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Now we know what happens to teens when you make pot legal

By **Christopher Ingraham** June 21, 2016

Rates of marijuana use among Colorado's teenagers are essentially unchanged in the years since the state's voters legalized marijuana in 2012, [new survey data](#) from the Colorado Department of Public Health and Environment shows.

In 2015, [21 percent of Colorado youths](#) had used marijuana in the past 30 days. That rate is slightly lower than the national average and down slightly from the 25 percent who used marijuana in 2009, before legalization. The survey was based on a random sample of 17,000 middle and high school students in Colorado.

"The survey shows marijuana use has not increased since legalization, with four of five high school students continuing to say they don't use marijuana, even occasionally," the Colorado health department [said in a news release](#).

The numbers out of Colorado are being closely monitored by policymakers and advocates on both sides of the marijuana legalization divide. Researchers generally agree that marijuana use during adolescence should be strongly discouraged — younger users are [more likely to become dependent](#) on the drug, and teens who use marijuana heavily are [at higher risk](#) of a number of mental and physical health problems later in life.

Opponents have often claimed that marijuana legalization would lead to more kids smoking pot, with all the negative health consequences that would entail. But the scant data available until now hasn't borne this out.

<https://www.washingtonpost.com/news/wonk/wp/2016/06/21/colorado-survey-shows...> 27-01-2017

National surveys have shown that teen marijuana use rates are falling across the country. But there haven't been many numbers available specifically for states such as Colorado and Washington where it is legal. Federal data released late last year showed that teen use rates in Colorado and Washington were essentially flat, but they covered only 2014, the first year commercial marijuana was available in those states.

The latest data from Colorado includes 2015, reflecting two full years of the legal marijuana market's effect. These numbers give the strongest indication yet that fears of skyrocketing adolescent use have not materialized.

"These statistics clearly debunk the theory that making marijuana legal for adults will result in more teen use," Mason Tvert, director of communications for the Marijuana Policy Project, said in a statement. "Levels of teen use in Colorado have not increased since it ended marijuana prohibition, and they are lower than the national average. Elected officials and voters in states that are considering similar proposals should be wary of claims that it will hurt teens."

Smart Approaches to Marijuana, a group opposing legalization, has pointed out that the most recent federal surveys show that teen marijuana use rates in Colorado are among the highest in the country. But this latest survey, conducted by the state of Colorado, shows that teen use rates in that state are about average. Why the discrepancy?

For starters, this latest survey polled a much larger sample of Colorado students, 17,000, than the federal survey, which polls fewer than 400 Colorado teenagers in a given year. That much larger sample could produce a more accurate estimate than the smaller numbers in the federal drug survey.

There's a simple reason why legalization may not be having much of an effect on teen marijuana use — adolescents already report that marijuana is widely available. Nationally, roughly 80 percent of 12th-graders say that pot is easy to get. The kids who want to smoke weed are probably already doing so — and legalization would do little to change that.

Christopher Ingraham writes about politics, drug policy and all things data. He previously worked at the Brookings Institution and the Pew Research Center. 🐦 Follow @_cingraham

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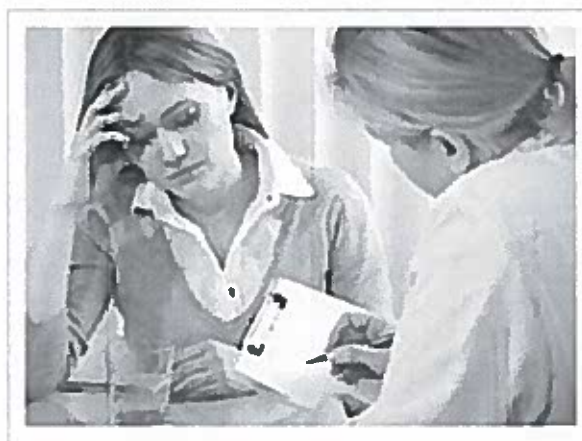
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Principles of Adolescent Substance Use Disorder Treatment: A Research-Based Guide

Print

Is it possible for teens to become addicted to marijuana?

Yes. Contrary to common belief, marijuana is addictive. Estimates from research suggest that about 9 percent of users become addicted to marijuana; this number increases among those who start young (to about 17 percent, or 1 in 6) and among daily users (to 25–50 percent).³² Thus, many of the nearly 7 percent of high-school seniors who (according to annual survey data)³³ report smoking marijuana daily or almost daily are well on their way to addiction, if not already addicted, and may be functioning at a sub-optimal level in their schoolwork and in other areas of their lives.



Long-term marijuana users who try to quit report withdrawal symptoms including irritability, sleeplessness, decreased appetite, anxiety, and drug craving, all of which can make it difficult to stay off the drug. Behavioral interventions, including Cognitive-Behavioral Therapy and Contingency Management (providing tangible incentives to patients who remain drug-free) have proven to be effective in treating marijuana addiction (see [descriptions of these treatments](#)). Although no medications are currently available to treat marijuana addiction, it is possible that medications to ease marijuana withdrawal, block its intoxicating effects, and prevent relapse may emerge from recent discoveries about the workings of the endocannabinoid system, a signaling system in the body and brain that uses chemicals related to the active ingredients in marijuana.

Legalization of marijuana for adult recreational use and for medicinal purposes is currently the subject of much public debate. Whatever the outcome, public health experts are worried about use increasing among adolescents, since marijuana use as a teen may harm the developing brain, lower IQ, and seriously impair the ability to drive safely, especially when combined with alcohol.

Parents seeking more information about the effects of marijuana on teens are encouraged to see information offered on NIDA's Web site: www.drugabuse.gov/drugs-abuse/marijuana.

The Dangers of Inhalants

Various household products, including cleaning fluids, glues, lighter fluid, aerosol sprays, and office supplies like markers and correction fluid, have fumes that are sometimes breathed to obtain a brief, typically alcohol-like high. Because of their ready availability, these are frequently among the earliest substances youth abuse; they are generally less popular among older teens, who have greater access to other substances like alcohol or marijuana.

Although the high from inhalants typically wears off quickly, immediate health consequences of inhalant abuse may be severe: In addition to nausea or vomiting, users risk suffocation and heart failure—called "sudden sniffing death." Serious long-term consequences include liver and kidney damage, hearing loss, bone marrow damage, and brain damage. Although addiction to inhalants is not very common, it can occur with repeated abuse.

