

# Mainstreaming marijuana

## Pot legalization is revealing unintended consequences

By Markian Hawryluk  
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Sitting in her counselor's office, the 41-year-old Bend mother of five fingered a plastic silver cross on a loop of clear beads. As the words became more difficult to form, she squeezed her eyes shut. Her mascara began to run. She rubbed the cross harder and harder, searching for strength and with a slight stutter, uttered the almost unthinkable words ...

"I chose drugs over my kids."

She started smoking marijuana at 18, and over the ensuing two decades, has been able to stay sober for barely more than a year. Now the mother, who asked not to be identified, is facing the sobering reality that she would lose the last of her children.

Her parents took away her oldest daughter just after she was born. Child services took her second daughter and placed her in a foster home. Courts granted custody of her youngest child to the biological father. And now a judge is set to rule on terminating her parental rights to her two boys.

"I feel like this is it," she sobbed. "This is it."

She said she came from a good home in Bellevue, Washington, and was resistant to trying drugs, but a boy talked her into it, and soon she was hooked.

"It came on really quickly," she said. "You always knew who had it, and you'd go to their house or that sort of thing."

She dropped out of high school and had no job. She left her parents' home at 22, moved in with a man who used methamphetamines and had three children with him. When the relationship turned violent, she retreated behind a cloud of smoke.

"My way to take care of that pain is to smoke pot," she said. "I have so much buried inside me, and it's too hard. So the minute I start thinking about it, I just want to go smoke, so I can get rid of it."

She's been diagnosed with depression, post-traumatic stress disorder and just recently, bipolar disorder. Twice she's entered rehab and completed a residential treatment program, only to relapse again and again.

"Life has handed her a pretty crappy hand," said Talie Wenick, her counselor at BestCare Treatment Services in Bend. "And it's just the cycle of addiction."

Now homeless and estranged from her family, smoking marijuana remains her only escape from the pain, her only way of coping with the shame and guilt of being unable to break her addiction for the sake of her kids.

“Everybody that has an addiction like mine; we are all suffering from one thing or another that makes us want to numb,” she said. “We can’t deal with what’s going on inside, so we want to numb.”

When Oregon voters debated legalizing recreational use of marijuana, proponents argued that marijuana was relatively harmless, that it differed little from other legal drugs like alcohol and tobacco. While the vast majority of individuals who use marijuana will suffer no ill effects, data from Oregon and other states that have fully legalized marijuana sales show there are real risks with marijuana use that may have not been fully appreciated.

When Colorado was the first state to legalize recreational use of marijuana, Gov. John Hickenlooper called it “one of the great social experiments of the century.” But the early returns in Colorado and Oregon suggest that states could soon regret their decisions.

#### Worrisome trends

Emergency room data from the four Central Oregon hospitals in the St. Charles Health System show a rise in marijuana-related cases since 2010, with two clear steps: the first, in the summer of 2014 as debate over Ballot Measure 91 to legalize recreational use heated up, and the second, after recreational sales began on Oct. 1, 2015.

From 2010 to 2012, St. Charles registered between 205 and 229 marijuana-related cases per year. That number jumped to 1,388 in 2014, and 2,251 in 2015. Through the first eight months of 2016, the hospital has seen an average of 552 marijuana-related cases per month, on track for a total of more than 6,600 for the year.

“When we run a urine drug screen, the number of people who test positive for marijuana is amazingly high,” said Dr. David Rosenberg, an emergency medicine physician at St. Charles Bend. “It’s never surprising with any person under 50.”

Marijuana use has become so prevalent and so accepted that many of his patients don’t think of it as a drug. He formerly asked patients in his initial exam if they smoke, drink or use drugs, and generally patients say no to all three. When their lab work comes back positive for marijuana anyway, most claim it’s medicinal.

“Now my interview is, do you smoke cigarettes, do you consume alcohol, do you use marijuana or any other drugs?” Rosenberg said.

