoors in Oregon may actually exceed 50%.

Of the 35,768 registered grow sites in Oregon, 11,277 are located within the 4 southern counties highlighted in Table 6 (see appendix). Therefore, an initial assumption was made that all 11,277 of these grow sites are outdoor sites. This proportion was used to estimate that 32% of grow sites in Oregon are conducted outdoors and the remaining 68% grow sites operate indoors. To ensure a conservative estimate, the same method was applied three more times using only Lane (the county with the most registered grow sites), the top three other counties by number of grow sites (Douglas, Jackson and Josephine), and the top three counties overall (Jackson, Josephine and Lane). The proportions of outdoor cultivation under these scenarios are 12%, 20% and 28% respectively.

2 (Oregon HIDTA, 2014)
3 (Oregon HIDTA, 2014)
4 (Oregon HIDTA, 2014)
5 (Oregon Health Authority, 2015)

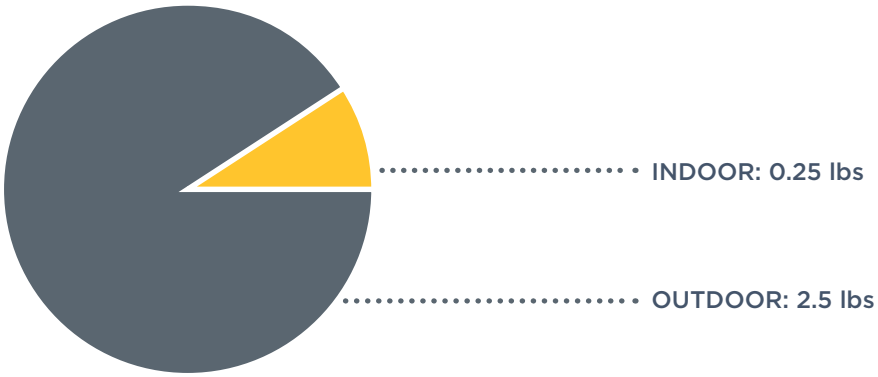
## EXPECTED PRODUCTION: INDOOR VS. OUTDOOR CULTIVATION

Individual plant yields depend on many factors, such as plant density, nutrient availability, light availability and genetic predisposition. As noted by the Oregon HIDTA assessment, outdoor cultivation generally results in large, high-yielding plants. The U.S. Drug Enforcement Administration (DEA) has established a presumption that every marijuana plant yields one pound of useable marijuana.[6] However, the exceptional climate in southern Oregon significantly improves outdoor yield. A recent HIDTA paper anecdotally reported yields in southern Oregon ranging from 6 to 20 lbs per plant with an average yield of 10 lbs of usable, dried, marijuana per plant.[7] We believe that 10 lbs per plant represents the higher limit of average yield for the typical outdoor grow. RAND suggests that outdoor grows generally yield approximately 2.5 lbs of useable, dried product per plant. Though we believe that 2.5 lbs per plant is conservative for Oregon, we are comfortable using this yield as the baseline for our report.[8] Due to the seasonal growth cycle of cannabis, outdoor production sites in southern Oregon can expect a single harvest per year. Conversely, indoor cultivation of marijuana requires smaller plants with lower yields but can be advantageous due to the increased number of annual harvests and the degree to which the growing environment can be controlled. A recent study by the University of Washington on indoor cannabis production found that the typical yield from a single plant grown indoors is about one ounce, and the indoor grow site can expect four harvests per year. Claims of indoor yields above 16 ounces per plant and outdoor yields above three pounds per plant are not uncommon.[9,10] To calculate the medical market supply we chose to use the more conservative figure of one ounce to estimate per plant production for indoor cultivation.

## CALCULATIONS

The legal limit of six marijuana plants per patient and a total patient population of 70,229 equates to a total of 421,374 legally allowed plants. Note that the per plant yields of outdoor plants are at least 10 times greater than indoor plants (Figure 1). Table 5 shows that changing the yields of indoor plants does not have a significant impact on the total production. Therefore, the most relevant variables that impact total production are the yield of outdoor plants and proportion of all plants which are cultivated outdoors.

**FIGURE 1:**
**COMPARISON OF ANNUAL, SINGLE PLANT YIELDS BY CULTIVATION METHOD**




6 (Oregon HIDTA, 2014)
7 (Oregon HIDTA, 2014)
8 (Caulkins, RAND, 2010)
9 (Vanhove, Van Damme, & Meert, 2011)
10 (Crombie, 2015)

**The following equation is used to determine the annual production of medical marijuana in Oregon:**

(421,374 PLANTS) x (PROPORTION OF OUTDOOR GROWS) x (OUTDOOR YIELD PER PLANT)
\+ (1 - PROPORTION OF OUTDOOR GROWS) x (0.0625 lbs PER INDOOR PLANT) x (4 INDOOR HARVESTS PER YEAR)
= **TOTAL ANNUAL PRODUCTION**