Early abuse of inhalants may also be a warning sign for later abuse of other drugs. One study found that youth who used inhalants before age 14 were twice as likely to later use opiate drugs.³⁴ So it is important for parents to safeguard household products and be alert to signs that their younger teens may be abusing these substances.

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National Institute
on Drug Abuse

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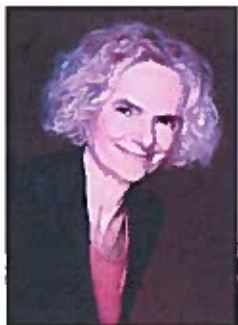
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From the Director



Since its first edition in 1999, NIDA's *Principles of Drug Addiction Treatment* has been a widely used resource for health care providers, families, and others needing information on addiction and treatment for people of all ages. But recent research has greatly advanced our understanding of the particular treatment needs of adolescents, which are often different from those of adults. I thus am very pleased to present this new guide, *Principles of Adolescent Substance Use Disorder Treatment*, focused exclusively on the unique realities of adolescent substance use—which includes abuse of illicit and prescription drugs, alcohol, and tobacco—and the special treatment needs for people aged 12 to 17.

The adolescent years are a key window for both substance use and the development of substance use disorders. Brain systems governing emotion and reward-seeking are fully developed by this time, but circuits governing judgment and self-inhibition are still maturing, causing teenagers to act on impulse, seek new sensations, and be easily swayed by their peers—all of which may draw them to take risks such as trying drugs of abuse. What is more, because critical neural circuits are still actively forming, teens' brains are particularly susceptible to being modified by those substances in a lasting way—making the development of a substance use disorder much more likely.

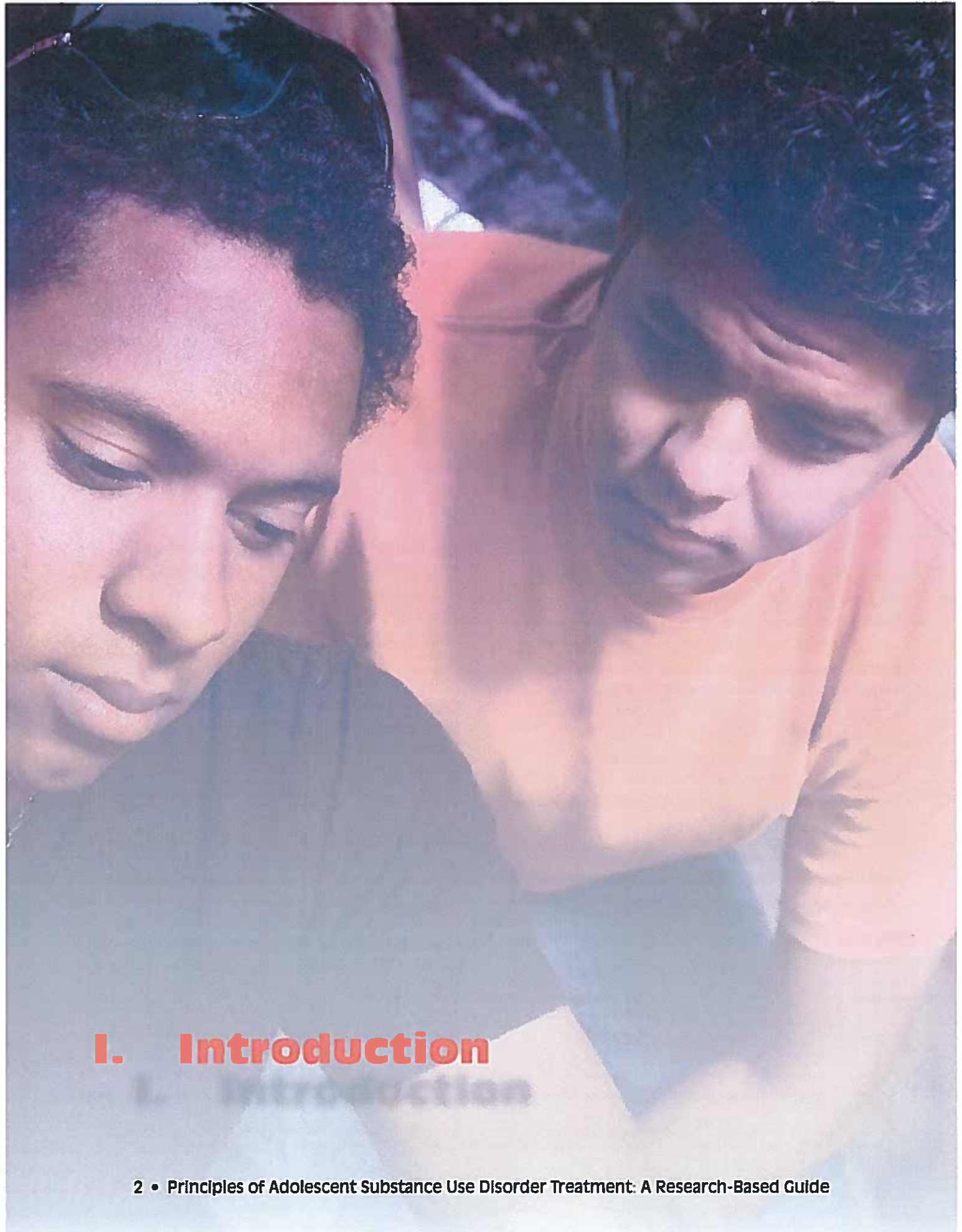
Addiction is not the only danger. Abusing drugs during adolescence can interfere with meeting crucial social and developmental milestones and also compromise cognitive development. For example, heavy marijuana use in the teen years may cause a loss of several IQ points that are not regained even if users later quit in adulthood. Unfortunately, that drug's popularity among teens is growing—possibly due in part to legalization advocates touting marijuana as a “safe” drug. Nor do most young people appreciate the grave safety risks posed by abuse of other substances like prescription opioids and stimulants or newly popular synthetic cannabinoids (“Spice”)—and even scientists still do not know much about how abusing these drugs may affect the developing brain.