Some of the increase likely reflects patients being much more willing to admit using marijuana, now that it’s legal. But the increase has been so dramatic, Rosenberg said it’s hard to conclude there hasn’t been a major increase in use.

Even more worrisome is the number of children among those cases. Prior to 2014, the hospital system had never seen more than seven children for marijuana-related issues in a single month. Since recreational use was legalized, increasing the supply of marijuana-laced edibles on the market, pediatric cases have hit double digits — ranging from 11 to 21 cases — in nine out of 11 months.

In February, an 8-year-old boy in Klamath Falls found a packaged cookie while at a local rock quarry, and despite being told to leave it alone, the boy ate the entire thing. The cookie was laced with 50 milligrams of THC.

He told his mother that everything he saw looked like a cartoon and that he felt like he was choking. He was given intravenous fluids and spent five hours in a hospital emergency room before being released.

“There’s no antidote, there’s no way to decontaminate,” Rosenberg said. “You just have to wait for it to be metabolized.”

The results mirror what has been happening in other states with recreational use. An analysis of emergency department records at the Children’s Hospital Colorado, in Aurora, found 81 kids with a positive urine drug screen for marijuana or a marijuana-related billing code from 2009 to 2015. In the two years prior to legalization in 2012, marijuana ingestion accounted for 4.3 out every 1,000 ED visits at the children’s hospital. In the two years after legalization, the rate increased to 6.4 per 1,000 visits, or slightly more than a 50 percent increase.

The median age of those patients was only 2.4 years.

Nearly half of the cases involved an edible product — cookies, brownies, cake, candy or popcorn — and 1 in 3 children had to be admitted to the hospital. Some were so ill they had to be placed on ventilators in the ICU. One child died from heart problems, although it is unclear how much marijuana contributed to that death.

The numbers of marijuana poisonings still lag behind ingestions of other over-the-counter medications or household products. But Dr. George Wang, a pediatrician with the Colorado hospital and lead author of the analysis, said marijuana still isn’t nearly as prevalent as those other products in people’s homes.

“This is the beginning of the marijuana industry, and if it becomes as popular as alcohol and cigarettes have become and becomes just as available, I think we’re going to see numbers that are quite large,” he said. “I think it’s the trend we have to pay attention to. We don’t want to wait until that point.”

Wang and his colleagues also looked at calls to the poison control center in Colorado, where the annual number of calls for kids ingesting marijuana increased from nine in 2009 to 47 in 2015. Again most cases involved toddlers, with a mean age of 2.

“The majority of pediatric poisonings occur unintentionally,” said Dr. Alexander Garrard, clinical managing director of the Washington state poison center. “Marijuana edibles left lying around on the coffee table or next to snacks can easily fall into the hands of young kids.”

In Washington, the number of marijuana edible intoxication calls in King County rose 73 percent from 2013 to 2014, and children under 5 accounted for about 30 percent of all edible marijuana intoxication reports.

A 2015 analysis of data from the National Poison Data System found that nationwide between 2006 and 2013, the rate of children exposed to marijuana increased 148 percent. Rates were highest in states that had legalized recreational use, but even in states with medical marijuana, more kids were ingesting pot than in states where no marijuana was legal.

Colorado officials were surprised by the interest in edibles, which they thought would be a small segment of the market but accounted for 45 percent of sales in the first year after legalization. Edibles pose a unique challenge because no other drug is infused into palatable and appetizing form for kids, or one that is so often indistinguishable from noninfused products. The federal Drug Enforcement Agency has confiscated marijuana products, such as “Pot Tarts” or “KeefKats,” whose packaging closely resemble commercial snack foods marketed toward kids.

“Why we think it’s OK to dress up a piece of marijuana as a gummy bear when we won’t put a cartoon character on a pack of cigarettes is somewhat beyond me,” Dr. Gillian Salton, an emergency physician in Bend said at a recent panel discussion on marijuana.