**TABLE 1: ESTIMATED ANNUAL PRODUCTION OF MEDICAL MARIJUANA**

| % OUTDOOR CULTIVATION | OUTDOOR YIELDS (LBS./PLANT) | | | |
|---|---|---|---|---|
| | 1 | 2.5 | 5 | 10 |
| 12% | 143,267 | **219,114** | 345,527 | 598,351 |
| 20% | 168,550 | **294,962** | 505,649 | 927,023 |
| 25% | 184,351 | **342,366** | 605,725 | 1,132,443 |
| 28% | 192,427 | **366,593** | 656,871 | 1,237,427 |
| 30% | 200,153 | **389,771** | 705,801 | 1,337,862 |
| 32% | 206,473 | **408,733** | 745,832 | 1,420,030 |
| 35% | 215,954 | **437,176** | 805,878 | 1,543,282 |
| 40% | 231,756 | **484,580** | 905,954 | 1,748,702 |
| 45% | 247,557 | **531,985** | 1,006,030 | 1,954,122 |
| 50% | 263,359 | **579,389** | 1,106,107 | 2,159,542 |

As shown in Table 1, from an average outdoor yield of 2.5 pounds per plant the expected total annual production of medical marijuana in Oregon is 408,733 pounds. This calculation supposes that all cultivators are growing the maximum allowable plants under OMMP regulations and that none of the growers are cultivating additional, illegal plants.

The absence of a tracking system to monitor legal production prevents the collection of vital information regarding individual grow sites. If, for instance, the proportion of grow sites operating outdoors actually exceeds 50%, the actual production may exceed 579,000 pounds per year. Note that this model pertains only to legally registered grow sites. Illicit production of marijuana by unregistered, illicit market producers is not included in this assessment.

## RESULTS

Registered grow sites in Oregon appear to be producing a considerable amount of marijuana beyond what is necessary to serve the population of medical patients across the state. The perishable nature of cannabis suggests that cannabis which is not used or preserved will spoil. We expect the “shelf life” of marijuana is, at most, one year. Oregon medical marijuana laws set the limit on possession for a medical marijuana patient at 24 ounces. In order to consume 408,000 pounds of legal, medical marijuana produced in the state of Oregon in a single year, each of the 70,229 medical patients must consume an average of 93.12 ounces each year. This equates to a daily average consumption of 7.2 grams per person per day.

**TABLE 2:**

**INDIVIDUAL ANNUAL CONSUMPTION (IN OUNCES) REQUIRED TO ABSORB ALL PRODUCTION**

| % OUTDOOR CULTIVATION | OUTDOOR YIELDS (LBS./PLANT) | | | |
|---|---|---|---|---|
| | 1 | 2.5 | 5 | 10 |
| 12% | 32.64 | 49.92 | 78.72 | 136.32 |
| 20% | 38.40 | 67.20 | 115.20 | 211.20 |
| 25% | 42.00 | 78.00 | 138.00 | 258.00 |
| 28% | 43.84 | 83.52 | 149.65 | 281.92 |
| 30% | 45.60 | 88.80 | 160.80 | 304.80 |
| 32% | 47.04 | 93.12 | 169.92 | 323.52 |
| 35% | 49.20 | 99.60 | 183.60 | 351.60 |
| 40% | 52.80 | 110.40 | 206.40 | 398.40 |
| 45% | 56.40 | 121.20 | 229.20 | 445.20 |
| 50% | 60.00 | 132.00 | 252.00 | 492.00 |

Since the individual sales and consumption rates of marijuana are often measured in grams, the following table shows the required daily consumption for Oregon medical marijuana patients in grams. The figures in Table 3 - Individual Daily Consumption (in grams) Required to Absorb All Production simplify the comparison of Oregon medical marijuana consumption to that of other medical programs, as described below.

**TABLE 3:**

**INDIVIDUAL DAILY CONSUMPTION (IN GRAMS) REQUIRED TO ABSORB ALL PRODUCTION**

| % OUTDOOR CULTIVATION | OUTDOOR YIELDS (LBS./PLANT) | | | |
|---|---|---|---|---|
| | 1 | 2.5 | 5 | 10 |
| 12% | 2.54 | 3.88 | 6.11 | 10.59 |
| 20% | 2.98 | 5.22 | 8.95 | 16.40 |
| 25% | 3.26 | 6.06 | 10.72 | 20.04 |
| 28% | 3.41 | 6.49 | 11.62 | 21.90 |
| 30% | 3.54 | 6.90 | 12.49 | 23.67 |
| 32% | 3.65 | 7.23 | 13.20 | 25.13 |
| 35% | 3.82 | 7.74 | 14.26 | 27.31 |
| 40% | 4.10 | 8.57 | 16.03 | 30.94 |
| 45% | 4.38 | 9.41 | 17.80 | 34.58 |
| 50% | 4.66 | 10.25 | 19.57 | 38.21 |

# CONSUMPTION OF MARIJUANA

## GENERAL CONSUMPTION

A 2009 study by the RAND Corporation found that the consumption of marijuana among the heaviest users is approximately 1.2 grams per day +/- 0.4 grams.[11]