These unknowns only add to the urgency of identifying and intervening in substance use as early as possible. Unfortunately, this urgency is matched by the difficulty of reaching adolescents who need help. Only 10 percent of adolescents who need treatment for a substance use disorder actually get treatment. Most teens with drug problems don't want or think they need help, and parents are frequently blind to indications their teenage kids may be using drugs—or they may dismiss drug use as just a normal part of growing up.

Historically the focus with adolescents has tended to be on steering young people clear of drugs before problems arise. But the reality is that different interventions are needed for adolescents at different places along the substance use spectrum, and some require treatment, not just prevention. Fortunately, scientific research has now established the efficacy of a number of treatment approaches that can address substance use during the teen years. This guide describes those approaches, as well as presents a set of guiding principles and frequently asked questions about substance abuse and treatment in this age group. I hope this guide will be of great use to parents, health care providers, and treatment specialists as they strive to help adolescents with substance use problems get the help they need.

A handwritten signature in black ink, appearing to read 'N. Volkow', written over a white background.

Nora D. Volkow, M.D.
Director
National Institute on Drug Abuse



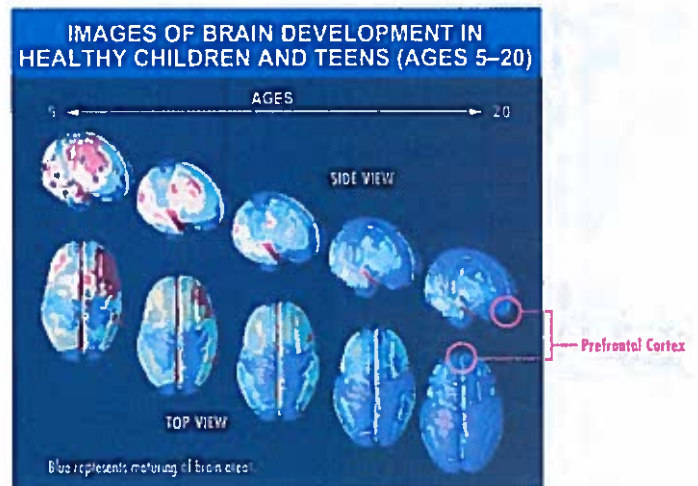
I. Introduction

I. Introduction

People are most likely to begin abusing drugs*—including tobacco, alcohol, and illegal and prescription drugs—during adolescence and young adulthood.‡ By the time they are seniors, almost 70 percent of high school students will have tried alcohol, half will have taken an illegal drug, nearly 40 percent will have smoked a cigarette, and more than 20 percent will have used a prescription drug for a nonmedical purpose.¹ There are many reasons adolescents use these substances, including the desire for new experiences, an attempt to deal with problems or perform better in school, and simple peer pressure. Adolescents are “biologically wired” to seek new experiences and take risks, as well as to carve out their own identity. Trying drugs may fulfill all of these normal developmental drives, but in an unhealthy way that can have very serious long-term consequences.

Many factors influence whether an adolescent tries drugs, including the availability of drugs within the neighborhood, community, and school and whether the adolescent’s friends are using them. The family environment is also important: Violence, physical or emotional abuse, mental illness, or drug use in the household increase the likelihood an adolescent will use drugs. Finally, an adolescent’s inherited genetic vulnerability; personality traits like poor impulse control or a high need for excitement; mental

The adolescent brain is often likened to a car with a fully functioning gas pedal (the reward system) but weak brakes (the prefrontal cortex).



The brain continues to develop through early adulthood. Mature brain regions at each developmental stage are indicated in blue. The prefrontal cortex (red circles), which governs judgment and self-control, is the last part of the brain to mature. Source: PNAS 101 8174–8179, 2004

health conditions such as depression, anxiety, or ADHD; and beliefs such as that drugs are “cool” or harmless make it more likely that an adolescent will use drugs.²

The teenage years are a critical window of vulnerability to substance use disorders, because the brain is still developing and malleable (a property known as neuroplasticity), and some brain areas are less mature than others. The parts of the brain that process feelings of reward and pain—crucial drivers of drug use—are the first to mature during childhood. What remains incompletely developed during the teen years are the prefrontal cortex and its connections to other brain regions. The prefrontal cortex is responsible for assessing situations, making sound decisions, and controlling our emotions and impulses; typically this circuitry is not mature until a person is in his or her mid-20s (see figure, above).

The adolescent brain is often likened to a car with a fully functioning gas pedal (the reward system) but weak brakes (the prefrontal cortex). Teenagers are highly motivated to pursue pleasurable rewards and avoid pain,

* In this guide, the terms *drugs* and *substances* are used interchangeably to refer to tobacco, alcohol, illegal drugs, and prescription medications used for nonmedical reasons.

‡ Specifying the period of *adolescence* is complicated because it may be defined by different variables, and policymakers and researchers may disagree on the exact age boundaries. For purposes of this guide, adolescents are considered to be people between the ages of 12 and 17.

but their judgment and decision-making skills are still limited. This affects their ability to weigh risks accurately and make sound decisions, including decisions about using drugs. For these reasons, adolescents are a major target for prevention messages promoting healthy, drug-free behavior and giving young people encouragement and skills to avoid the temptations of experimenting with drugs.³

Most teens do not escalate from trying drugs to developing an addiction or other substance use disorder;^{*} however, even experimenting with drugs is a problem. Drug use can be part of a pattern of risky behavior including unsafe sex, driving while intoxicated, or other hazardous, unsupervised activities. And in cases when a teen does develop a pattern of repeated use, it can pose serious social and health risks, including:

- school failure
- problems with family and other relationships
- loss of interest in normal healthy activities
- impaired memory
- increased risk of contracting an infectious disease (like HIV or hepatitis C) via risky sexual behavior or sharing contaminated injection equipment
- mental health problems—including substance use disorders of varying severity
- the very real risk of overdose death

How drug use can progress to addiction.

Different drugs affect the brain differently, but a common factor is that they all raise the level of the chemical *dopamine* in brain circuits that control reward and pleasure.

The brain is wired to encourage life-sustaining and healthy activities through the release of dopamine. Everyday rewards during adolescence—such as hanging out with friends, listening to music, playing sports,

Despite popular belief, willpower alone is often insufficient to overcome an addiction. Drug use has compromised the very parts of the brain that make it possible to “say no.”

and all the other highly motivating experiences for teenagers—cause the release of this chemical in moderate amounts. This reinforces behaviors that contribute to learning, health, well-being, and the strengthening of social bonds.