States have mandated child-resistant packaging for marijuana edibles, and Colorado recently passed legislation to prevent sales of marijuana that looks like common candies. Marijuana gummies must now be sold in cubes or other generic forms, rather than in the traditional gummy bear shape.

#### Poison center calls

In Oregon, marijuana-related poison control calls spiked after criminal penalties were reduced in July 2013, again when voters approved Measure 91 in 2014 and when possession became legal in July 2015. The number of calls continued to rise after early retail sales began in October 2015 and have more than doubled in frequency during the first half of 2016.

“Poison centers usually get a subset of total cases, and we usually get the worse cases, because physicians are calling us to consult on the details,” said Dr. Robert Hendrickson, associate medical director of the Oregon Poison Center at Oregon Health & Science University. “I would suspect there are a lot more cases than we’re getting.”

The center is repeatedly fielding calls from people who have accidentally consumed too much. Middle-age or older individuals, who had tried marijuana in their youth, decide to light up again only to find today’s pot is so much stronger than the weed of their college days. Soon they’re sweaty, they’re anxious, their hearts are racing and they’re hallucinating.

Emergency rooms are seeing an influx of patients with a vomiting syndrome that has been tied to marijuana use. Dr. Emily Osborn, an emergency physician in Bend, said before she moved to Central Oregon five years ago, she had never seen a patient with the syndrome.

“Now it seems I can’t go through a shift without seeing one,” she said.

Other casual users of marijuana consume too much because producers are playing with serving sizes to get under the legal limit. Potency of cannabis is usually judged by the amount of tetrahydrocannabinol or THC. A single edible serving in Colorado and Washington can contain no more than 10 milligrams of THC, and first-time users are encouraged to start with half that amount. Yet, cookies, brownies and chocolate bars that most people would eat in a single serving often contain up to 50 mg in total.

Others get too large a dose because it can take 30 to 90 minutes for the effect to kick in. They eat a serving and feel nothing, so they eat two or three more. When the drug finally hits, the dose is too much for them.

“We’re seeing concentration levels that are off the charts,” said Ed Shemelya, director of the National Marijuana Initiative, a federally funded marijuana education campaign. “To me, that is the scary part of this ordeal. Nobody is regulating the levels of THC, and whatever mechanisms that are in place to limit access to young people aren’t working.”

#### Increasing potency

Today’s pot is much stronger than the weak homegrown versions many people have experienced. Researchers at the University of Mississippi have tested more than 38,000 marijuana samples provided by the DEA from drug seizures across the country since 1995. The average strength of marijuana in the U.S. has grown from about 4 percent THC in 1995 to nearly 12 percent in 2014. Even that may not capture the full extent, as many of the seizures involved immature plants, which would have even higher THC content by the time of distribution. In states that legalized marijuana for medicinal or recreational use, average THC content was 8.73 percent, compared with 5.42 percent in states where it is illegal.

Cannabis growers have been hybridizing marijuana plants to breed more potent strains with more and more THC. But that has also resulted in a drop of cannabidiol, or CBD, a natural anti-psychotic that many researchers believe has a counterbalance effect on THC.

University of Mississippi testing found CBD content has dropped from 0.5 percent in 2004 to less than 0.2 percent in 2014. The ratio of THC to CBD increased from 15 to 80 over the past 20 years. It’s the equivalent of flooring the gas while disabling the brakes, and it’s had predictably tragic results.

“The rate of increase in ED admissions almost parallels the rate of increase in cannabis potency over time,” the researchers wrote in a 2015 report.

“It’s been surprising how strong a lot of the marijuana is,” said Andy LaFrate, president and director of research of Charas Scientific, one of eight labs certified to do potency testing in Colorado last year. “We’ve seen potency values close to 30 percent THC, which is huge.”

## Psychotic reactions

The higher the potency of marijuana, the higher the likelihood of psychosis, defined as a profound disturbance in thought, feeling or behavior with a loss of reality.