## COLORADO

Annual reports from the Colorado Marijuana Enforcement Division show medical sales in 2014 of 109,578 lbs. of marijuana flower, 1,964,917 units of edibles and 412,000 units of non-edible marijuana extracts.[12] While individual plants and strains vary in potency, chemical analysis of samples from U.S. DEA seizures found the average tetrahydrocannabinol (THC) content of marijuana to be 12.5%.[13]

Using the regulated serving size of 100 mg THC for each unit of edible marijuana products and an average of 12.5% THC content in dried flower, it is estimated that there is an equivalent of 2.5 grams of flower per unit of edible. Similarly, typical cannabis concentrates contain 60% THC by weight. With an average flower potency of 12.5% THC, a gram of non-edible concentrate is equivalent to 5 grams of dried flower. From these equivalents, the total consumption of medical marijuana in Colorado in 2014 at approximately 128,560 lbs. The number of medical marijuana patients in Colorado as of December 31, 2014 was 115,467.[14] On average, these individuals consumed 505 grams of marijuana in 2014 which equates to 1.4 grams per person per day.

## CANADA

The nationalized Canadian Marijuana for Medical Purposes (MMPR) program serves approximately 40,000 patients throughout the country. Prior to its implementation, the MMPR performed extensive cost-benefit analyses to determine the daily consumption of individual patients. It was determined that the average daily consumption of a medical marijuana patient is approximately 1.5 grams per day.[15]

Data collected from at least one of the licensed marijuana production facilities in Canada supports this estimate. In 2014, the average consumption of medical marijuana by Tilray's 3,500 registered patients in was 1.2 grams per day.

## COMPARISON OF MEDICAL MARIJUANA PROGRAMS

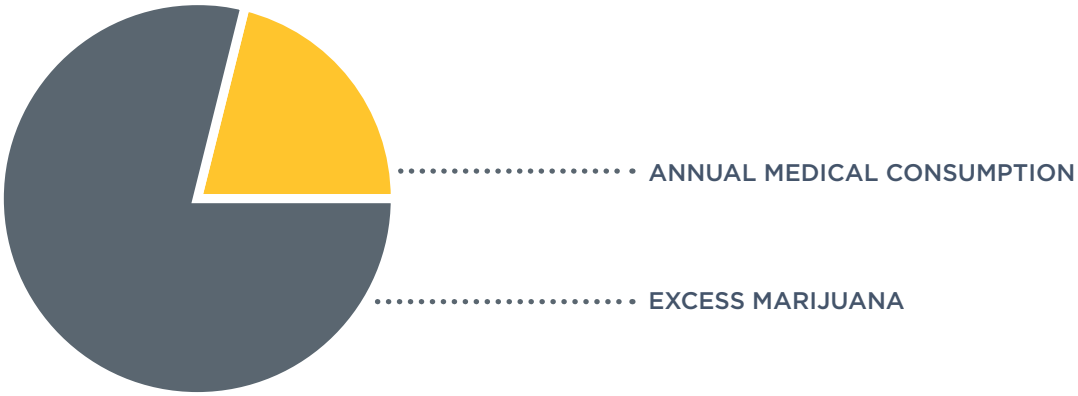
Compared to the medical marijuana programs in Colorado and Canada, the OMMP is far less tightly regulated. Both the Colorado and Canadian programs require extensive seed-to-sale tracking. They rely on inventory tracking systems and sales tracking systems to ensure strict adherence to each program. These tracking systems

11 (Kilmer & Pacula, 2009)
12 (Enforcement Division - Marijuana, 2015)
13 (Oregon HIDTA, 2014)
14 (Colorado Department of Public Health and Environment, 2015)
15 (Health Canada, 2013)

do not exist in Oregon under the OMMP. Additionally, the lack of a state sales tax means that accurate figures regarding the consumption of medical marijuana are nonexistent.

The qualifying conditions to receive medical marijuana are generally the same across all programs.[16] Therefore, we believe that the actual consumption of a medical marijuana patient, regardless of program or location, is approximately 1.5 grams per day. Therefore, the implied annual medical marijuana consumption for the 70,229 registered Oregonian patients is 84,769 pounds.

**FIGURE 2: ANNUAL MEDICAL CONSUMPTION VS. ESTIMATED PRODUCTION**




To put this into perspective, using the generally accepted consumption rate of 1.5 grams per day, Oregon's annual production of 408,000 pounds of medical marijuana is enough to supply all of the medical patients in Arizona, Colorado, Oregon and Washington, which represent roughly one-third of existing U.S. medical marijuana patients.[17]