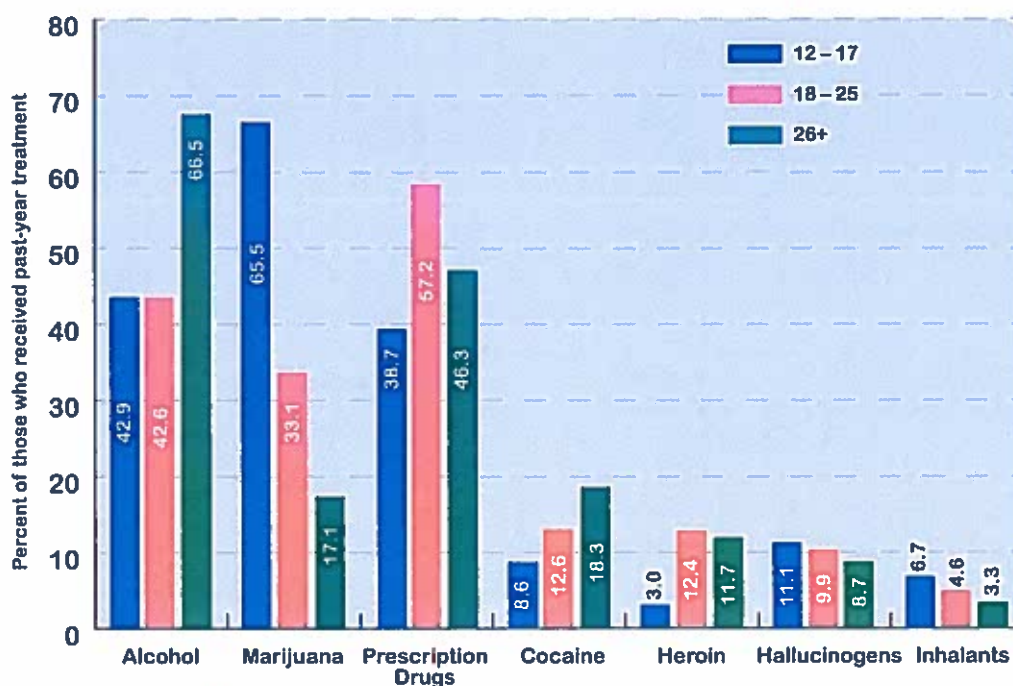
Drugs, unfortunately, are able to hijack this process. The “high” produced by drugs represents a flooding of the brain’s reward circuits with much more dopamine than natural rewards generate. This creates an especially strong drive to repeat the experience. The immature brain, already struggling with balancing impulse and self-control, is more likely to take drugs again without adequately considering the consequences.⁴ If the experience is repeated, the brain reinforces the neural links between pleasure and drug-taking, making the association stronger and stronger. Soon, taking the drug may assume an importance in the adolescent’s life out of proportion to other rewards.

The development of addiction is like a vicious cycle: Chronic drug use not only realigns a person’s priorities but also may alter key brain areas necessary for judgment and self-control, further reducing the individual’s ability to control or stop their drug use. This is why, despite popular belief, willpower alone is often insufficient to overcome an addiction. Drug use has compromised the very parts of the brain that make it possible to “say no.”

Not all young people are equally at risk for developing an addiction. Various factors including inherited genetic predispositions and adverse experiences in early life make trying drugs and developing a substance use disorder more likely. Exposure to stress (such as emotional or physical abuse) in childhood primes the brain to be sensitive

^{*} For purposes of this guide, the term addiction refers to compulsive drug seeking and use that persists even in the face of devastating consequences; it may be regarded as equivalent to a severe substance use disorder as defined by the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5, 2013). The spectrum of substance use disorders in the DSM-5 includes the criteria for the DSM-4 diagnostic categories of abuse and dependence.

Adolescents Differ from Adults in Substances Most Abused



Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2013.

to stress and seek relief from it throughout life; this greatly increases the likelihood of subsequent drug abuse and of starting drug use early.⁵ In fact, certain traits that put a person at risk for drug use, such as being impulsive or aggressive, manifest well before the first episode of drug use and may be addressed by prevention interventions during childhood.⁶ By the same token, a range of factors, such as parenting that is nurturing or a healthy school environment, may encourage healthy development and thereby lessen the risk of later drug use.

Drug use at an early age is an important predictor of development of a substance use disorder later. The majority of those who have a substance use disorder started using before age 18 and developed their disorder by age 20.⁷ The likelihood of developing a substance use disorder is greatest for those who begin use in their *early* teens. For example, 15.2 percent of people who start drinking by age 14 eventually develop alcohol abuse or dependence (as compared to just 2.1 percent of those who wait until they are 21 or older),⁸ and 25 percent of those who begin abusing prescription drugs at

age 13 or younger develop a substance use disorder at some time in their lives.⁹ Tobacco, alcohol, and marijuana are the first addictive substances most people try. Data collected in 2012 found that nearly 13 percent of those with a substance use disorder began using marijuana by the time they were 14.¹⁰

When substance use disorders occur in adolescence, they affect key developmental and social transitions, and they can interfere with normal brain maturation. These potentially lifelong consequences make addressing adolescent drug use an urgent matter. Chronic marijuana use in adolescence, for example, has been shown to lead to a loss of IQ that is not recovered even if the individual quits using in adulthood.¹¹ Impaired memory or thinking ability and other problems caused by drug use can derail a young person's social and educational development and hold him or her back in life.

The serious health risks of drugs compound the need to get an adolescent who is abusing drugs into treatment as quickly as possible. Also, adolescents who are abusing drugs are likely to have other issues such as mental health

problems accompanying and possibly contributing to their substance use, and these also need to be addressed.¹² Unfortunately, less than one third of adolescents admitted to substance abuse treatment who have other mental health issues receive any care for their conditions.¹³

Adolescents' drug use and treatment needs differ from those of adults. Adolescents in treatment report abusing different substances than adult patients do. For example, many more people aged 12–17 received treatment for marijuana use than for alcohol use in 2011 (65.5 percent versus 42.9 percent), whereas it was the reverse for adults (see figure, page 5). When adolescents do drink alcohol, they are more likely than adults to binge drink (defined as five or more drinks in a row on a single occasion).¹⁴ Adolescents are less likely than adults to report withdrawal symptoms when not using a drug, being unable to stop using a drug, or continued use of a drug in spite of physical or mental health problems; but they are more likely than adults to report hiding their substance use, getting complaints from others about their substance use, and continuing to use in spite of fights or legal trouble.