In 2009, Lori Robinson and her husband received a call in the middle of the night that their 23-year-old son Shane had just been arrested. Unbeknownst to his parents, he had been using marijuana for years, and now just two months after his wedding in 2009, his bride had called 911 concerned about his erratic behavior.

When they arrived at the psychiatric facility in Ventura, California, Shane was being ushered into a cab, with no money in his pockets and no grasp on reality. The staff had determined he was not a danger to himself or others and discharged him. Shane got into his parents car and as they drove the Southern California freeways, he talked of bombed-out buildings and rambled that they needed to go save Obama. At one point, he tried to jump from the moving car as it barreled down U.S. Highway 101.

“It was the most terrifying moment for my husband and me,” she said. “We were witnessing our own son’s mind breaking down.”

Robinson thought Shane must have taken LSD or some other hallucinatory drug.

““I just smoked pot,”” she recalled Shane reassuring her. ““But don’t worry. It’s harmless, just an herb.””

The Robinsons persuaded their son to enter a psychiatric hospital, where drug tests came back positive only for the one drug he admitted to using.

Shane continued to smoke marijuana after his discharge and in 2011, suffered another psychotic break. Again, he entered a psychiatric facility. His wife left him. His friends distanced themselves. He lost his job.

By 2012, he had moved into his family’s cabin near Yosemite. Then, on Jan. 13, his mother suddenly got a feeling that something had gone terribly wrong. Unable to contact him, she and her husband raced to the cabin, finding a note on the door warning them what they were about to find inside. Two lines in the note still gnaw at her years later: “There is nothing anyone could have done for me. My choices led me to this point. I can’t go on anymore.”

“We have already begun to lose a whole generation of kids,” Robinson said. “My son was at the forefront of it all.”

The link between marijuana use and schizophrenic-like psychosis has been known for decades. U.S. Army medics reported cases during the Vietnam War, and dozens of researchers in Europe and Australia have documented the risks.

There has been scant research done in the U.S. because of federal prohibitions on cannabis studies, and what research has been done has been mainly with the older, weaker strains of marijuana.

“The old version of pot would increase the risk for schizophrenia about twofold, and now with the high strength, we’re up to about fivefold,” said Dr. Christine Miller, a Baltimore pharmacologist specializing in neuroscience. “That equates to about 1 out of every 20 people who are moderately heavy users, and the risk begins to increase dramatically with weekly use.”

Methamphetamines, PCP and cocaine are all known to cause temporary psychosis, but there’s evidence that with marijuana the risk of it progressing to a schizophrenia-type disorder is higher.

“About half of those who experience a marijuana-induced psychosis, which can be temporary, will go on to be chronically mentally ill (with continued use),” Miller said.

She added that there’s likely a genetic component that predisposes someone to psychotic reactions to THC, but as yet, nobody knows precisely what it is or how to test for it.

The notion that long-term marijuana use can lead to schizophrenia remains controversial.

Dr. Magnus Lakovics, a psychiatrist who treats patients in the emergency room at St. Charles Bend, said a significant number of patients presenting with mental health problems also use marijuana, and that makes it difficult to determine whether their psychosis is being caused by marijuana or some underlying mental illness.

“It feels like more patients are using marijuana because it’s legal,” Lakovics said. “There’s no question we talk about it in our team meetings every day: are they in here because they used marijuana or are they here because of other factors in their illness?”

It’s further complicated by studies that show symptoms of schizophrenia can manifest earlier with marijuana use. The drug could in some way trigger the condition for which people already have a genetic predisposition.

“That’s hard to tell when somebody comes in with a psychosis who’s been using extensive amounts of marijuana whether they have schizophrenia or whether they have psychosis from marijuana,” Lakovics said. “You don’t know which came first, the chicken or the egg.”

Sally Schindel, of Prescott, Arizona, has wrestled with this exact question about her son. Andy Zorn completed three years of active duty with the U.S. Army’s 82nd Airborne Division, but at age 25 became addicted to marijuana. He spent five years in a downward spiral, marked by repeated calls to the suicide hotline, hospitalizations in at least five different mental hospitals, and two court-ordered mental health treatments.