**TABLE 4:**
**TOTAL NUMBER OF MEDICAL MARIJUANA PATIENTS SUPPORTED AT 1.5 GRAMS PER PERSON PER DAY**

| % OUTDOOR CULTIVATION | OUTDOOR YIELDS (LBS./PLANT) | | | |
|---|---|---|---|---|
| | 1 | 2.5 | 5 | 10 |
| 12% | 118,694 | **181,532** | 286,261 | 495,721 |
| 20% | 139,640 | **244,370** | 418,919 | 768,018 |
| 25% | 152,731 | **283,643** | 501,830 | 938,204 |
| 28% | 159,422 | **303,715** | 544,204 | 1,025,182 |
| 30% | 165,822 | **322,917** | 584,741 | 1,108,390 |
| 32% | 171,059 | **338,626** | 617,906 | 1,176,465 |
| 35% | 178,913 | **362,191** | 667,652 | 1,278,576 |
| 40% | 192,005 | **401,464** | 750,564 | 1,448,762 |
| 45% | 205,096 | **440,738** | 833,475 | 1,618,948 |
| 50% | 218,187 | **480,012** | 916,386 | 1,789,134 |

16 Appendix (Table 8)

17 (The Network for Public Health Law, 2014)

## IMPLICATIONS

The assumptions used to estimate the total production of medical marijuana in Oregon have probably understated the actual amount of legal marijuana grown in Oregon. However, in order to provide a lower bound to this estimate, a "worst case" production scenario was created. In the following scenario, the per-plant yield from outdoor cultivation was fixed at a half-pound and the yield of indoor plants is shown at intervals between a half-ounce and 1.25 ounces.

**TABLE 5: "WORST CASE" PRODUCTION ESTIMATE OF MEDICAL MARIJUANA (IN LBS.)**

| % OUTDOOR CULTIVATION | INDOOR YIELDS (LBS./PLANT) | | | |
|---|---|---|---|---|
| | 0.03125 | 0.05 | **0.0625** | 0.075 |
| 12% | 71,634 | 99,444 | **117,985** | 136,525 |
| 20% | 84,275 | 109,557 | **126,412** | 143,267 |
| 25% | 92,176 | 115,878 | **131,679** | 147,481 |
| 28% | 96,213 | 119,108 | **134,371** | 149,634 |
| 30% | 100,076 | 122,198 | **136,947** | 151,695 |
| 32% | 103,237 | 124,727 | **139,053** | 153,380 |
| 35% | 107,977 | 128,519 | **142,214** | 155,908 |
| 40% | 115,878 | 134,840 | **147,481** | 160,122 |
| 45% | 123,779 | 141,160 | **152,748** | 164,336 |
| 50% | 131,679 | 147,481 | **158,015** | 168,550 |

The only scenario in which consumption of marijuana is greater than the production is the least likely, worst case scenario. In this case, the estimated yields for indoor and outdoor production are fixed at 50% of their lowest estimated levels and only 12% of grow sites are operated outdoors. In all other scenarios, there is a surplus of medical marijuana that is likely not being consumed by patients under the OMMP.

This surplus is either being destroyed, which is unlikely, or sold on the illicit market. A 2014 study from the Oregon State University School of Public Policy found that nearly 18% of non-OMMP marijuana users obtain cannabis directly from medical growers and another 30% cite the illicit market as their source of marijuana.[18] Data gathered by the U.S. Department of Justice's El Paso Intelligence Center from 2008 to 2013 shows law enforcement in more than 30 states reported 615 seizures totaling 36,785 pounds of marijuana that had originated in Oregon (an average of 6,130 pounds per year).[19] The street value of these seizures is estimated to be in excess of $88 million. Also, in another report from 2013, in-state seizures of marijuana on Oregon highways was 1,300 pounds.[20]

Drug seizures by law enforcement likely represent only a small fraction of cannabis leaving the state. It is not possible to know the true amount of marijuana that is trafficked out of Oregon. The illicit nature of drug trafficking precludes the collection of verifiable data. However, if the seizures represent even 10% of surplus medical marijuana diverted out of state (a generously high estimate), then the total amount of cannabis directed out of state is roughly 61,300 pounds each year. These assumptions are broad and likely understate the true supply of marijuana. Their purpose is to illustrate the vast quantity of marijuana that is likely diverted from the legal medical market to the illicit market.

18 (Crawford, 2014)

19 (Oregon HIDTA, 2014)

20 (Oregon HIDTA, 2014)

# EMERGENCE OF A RECREATIONAL MARKET

The original medical marijuana laws in Colorado paralleled the OMMP in that neither of the two programs created a legal framework for the dispensation of medical marijuana. In response to a 2009 case against a marijuana grower, the state created a clear licensing scheme which established standards for cultivation and distribution of marijuana.[21] The passage of HB 3460 in Oregon creates a similar structure for establishing and regulating marijuana dispensaries. However, it does not establish rules governing the production of medical marijuana.

The emergence of recreational marijuana markets in tandem with established medical marijuana programs has had mixed outcomes. The case study of the state of Colorado demonstrates the effects of introducing a legal market in a state with a preexisting medical marijuana supply. To date, Colorado is the most successful example of new, recreational market. The inaugural year of recreational sales in 2014 generated more than $60 million in tax revenue for the state.