Adolescents also may be less likely than adults to feel they need help or to seek treatment on their own. Given their shorter histories of using drugs (as well as parental protection), adolescents may have experienced relatively few adverse consequences from their drug use; their incentive to change or engage in treatment may correspond to the number of such consequences they have experienced.¹⁵ Also, adolescents may have more difficulty than adults seeing their own behavior patterns (including causes and consequences of their actions) with enough detachment to tell they need help.

Only 10 percent of 12- to 17-year-olds needing substance abuse treatment actually receive any services.¹⁶ When they do get treatment, it is often for different reasons than adults. By far, the largest proportion of adolescents who receive treatment are referred by the juvenile justice system (see figure, page 7). Given that adolescents with

substance use problems often feel they do not need help, engaging young patients in treatment often requires special skills and patience.

Many treatment approaches are available to address the unique needs of adolescents.

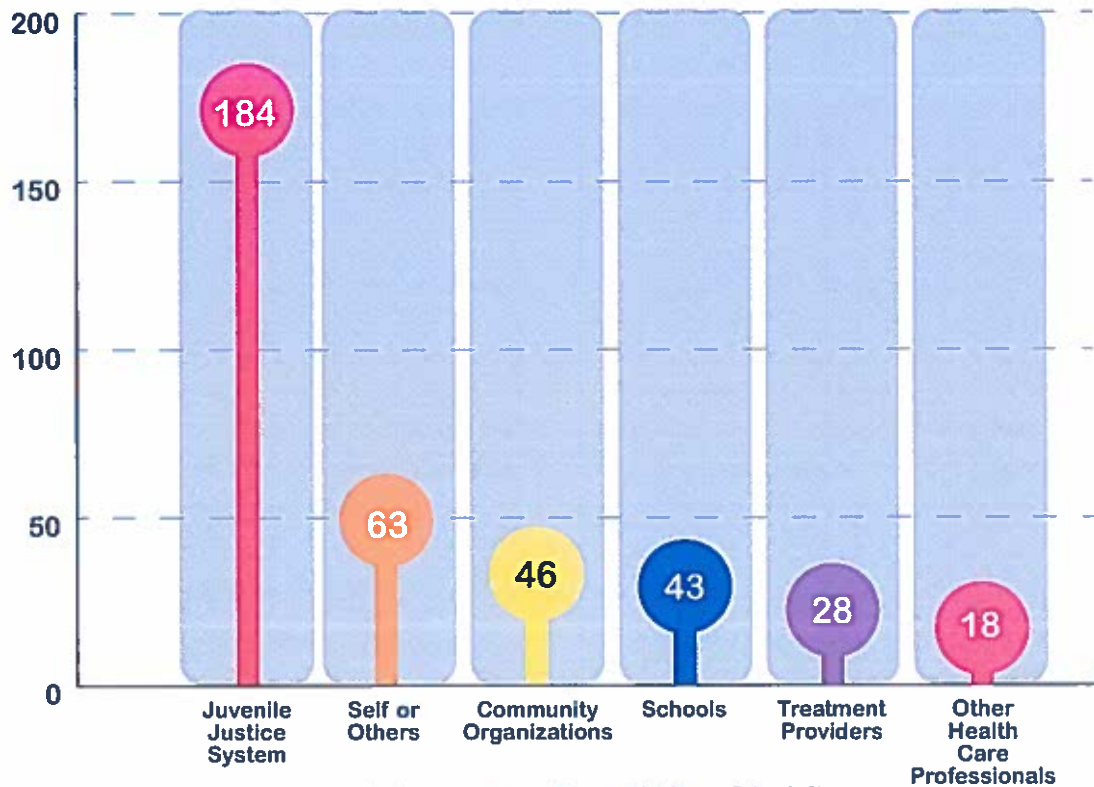
The focus of this guide is on *evidence-based* treatment approaches—those that have been scientifically tested and found to be effective in the treatment of adolescent substance abuse. Whether delivered in residential or inpatient settings or offered on an outpatient basis, effective treatments for adolescents primarily consist of some form of behavioral therapy. Addiction medications, while effective and widely prescribed for adults, are not generally approved by the U.S. Food and Drug Administration (FDA) for adolescents. However, preliminary evidence from controlled trials suggest that some medications may assist adolescents in achieving abstinence, so providers may view their young patients' needs on a case-by-case basis in developing a personalized treatment plan.

Whatever a person's age, treatment is not "one size fits all." It requires taking into account the needs of the whole person—including his or her developmental stage and cognitive abilities and the influence of family, friends, and others in the person's life, as well as any additional mental or physical health conditions. Such issues should be addressed at the same time as the substance use treatment. When treating adolescents, clinicians must also be ready and able to manage complications related to their young patients' confidentiality and their dependence on family members who may or may not be supportive of recovery.

Supporting Ongoing Recovery—Sustaining Treatment Gains and Preventing Relapse

Enlisting and engaging the adolescent in treatment is only part of a sometimes long and complex recovery process.¹⁷ Indeed, treatment is often seen as part of a continuum of care. When an adolescent requires substance

Number of Adolescents Aged 12–17 Admitted to Publicly Funded Substance Abuse Treatment Facilities on an Average Day, by Principal Source of Referral: Treatment Episode Data Set 2008*



Source: 2008 SAMHSA Treatment Episode Data Set (TEDS)

abuse treatment, follow-up care and recovery support (e.g., mutual-help groups like 12-step programs) may be important for helping teens stay off drugs and improving their quality of life.