In 2013, he was arrested for alleged marijuana use and entered a diversion program that included regular drug testing. In that brief window of sobriety, he told his mother quitting marijuana was much harder than he ever thought possible. She would later read in his medical records that he had been diagnosed with severe cannabis use disorder, a psychiatric term for those addicted to marijuana and unable to stop.

The following year, his father found his body in the midst of a heavy, pouring Arizona rain.

“My soul is already dead,” Zorn wrote in his final note. “Marijuana killed my soul + ruined my brain.”

Miller says the risk of suicide increases seven-fold with marijuana use, and with the current generation of edibles and super-potent weed, it can happen even with the first use.

“They can be tripped into sudden suicidal ideation. It just comes out of nowhere,” she said. “For some people, it just takes one exposure and it sends them over the edge.”

Miller points to two cases that occurred in Colorado after legalization. In 2014, Levy Thamba, a 19-year-old college student from Wyoming, jumped from a Denver hotel balcony after eating an entire cookie. The cookie, which was labeled as having 6.5 servings, contained 65 mg of THC. That same year, Richard Kirk shot his wife Kristine Kirk, after eating a marijuana-laced product in Denver. His children have filed the nation’s first wrongful-death lawsuit against a marijuana manufacturer. Toxicology screens showed neither had any other drug in their system.

Such cases are hard to fathom for people who smoked the milder forms of marijuana decades ago, or the vast majority of people who can use today’s higher potency versions and suffer no adverse effects. That undoubtedly led to the perception that marijuana is a harmless drug and boosted legalization efforts.

Stricken by her son’s death, Schindel began to dig into the links between marijuana use and depression and suicide. She visited marijuana dispensaries in Colorado and Arizona, asking them to educate her about the risks.

“The problem is the industry is telling their customers that it’s not addictive,” she said. “They told me there’s no such thing as cannabis use disorder. They told me the insurance industry made that up so they could get reimbursement.”

According to the National Institute on Alcohol Abuse and Alcoholism, 2.5 percent of U.S. adults — nearly 6 million people — experienced cannabis use disorder in the past year, and 6.3 percent meet the diagnostic criteria for the disorder at some point in their lives.

Current data suggests that 1 in 10 people who use marijuana will become addicted and require treatment to stop. Some 17 percent of people in treatment for substance abuse cite marijuana as their primary addiction, and many list it as their second or third drug of choice.

“People say it’s a victimless crime. It’s not victimless by any means,” Schindel said. “It’s life changing for the entire family. There are plenty of victims to go around.”

## Teens and pot

Much of the public health approach to minimizing the harms from marijuana has focused on preventing a new generation of victims, a page directly out of the tobacco prevention playbook. Several high-profile surveys of adolescent use of marijuana seem to suggest that so far there has been little impact.

The CDC’s Youth Risk Behavior Surveillance System study released in June as well as a recent study from the Substance Abuse and Mental Health Services Administration found that youth marijuana use nationally has remained constant. And a Washington University in St. Louis survey of 216,000 adolescents found that previous month pot use was down 10 percent.

But critics say those top-line conclusions mask the great variation between states and within them. The CDC study, for example, didn’t include any data from Washington or Oregon and insufficient data from 10 states, including Colorado. The state-funded Healthy Kids Colorado Survey in June found the percentage of teens who used marijuana in the past month rose slightly from 19.7 percent in 2013 to 21.2 percent in 2015. But within the state there were profoundly different results. Region 12, which includes mountain resort communities such as Breckenridge, Vail and Aspen, had a 90 percent increase in use among high school seniors and a 55 percent increase among sophomores. One out of 3 juniors in Denver reported marijuana use, a 20 percent increase from 2013 to 2015.

“Those are hot spots,” Miller, the Baltimore pharmacologist, said. “If they were treating this like a normal public health issue, they would have said, ‘We have problem areas. We are going to go in and figure out what to do, how to intervene.’”