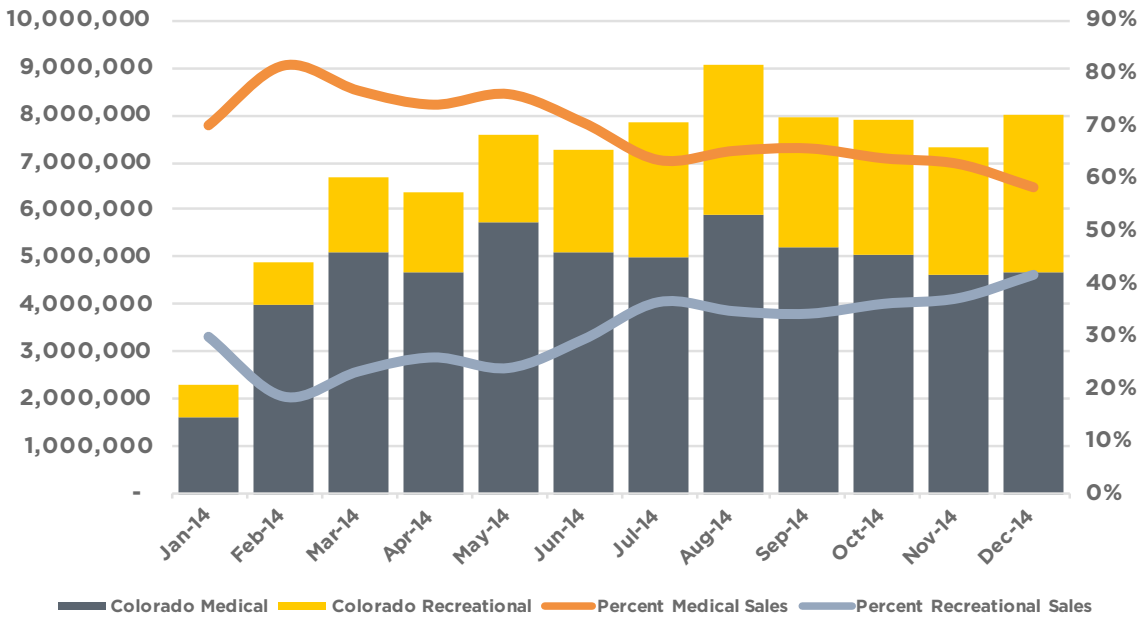
Washington State's creation of a legal recreational market in 2014 stands in contrast to the Colorado experience. The existing medical marijuana laws in Washington did not establish a patient registry or regulate dispensaries.[22] Consequently, the abundant supply of illicit medical marijuana inhibited rapid adoption of the recreational market. In the six months of operations in 2014, Washington State received only $16.4 million in recreational marijuana tax revenue despite the higher tax rates and larger population than Colorado. In the same period Colorado sales generated more than $30 million.[23,24]

Summary statistics from the 2011 NSDUH survey on marijuana use show that roughly 13% of the entire adult population in the U.S. consumes or has consumed marijuana in the past year.[25] To show the impact of legal, recreational sales on the overall market, the Colorado sales of medical marijuana and recreational marijuana were compared.

As expected, the increased availability for recreational users precipitated a drop in relative market of share of medical marijuana. The volume of medical marijuana as a percent of the total sales volume decreases from 81% in February 2014 to 58% in December 2014.

21 (Marijuana Policy Project, 2013)
22 (Marijuana Policy Project, 2013)
23 (Washington State Liquor Control Board, 2015)
24 (Enforcement Division - Marijuana, 2015)
25 (The Marijuana Policy Group, 2015)

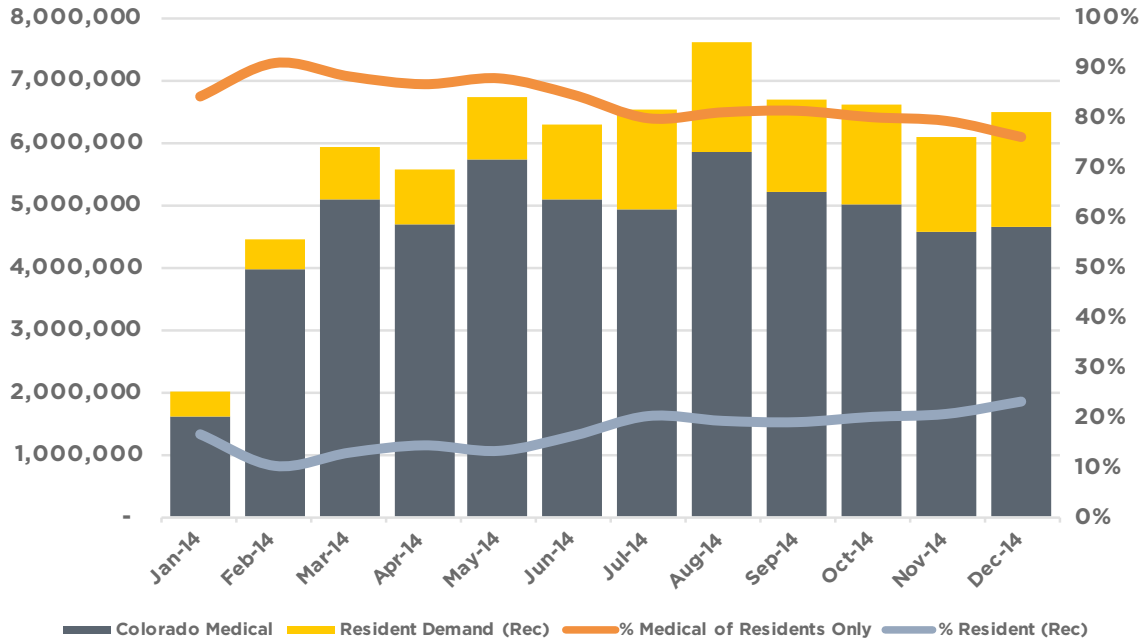
## COLORADO MEDICAL VS. RECREATIONAL MARKET