When substance use disorders are identified and treated in adolescence—especially if they are mild or moderate—they frequently give way to abstinence from drugs with no further problems. Relapse is a possibility, however, as it is with other chronic diseases like diabetes or asthma. Relapse should not be seen as a sign that treatment failed but as an occasion to engage in additional or different treatment. Averting and detecting relapse involves

monitoring by the adolescent, parents, and teachers, as well as follow-up by treatment providers. Although recovery support programs are not a substitute for formal evidence-based treatment, they may help some adolescents maintain a positive and productive drug-free lifestyle that promotes meaningful and beneficial relationships and connections to family, peers, and the community both during treatment and after treatment ends. Whatever services or programs are used, an adolescent's path to recovery will be strengthened by support from family members, non-drug-using peers, the school, and others in his or her life.

* "Treatment providers" in this chart refers to "alcohol/drug abuse care providers." Treatment providers can and do refer people to treatment if, for example, a person is transferring from one level of treatment to another and the original facility does not provide the level of treatment that the person needs, or if a person changes facilities for some other reason. "Other health care professionals" refers to physicians, psychiatrists, or other licensed health care professionals or general hospitals, psychiatric hospitals, mental health programs, or nursing homes.



II. Principles of Adolescent Substance Use Disorder Treatment

1. Adolescent substance use needs to be identified and addressed as soon as possible. Drugs can have long-lasting effects on the developing brain and may interfere with family, positive peer relationships, and school performance. Most adults who develop a substance use disorder report having started drug use in adolescence or young adulthood, so it is important to identify and intervene in drug use early.

2. Adolescents can benefit from a drug abuse intervention even if they are not addicted to a drug.¹⁸ Substance use disorders range from problematic use to addiction and can be treated successfully at any stage, and at any age. For young people, any drug use (even if it seems like only “experimentation”), is cause for concern, as it exposes them to dangers from the drug and associated risky behaviors and may lead to more drug use in the future. Parents and other adults should monitor young people and not underestimate the significance of what may appear as isolated instances of drug taking.

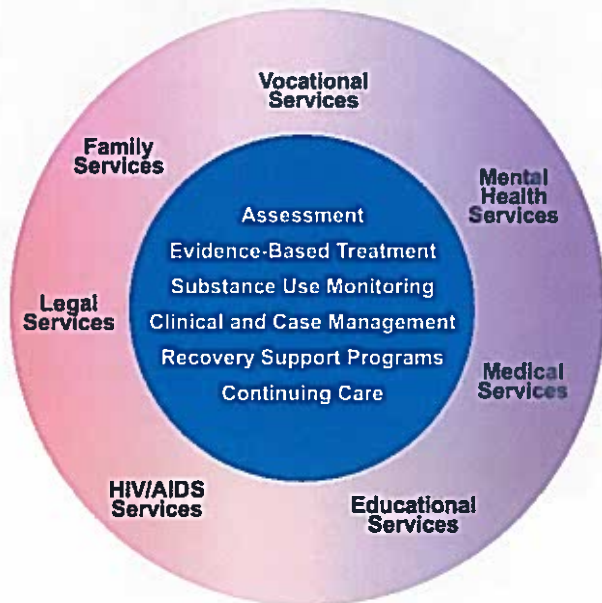
3. Routine annual medical visits are an opportunity to ask adolescents about drug use. Standardized screening tools are available to help pediatricians, dentists, emergency room doctors, psychiatrists, and other clinicians determine an adolescent’s level of involvement (if any) in tobacco, alcohol, and illicit and nonmedical prescription drug use.¹⁹ When an adolescent reports substance use, the health care provider can assess its severity and either provide an onsite brief intervention or refer the teen to a substance abuse treatment program.^{20, 21}



4. Legal interventions and sanctions or family pressure may play an important role in getting adolescents to enter, stay in, and complete treatment. Adolescents with substance use disorders rarely feel they need treatment and almost never seek it on their own. Research shows that treatment can work even if it is mandated or entered into unwillingly.²²

5. Substance use disorder treatment should be tailored to the unique needs of the adolescent. Treatment planning begins with a comprehensive assessment to identify the person’s strengths and weaknesses to be addressed. Appropriate treatment considers an adolescent’s level of psychological development, gender, relations with family and peers, how well he or she is doing in school, the larger community, cultural and ethnic factors, and any special physical or behavioral issues.

Components of Comprehensive Drug Abuse Treatment



The best treatment programs provide a combination of therapies and other services to meet the needs of the individual patient.

- 6. Treatment should address the needs of the whole person, rather than just focusing on his or her drug use.** The best approach to treatment includes supporting the adolescent's larger life needs, such as those related to medical, psychological, and social well-being, as well as housing, school, transportation, and legal services. Failing to address such needs simultaneously could sabotage the adolescent's treatment success.

Many adolescents who abuse drugs have a history of physical, emotional, and/or sexual abuse or other trauma.

- 7. Behavioral therapies are effective in addressing adolescent drug use.** Behavioral therapies, delivered by trained clinicians, help an adolescent stay off drugs by strengthening his or her motivation to change. This can be done by providing incentives for abstinence, building skills to resist and refuse substances and deal with triggers or craving, replacing drug use with constructive and rewarding activities, improving problem-solving skills, and facilitating better interpersonal relationships.
- 8. Families and the community are important aspects of treatment.** The support of family members is important for an adolescent's recovery. Several evidence-based interventions for adolescent drug abuse seek to strengthen family relationships by improving communication and improving family members' ability to support abstinence from drugs. In addition, members of the community (such as school counselors, parents, peers, and mentors) can encourage young people who need help to get into treatment—and support them along the way.
- 9. Effectively treating substance use disorders in adolescents requires also identifying and treating any other mental health conditions they may have.** Adolescents who abuse drugs frequently also suffer from other conditions including depression, anxiety disorders, attention-deficit hyperactivity disorder (ADHD), oppositional defiant disorder, and conduct problems.²³ Adolescents who abuse drugs, particularly those involved in the juvenile justice system, should be screened for other psychiatric disorders. Treatment for these problems should be integrated with the treatment for a substance use disorder.

10. Sensitive issues such as violence and child abuse or risk of suicide should be identified and addressed. Many adolescents who abuse drugs have a history of physical, emotional, and/or sexual abuse or other trauma.²⁴ If abuse is suspected, referrals should be made to social and protective services, following local regulations and reporting requirements.