In more conservative areas of the state, where communities have banned marijuana sales, many had lower rates of use. Seven out of 17 regions that had enough participation to be counted saw an overall drop in marijuana use.

“The state should be going in and finding out what they are doing right,” Miller said.

The Substance Abuse and Mental Health Services Administration study also showed a clear link between teen use and legalizing marijuana just for medical use. Of the 25 states with the highest teen-use rates in 2014, 22 had legalized medical marijuana. Of the 25 states with the lowest teen use, only one had.

It’s unclear whether legalizing marijuana for adults has led teens to be more forthright about their still-illegal use. But all four states with legalized marijuana program were in top 10 for teen use: Colorado ranked first, Oregon fourth, Washington fifth.

“Colorado, people have labeled as a social experiment, they’re basically the petri dish right now into what’s going on,” Shemelya, director of the National Marijuana Initiative, said. “I suspect in

the next SAMHSA survey, those three states will be one, two and three. They're all following a very similar pattern.”

### A new message

The shift has public health officials playing catch-up. Marijuana use had previously fallen under the category of illegal drugs, but post-legalization, health departments must shift course to combat underage use of a drug that's now legal for adults, much like alcohol or tobacco.

Alcohol and tobacco prevention messaging to teens in Oregon has relied primarily on promoting healthy norms, stressing that most high school students abstain, appealing to teen desires to fit in. But when state and county public health officials conducted focus groups with Oregon teens about marijuana messaging, they found those same messages didn't work.

“The perception that marijuana is so common and that everybody is using it is so strong right now that we couldn't break it apart,” said Nick Stevenson, a health educator with the Deschutes County Health Services.

Instead, campaigns will urge Oregon teens to “Be True To You,” to make their own decisions.

Oregon has launched a \$4 million pilot marijuana-prevention campaign targeting teens in the Portland metro area and Josephine and Jackson counties in Southern Oregon. The state Legislature would need to approve additional funding to take that statewide. Deschutes County is planning its own prevention campaign using much of the same message.

The focus groups with Oregon teens suggest they don't want platitudes or scare tactics, they want to know about the scientific research into how marijuana will affect their brains long term.

“They don't react well to the ‘Just Say No’ messaging. It's patronizing,” Stevenson said. “They have the view that there's a lot of biased sources of information and they see it on both sides, the pro and the con.”

There is good evidence that the earlier someone starts using marijuana, the greater the risk for addiction and for cognitive issues.

“The brain isn't mature, it's not fully hardwired when you're born,” said Dr. Darryl Inaba, director of clinical and behavioral health services at the Oregon Addictions Recovery Center in Medford and an internationally recognized expert on addiction. “It goes through waves of development in which the brain develops slowly from the back forward. Your decision-making, your executive functioning part of the brain, your frontal cortex, that's the last part of the brain to develop.”

Researchers from the Center for Brain Health at the University of Texas in Dallas recently imaged the brains of heavy users who started before the age of 16. They found arrested brain development, particularly in the prefrontal cortex, the part of the brain responsible for judgment, reasoning and complex thinking.

In typical adolescent brain development, the brain prunes neurons over time, resulting in reduced cortical thickness and a greater contrast between gray and white matter. And the more pruning, the more the brain adds wrinkles and folds to its surface. MRIs found those who started smoking marijuana early had greater cortical thickness, less gray and white matter contrast and fewer folds. The extent of brain alteration, the researchers found, was directly related to the amount of marijuana smoked.

A 2012 Duke University study that followed more than 1,000 individuals from birth till age 38 found that those who smoked marijuana more than once a week before age 18 experienced a six-point drop in IQ from age 13 to 38. Those who didn't use marijuana experienced a slight increase in IQ.

“If you expose yourself to marijuana, that’s going to interfere with brain development, you’re at much higher risk for developing marijuana addiction, psychosis, memory problems and IQ issues,” Inaba said. “Our message to kids, just say no, seems to be stupid. The message should be: Wait and give your brain a chance.”