This change in market share was initially believed to be caused by the uptick in marijuana related tourism to the state. In order to account for visitor demand, estimated visitor consumption was removed from recreational sales.26 After adjusting for non-residents, the medical sales as a percent of the total resident market fell from 91% to 76% over the same period. This shows that the increasing market share of recreational marijuana was a direct result of non-medical purchases by state residents.

26 (The Marijuana Policy Group, 2015)

## COLORADO MEDICAL VS. RECREATIONAL MARKET—VISITOR ADJUSTED




Colorado's tight regulations on medical production helped to ensure that shrinking market demand for medical marijuana did not allow medical producers to supplement sales with illicit market distribution. Consequently, these controls supported the growth of the legal, recreational market by minimizing the impact of excess medical marijuana.

# CONSEQUENCES OF UNREGULATED MEDICAL MARIJUANA PRODUCTION

In 2013, the Colorado Marijuana Enforcement Division employed 35 people to manage the 493 medical marijuana centers, 729 optional premises cultivations, and 149 medical marijuana-infused products manufacturers.[27] Unlike the Colorado medical marijuana program, the Oregon program does not impose restrictions on production limits or inventory and it does not use tracking systems to measure the quantity of medical marijuana that is produced and sold to patients. The OMMP maintains records of registered patients, caregivers and growers. Meeting minutes from the Advisory Committee on Medical Marijuana show as of December 2014, the OMMP had 24 employees overseeing the registration of 70,128 patients, 35,071 caregivers and 47,187 unique growers.[28] It is clear that state resources directed to administering the OMMP are far less concentrated than their counterparts in Colorado.

The direct, negative impacts of the lack of regulation of medical marijuana are threefold. First, the availability of surplus medical cannabis threatens the viability of Oregon's recreational market and will create an environment in which legal, recreational businesses are unsustainable. The robust distribution network of Oregon's informal marijuana economy already provides easy access to diverted medical cannabis.[29] Continued diversion will lead to lost tax revenue that would otherwise be generated by the recreational market. The official market estimate from the Oregon State Legislative Revenue Office is an annual recreational demand of 1.86 million ounces, or 116,250 pounds.[30] If this demand is met with illicit market medical marijuana, the state could lose $26 million in recreational tax revenue.

The second negative impact of unregulated medical marijuana production is the damage to the environment caused by the multitude of small scale, less professional operations. Irrigation of indoor grow operations with large numbers of plants often produce toxic environments where black mold proliferates and creates serious health hazards.[31] Outdoor operations divert water from natural sources to irrigate crops. The runoff created by these outdoor grow operations creates lasting damage to the surrounding environment.[32]

The third negative impact of unregulated medical production is the incentive it creates for criminal activity. Due to the restrictions on banking, many of these independent operations maintain significant cash on hand which makes them targets for theft and violence.[33] Furthermore, the vast quantity of surplus marijuana produced in Oregon which is trafficked out of state creates complications for federal law enforcement agencies trying to control the flow of illicit drugs.

Each of these items exposes the state to liability in the form of legal action and negative publicity, and creates significant public safety concerns.[34] It is not certain which of these effects, if any, will become sources of contention.

27 (Colorado Department of Regulatory Agencies, 2014)
28 (Advisory Committee on Medical Marijuana (ACMM), 2014)
29 (Crawford, 2014)
30 (Legislative Revenue Office, 2014)
31 (Oregon HIDTA, 2014)
32 (Office of National Drug Control Policy, 2015)
33 (Oregon HIDTA, 2014)
34 (Healy, 2014)

Still, it is in the best interest of the state to limit the negative impacts of unregulated cannabis production and consumption.[35]

Stricter controls on the production and sale of medical marijuana will reduce illicit market supply and remove a significant obstacle for the introduction of a well-regulated, recreational market.[36] Restructuring medical marijuana production in Oregon around more professional and better-regulated organizations that have the ability to provide an adequate supply for the needs of the state's medical patients will foster the growth of the recreational market and protect the state from the damage done by unregulated organizations that currently supply the OMMP.