That message may be getting lost in a sea of pro-marijuana messaging. Legalization and state taxation of the product has legitimized the notion that marijuana is harmless. The more cannabis products are mainstreamed, the more the just-an-herb mindset takes hold. The green crosses marking dispensaries have become commonplace in Bend, Portland and cities in Oregon. This year’s Oregon State Fair had a cannabis-growing exhibition as part of its horticulture competitions, providing blue, purple and yellow ribbons in three growing categories.

Schools in Oregon and Washington are reporting increased numbers of marijuana products and paraphernalia being confiscated.

“The attitudes have definitely changed,” said Dr. Yolanda Evans, assistant professor of adolescent medicine at Seattle Children’s Hospital. “They’ll say, ‘marijuana is natural, it’s an herb.’ ‘It’s not going to do anything to me.’ ‘It’s legal, so that means it must be OK.’”

Surveys show many teens consider marijuana to be less harmful than alcohol and less addicting than nicotine or other drugs.

“The general mindset of society is that it’s not addicting,” Inaba said. “Even when we get people coming in for marijuana addiction in a residential program, they’re still snickered and laughed at. People say, “‘Why don’t you go out and get a real addiction, like heroin?’”

As the perception of risk goes down, so do people’s risk-mitigation strategies. A recent survey of college students at two major universities in Washington state and Wisconsin found that of the 20 percent of students who admitted to using marijuana, 44 percent of males and 9 percent of females said they drove after using.

Driving high

The proportion of marijuana-positive drivers involved in fatal motor vehicle crashes in Colorado has increased dramatically since the commercialization of medical marijuana in 2009, from 4.5 percent in the first six months of 1994, to 10 percent in the last six months of 2011.

Researchers from the National Highway Transportation Safety Administration took voluntary but anonymous oral and blood drugs tests of drivers in Washington state and found the THC-positive rate had increased from 7.8 percent before legalization to 18.9 percent one year after. The rate of fatal crashes with marijuana-impaired drivers in Washington doubled after the state legalized recreational use, from 8 percent in 2013 to 17 percent in 2014.

One of those crashes killed Jennifer Barry. An avid photographer, the 43-year-old Beaverton woman left her home at 4 a.m. on July 4, 2015 to photograph horses at Emerald Downs in Auburn, Washington. She never made it.

At 5:39 a.m., near milepost 100 on northbound Interstate 5, a white Chrysler 500 hit Barry's Volkswagen Jetta from behind at more than 120 miles per hour. The driver, Patrick Martin, 27, of Seattle, had been smoking marijuana. According to court records, he told police he had fallen asleep while driving and woke up just before hitting Barry's car.

Her husband, Christian Barry, had taken their son, Sean, on a family camping trip to Catalina Island. He had stayed up late, loaded the best photos from their day onto his Facebook page so his wife could see them in the morning. She logged on at 3 a.m. just as he was finishing and they had a brief chat before she left.

After learning of the accident, Barry logged onto to his Facebook account to see what his last words to his wife had been. Have a good trip. Drive safe.

The loss of his wife hit even harder when this year, Sean, 10, was diagnosed with cancer and underwent chemotherapy treatments without her at his bedside.

"He would be much better off with his mother there," Barry said.

The now single father said he never had a strong opinion about marijuana legalization, and the accident hasn't changed his stance. For him it's more an issue of people using it responsibly and understanding the risks.

"Marijuana makes you mellow, and that's great as far as someone's attitude goes," Barry said. "Marijuana impairs your ability to drive in a similar way as alcohol. If people don't understand that, that's the problem."

States have grappled with how to deal with marijuana-impaired drivers, including creating legal limits that specify the amount of THC drivers can have in their system based on a blood test, much like the blood alcohol count used for drunk drivers. But there is no science showing that specific levels of marijuana are a reliable indicator of impairment. Some drivers do just fine with a large amount of THC in their system, while others become intoxicated even at low levels.

“There is understandably a strong desire by both lawmakers and the public to create legal limits for marijuana impairment in the same manner as we do with alcohol,” Marshall Doney, president and CEO of AAA, recently said. “In the case of marijuana, this approach is flawed and not supported by scientific research. It’s simply not possible today to determine whether a driver is impaired based solely on the amount of drug in their body.”

Doney said states should use a positive test for marijuana use along with behavioral or psychological evidence that the driver is impaired.

## Reducing crime

Pro-marijuana advocates have argued that legalization would help to reduce the crime and violence associated with illegal drugs. That hasn’t been the case in Colorado, where legal pot sales have provided additional cover for a thriving underground marijuana trade. In April, DEA agents told the Colorado Springs City Council of more than 186 large-scale cannabis growing operations in the city, mostly destined for out-of-state sales.

“You have to understand what Colorado is,” DEA agent Tim Scott told the City Council, according to the Colorado Springs Gazette. “Afghanistan is the source country for heroin. Venezuela and Colombia are source countries for cocaine. Mexico is the source country for methamphetamines. You are the source state for marijuana.”

Marijuana arrests in Colorado dropped by 46 percent from 2012 to 2014, although most of the decrease was in arrests for possession. Marijuana sales arrests declined 24 percent, while arrests for marijuana production did not change appreciably, according to the Colorado Department of Safety.

In Oregon, marijuana production has now moved into residential areas, with hash oil extraction operations becoming the new meth labs. In the past year, explosions of butane used to extract hash oil have rocked houses in Medford and Springfield, and state police shut down an extraction operation in Bend in April. In Washington state, 17 THC extraction labs exploded in 2014 alone.

Whether any of the adverse effects will be enough to get states to rethink legalization remains to be seen, but with the millions in revenues that states are collecting by taxing legal marijuana, the hurdle seems to get higher every day.

The old version of pot would increase the risk for schizophrenia about twofold, and now with the high strength, we’re up to about fivefold. That equates to about 1 out of every 20 people who are moderately heavy users, and the risk begins to increase dramatically with weekly use.

— Dr. Christine Miller, a Baltimore, Maryland, pharmacologist specializing in neuroscience.

Debate still swirls over the question of whether marijuana has any medicinal value. With the federal government still classifying marijuana as an illegal drug, such research has been hard to do in the U.S. Without that research, clinicians can never weigh the benefits of medical marijuana against its risks the way they do with every other medicine.

But the benefit-to-risk analysis for recreational use of marijuana becomes much simpler. States must eventually decide whether allowing citizens to enjoy the pleasures of marijuana outweighs the negative consequences that some will encounter.

Certainly, alcohol and tobacco use also carries significant risks with few benefits, and contributes greatly to the health care burden in the U.S. Whether the combined toll of marijuana's adverse effects can be tolerated by society remains to be seen. It may be that as more Americans learn how to use marijuana safely, some of the risks will diminish.

That calculus, however, will likely be clouded by the financial concerns.

“What’s happening now is sort of a circling of the wagons,” Miller said. “(Colorado Gov.) Hickenlooper originally was opposed to it. Now that it’s a (done deal) for the sake of tourism, for the sake of the image of the state, they have to make it seem like everything is really OK”

Colorado garnered \$573 million in revenue in the first year of marijuana sales, and it’s become a major tourist draw for the state. The Oregon market may be even bigger. Colorado dealers sold \$5 million of marijuana in their first week, Washington dealers netted just under \$1 million, in part, due to a lack of supply. Oregon dispensers rang up \$11 million in the first week of legal sales, including an estimated \$3.5 million on the first day.

“When have we ever as a society benefited from a sin tax?” Shemelya, with National Marijuana Initiative asked. “Look at the models for alcohol and tobacco and what they cost every year. They’re not even revenue neutral, and neither will this drug be. It’ll end up costing states more than they’ll ever take in, in tax receipts.”