# CONCLUSION

Assuming comparable regulation to both the recreational and medical markets, we believe that in time, the Oregon medical market will shrink with the growth of the recreational market. However, if regulations remain loose, medical marijuana growers will likely continue to produce at current levels, despite a stabilizing legal market (and shrinking medical demand). This will likely continue the trend of diverting excess production outside the state in direct violation of the eight federal enforcement priorities outlined in the second Cole Memo from the U.S. Department of Justice.

35 (Pacula, Powell, Heaton, & Sevigny, 2015)

36 (Pacula, Powell, Heaton, & Sevigny, 2015)

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# APPENDIX

## TABLE 6: REGISTERED PATIENTS AND GROW SITES BY COUNTY[37]

| COUNTY | PATIENTS | GROW SITES | MAX PLANT COUNT | % OF STATE GROW SITES | COUNTY POPULATION | % OF STATE POP. | % OF PATIENT POP. |
|---|---|---|---|---|---|---|---|
| Baker | 256 | 152 | 1,536 | 0.4% | 16,280 | 0.4% | 0.4% |
| Benton | 1,068 | 549 | 6,408 | 1.5% | 87,725 | 2.2% | 1.6% |
| Clackamas | 5,008 | 2,901 | 30,048 | 8.1% | 386,080 | 9.9% | 7.3% |
| Clatsop | 667 | 380 | 4,002 | 1.1% | 37,270 | 1.0% | 1.0% |
| Columbia | 939 | 573 | 5,634 | 1.6% | 49,850 | 1.3% | 1.4% |
| Coos | 1,645 | 963 | 9,870 | 2.7% | 62,860 | 1.6% | 2.4% |
| Crook | 386 | 220 | 2,316 | 0.6% | 20,690 | 0.5% | 0.6% |
| Curry | 870 | 471 | 5,220 | 1.3% | 22,300 | 0.6% | 1.3% |
| Deschutes | 3,491 | 1,830 | 20,946 | 5.1% | 162,525 | 4.1% | 5.1% |
| Douglas | 2,386 | 1,421 | 14,316 | 4.0% | 108,850 | 2.8% | 3.5% |
| Grant | 105 | 69 | 630 | 0.2% | 7,435 | 0.2% | 0.2% |
| Harney | 106 | 63 | 636 | 0.2% | 7,260 | 0.2% | 0.2% |
| Hood River | 317 | 196 | 1,902 | 0.5% | 23,295 | 0.6% | 0.5% |
| Jackson | 7,962 | 3,240 | 47,772 | 9.1% | 206,310 | 5.3% | 11.6% |
| Jefferson | 358 | 231 | 2,148 | 0.6% | 22,040 | 0.6% | 0.5% |
| Josephine | 5,160 | 2,482 | 30,960 | 6.9% | 82,815 | 2.1% | 7.5% |
| Klamath | 1,228 | 765 | 7,368 | 2.1% | 66,810 | 1.7% | 1.8% |
| Lake | 128 | 89 | 768 | 0.2% | 7,895 | 0.2% | 0.2% |
| Lane | 7,577 | 4,134 | 45,462 | 11.6% | 356,125 | 9.1% | 11.1% |
| Lincoln | 1,258 | 662 | 7,548 | 1.9% | 46,560 | 1.2% | 1.8% |
| Linn | 2,021 | 1,077 | 12,126 | 3.0% | 118,665 | 3.0% | 2.9% |
| Malheur | 519 | 305 | 3,114 | 0.9% | 31,440 | 0.8% | 0.8% |
| Marion | 3,860 | 2,055 | 23,160 | 5.7% | 322,880 | 8.2% | 5.6% |
| Morrow | 67 | 50 | 402 | 0.1% | 11,425 | 0.3% | 0.1% |
| Multnomah | 12,014 | 5,967 | 72,084 | 16.7% | 756,530 | 19.3% | 17.5% |
| Polk | 1,062 | 583 | 6,372 | 1.6% | 77,065 | 2.0% | 1.5% |
| Tillamook | 558 | 325 | 3,348 | 0.9% | 25,375 | 0.6% | 0.8% |
| Umatilla | 614 | 351 | 3,684 | 1.0% | 77,895 | 2.0% | 0.9% |
| Union | 376 | 223 | 2,256 | 0.6% | 26,325 | 0.7% | 0.5% |
| Wallowa | 139 | 73 | 834 | 0.2% | 7,045 | 0.2% | 0.2% |
| Wasco | 440 | 292 | 2,640 | 0.8% | 25,810 | 0.7% | 0.6% |
| Washington | 4,737 | 2,362 | 28,422 | 6.6% | 550,990 | 14.1% | 6.9% |
| Yamhill | 1,180 | 664 | 7,080 | 1.9% | 101,400 | 2.6% | 1.7% |
| Gilliam/Sherman/Wheeler | 68 | 50 | 408 | 0.1% | 5,155 | 0.1% | 0.1% |
| Outside of Oregon | 1,659 | N/A | 9,954 | | | | |
| **Total** | **70,229** | **35,768** | **421,374** | | **3,918,975** | | |

37 (Oregon Health Authority, 2015)

**TABLE 7:**

**ANNUAL MEDICAL MARIJUANA PRODUCTION IN OREGON UNDER VARIOUS YIELD SCENARIOS**

(HIGHLIGHTED SCENARIOS CONSIDERED HIGHLY UNLIKELY)

| OUTDOOR YIELD | INDOOR YIELD | % OUTDOOR CULTIVATION | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0% | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |
| 1 | 0.046875 | 79,008 | 113,244 | 147,481 | 181,718 | 215,954 | 250,191 | 284,427 | 318,664 | 352,901 | 387,137 | 421,374 |
| 1 | 0.0625 | 105,344 | 136,947 | 168,550 | 200,153 | 231,756 | 263,359 | 294,962 | 326,565 | 358,168 | 389,771 | 421,374 |
| 1 | 0.078125 | 131,679 | 160,649 | 189,618 | 218,588 | 247,557 | 276,527 | 305,496 | 334,466 | 363,435 | 392,405 | 421,374 |
| 1 | 0.09375 | 158,015 | 184,351 | 210,687 | 237,023 | 263,359 | 289,695 | 316,031 | 342,366 | 368,702 | 395,038 | 421,374 |
| 5 | 0.046875 | 79,008 | 281,794 | 484,580 | 687,366 | 890,153 | 1,092,939 | 1,295,725 | 1,498,511 | 1,701,298 | 1,904,084 | 2,106,870 |
| 5 | 0.0625 | 105,344 | 305,496 | 505,649 | 705,801 | 905,954 | 1,106,107 | 1,306,259 | 1,506,412 | 1,706,565 | 1,906,717 | 2,106,870 |
| 5 | 0.078125 | 131,679 | 329,198 | 526,718 | 724,237 | 921,756 | 1,119,275 | 1,316,794 | 1,514,313 | 1,711,832 | 1,909,351 | 2,106,870 |
| 5 | 0.09375 | 158,015 | 352,901 | 547,786 | 742,672 | 937,557 | 1,132,443 | 1,327,328 | 1,522,214 | 1,717,099 | 1,911,985 | 2,106,870 |
| 10 | 0.046875 | 79,008 | 492,481 | 905,954 | 1,319,427 | 1,732,901 | 2,146,374 | 2,559,847 | 2,973,320 | 3,386,794 | 3,800,267 | 4,213,740 |
| 10 | 0.0625 | 105,344 | 516,183 | 927,023 | 1,337,862 | 1,748,702 | 2,159,542 | 2,570,381 | 2,981,221 | 3,392,061 | 3,802,900 | 4,213,740 |
| 10 | 0.078125 | 131,679 | 539,885 | 948,092 | 1,356,298 | 1,764,504 | 2,172,710 | 2,580,916 | 2,989,122 | 3,397,328 | 3,805,534 | 4,213,740 |
| 10 | 0.09375 | 158,015 | 563,588 | 969,160 | 1,374,733 | 1,780,305 | 2,185,878 | 2,591,450 | 2,997,023 | 3,402,595 | 3,808,168 | 4,213,740 |
| 20 | 0.046875 | 79,008 | 913,855 | 1,748,702 | 2,583,549 | 3,418,397 | 4,253,244 | 5,088,091 | 5,922,938 | 6,757,786 | 7,592,633 | 8,427,480 |
| 20 | 0.0625 | 105,344 | 937,557 | 1,769,771 | 2,601,984 | 3,434,198 | 4,266,412 | 5,098,625 | 5,930,839 | 6,763,053 | 7,595,266 | 8,427,480 |
| 20 | 0.078125 | 131,679 | 961,259 | 1,790,840 | 2,620,420 | 3,450,000 | 4,279,580 | 5,109,160 | 5,938,740 | 6,768,320 | 7,597,900 | 8,427,480 |
| 20 | 0.09375 | 158,015 | 984,962 | 1,811,908 | 2,638,855 | 3,465,801 | 4,292,748 | 5,119,694 | 5,946,641 | 6,773,587 | 7,600,534 | 8,427,480 |

**TABLE 8:**

**QUALIFYING CONDITIONS FOR MEDICAL MARIJUANA IN COLORADO, CANADA AND OREGON**

| COLORADO | CANADA | OREGON |
|---|---|---|
| Cancer | Cancer | Cancer |
| Cachexia | Cachexia | Cachexia |
| HIV/AIDS | HIV/AIDS | HIV/AIDS |
| Seizures | Seizures/Epilepsy | Seizures |
| Glaucoma | Multiple Sclerosis | Glaucoma |
| Persistent Muscle Spasms | Spinal Cord Injury | Hepatitis C |
| Severe Nausea | Spinal Cord Disease | Severe Nausea |
| Severe Pain | Severe Arthritis | Severe Muscle Spasms |
| | Severe Pain | Multiple Sclerosis |
| | Debilitating Conditions | Crohn's Disease |
| | | Alzheimer's Disease |