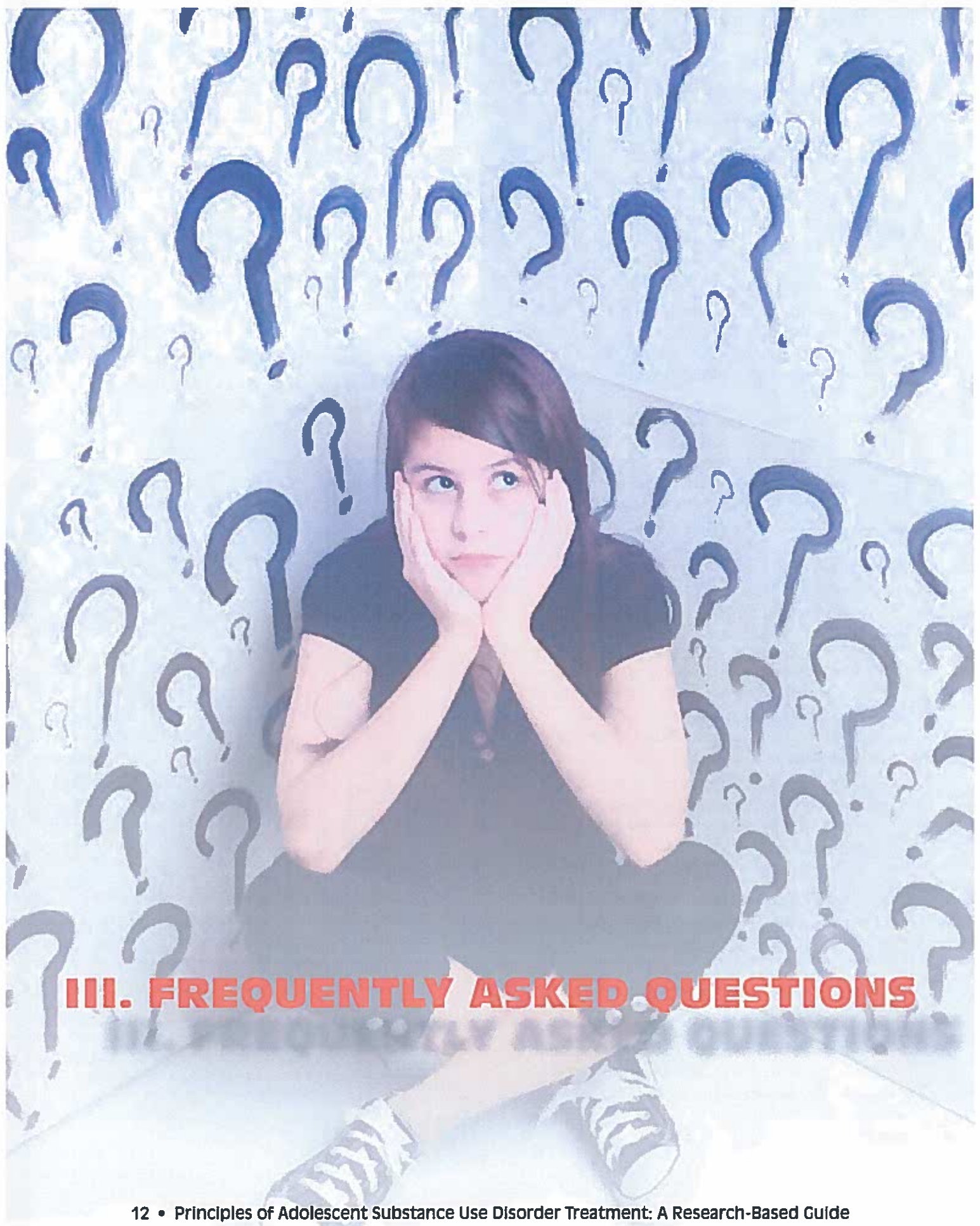
11. It is important to monitor drug use during treatment. Adolescents recovering from substance use disorders may experience relapse, or a return to drug use. Triggers associated with relapse vary and can include mental stress and social situations linked with prior drug use. It is important to identify a return to drug use early before an undetected relapse progresses to more serious consequences. A relapse signals the need for more treatment or a need to adjust the individual's current treatment plan to better meet his or her needs.

12. Staying in treatment for an adequate period of time and continuity of care afterward are important. The minimal length of drug treatment depends on the type and extent of the adolescent's problems, but studies show outcomes are better when a person stays in treatment for 3 months or more.²⁵ Because relapses often occur, more than one episode of treatment may be necessary. Many adolescents also benefit from continuing care following treatment,²⁶ including drug use monitoring, follow-up visits at home,²⁷ and linking the family to other needed services.



A relapse signals the need for more treatment or a need to adjust the individual's current treatment plan.

13. Testing adolescents for sexually transmitted diseases like HIV, as well as hepatitis B and C, is an important part of drug treatment. Adolescents who use drugs—whether injecting or non-injecting—are at an increased risk for diseases that are transmitted sexually as well as through the blood, including HIV and hepatitis B and C. All drugs of abuse alter judgment and decision making, increasing the likelihood that an adolescent will engage in unprotected sex and other high-risk behaviors including sharing contaminated drug injection equipment and unsafe tattooing and body piercing practices—potential routes of virus transmission. Substance use treatment can reduce this risk both by reducing adolescents' drug use (and thus keeping them out of situations in which they are not thinking clearly) and by providing risk-reduction counseling to help them modify or change their high-risk behaviors.^{28,29}



III. FREQUENTLY ASKED QUESTIONS

1. Why do adolescents take drugs?

Adolescents experiment with drugs or continue taking them for several reasons, including:

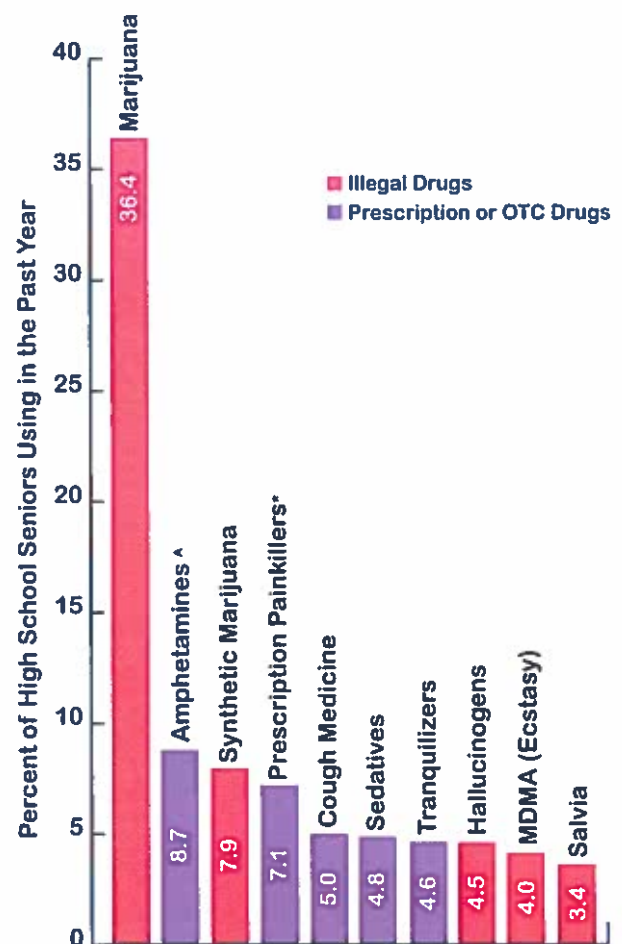
- **To fit in:** Many teens use drugs “because others are doing it”—or they *think* others are doing it—and they fear not being accepted in a social circle that includes drug-using peers.
- **To feel good:** Abused drugs interact with the neurochemistry of the brain to produce feelings of pleasure. The intensity of this euphoria differs by the type of drug and how it is used.
- **To feel better:** Some adolescents suffer from depression, social anxiety, stress-related disorders, and physical pain. Using drugs may be an attempt to lessen these feelings of distress. Stress especially plays a significant role in starting and continuing drug use as well as returning to drug use (relapsing) for those recovering from an addiction.
- **To do better:** Ours is a very competitive society, in which the pressure to perform athletically and academically can be intense. Some adolescents may turn to certain drugs like illegal or prescription stimulants because they think those substances will enhance or improve their performance.
- **To experiment:** Adolescents are often motivated to seek new experiences, particularly those they perceive as thrilling or daring.

2. What drugs are most frequently used by adolescents?

Alcohol and tobacco are the drugs most commonly abused by adolescents, followed by marijuana. The next most popular substances differ between age groups. Young adolescents tend to favor inhalant substances (such as breathing the fumes of household cleaners,

glues, or pens; see “The Dangers of Inhalants,” page 15), whereas older teens are more likely to use synthetic marijuana (“K2” or “Spice”) and prescription medications—particularly opioid pain relievers like Vicodin® and stimulants like Adderall®. In fact, the Monitoring the Future survey of adolescent drug use and attitudes shows that prescription and over-the-counter medications account for a majority of the drugs most commonly abused by high-school seniors.

Most Commonly Abused Drugs by High School Seniors (Other than Tobacco and Alcohol)



^aThe top drug used in this category is Adderall (7.4%)

^{*}The top drugs used in this category are Vicodin (5.3%) and OxyContin (3.6%)

Source: Monitoring the Future National Results on Adolescent Drug Use: Summary of Key Findings, 2013.

3. **How do adolescents become addicted to drugs, and which factors increase risk?**

Addiction occurs when repeated use of drugs changes how a person's brain functions over time. The transition from voluntary to compulsive drug use reflects changes in the brain's natural inhibition and reward centers that keep a person from exerting control over the impulse to use drugs even when there are negative consequences—the defining characteristic of addiction.

Some people are more vulnerable to this process than others, due to a range of possible risk factors. Stressful early life experiences such as being abused or suffering other forms of trauma are one important risk factor. Adolescents with a history of physical and/or sexual abuse are more likely to be diagnosed with substance use disorders.³⁰ Many other risk factors, including genetic vulnerability, prenatal exposure to alcohol or other drugs, lack of parental supervision or monitoring, and association with drug-using peers also play an important role.³¹

At the same time, a wide range of genetic and environmental influences that promote strong psychosocial development and resilience may work to balance or counteract risk factors, making it ultimately hard to predict which individuals will develop substance use disorders and which won't.

4. **Is it possible for teens to become addicted to marijuana?**

Yes. Contrary to common belief, marijuana *is* addictive. Estimates from research suggest that about 9 percent of users become addicted to marijuana; this number increases among those who start young (to about 17 percent, or 1 in 6) and among daily users (to 25–50 percent).³² Thus, many of the nearly 7 percent of high-school seniors who (according to annual survey data)³³ report smoking marijuana daily or almost daily are well on their way to addiction, if not already addicted, and may be functioning at a sub-optimal level in their schoolwork and in other areas of their lives.



Long-term marijuana users who try to quit report withdrawal symptoms including irritability, sleeplessness, decreased appetite, anxiety, and drug craving, all of which can make it difficult to stay off the drug. Behavioral interventions, including Cognitive-Behavioral Therapy and Contingency Management (providing tangible incentives to patients who remain drug-free) have proven to be effective in treating marijuana addiction (see Page 24 for descriptions of these treatments). Although no medications are currently available to treat marijuana addiction, it is possible that medications to ease marijuana withdrawal, block its intoxicating effects, and prevent relapse may emerge from recent discoveries about the workings of the endocannabinoid system, a signaling system in the body and brain that uses chemicals related to the active ingredients in marijuana.

Legalization of marijuana for adult recreational use and for medicinal purposes is currently the subject of much public debate. Whatever the outcome, public health experts are worried about use increasing among adolescents, since marijuana use as a teen may harm the developing brain, lower IQ, and seriously impair the ability to drive safely, especially when combined with alcohol.

Parents seeking more information about the effects of marijuana on teens are encouraged to see information offered on NIDA's Web site: <http://www.drugabuse.gov/drugs-abuse/marijuana>.

The Dangers of Inhalants

Various household products, including cleaning fluids, glues, lighter fluid, aerosol sprays, and office supplies like markers and correction fluid, have fumes that are sometimes breathed to obtain a brief, typically alcohol-like high. Because of their ready availability, these are frequently among the earliest substances youth abuse; they are generally less popular among older teens, who have greater access to other substances like alcohol or marijuana.

Although the high from inhalants typically wears off quickly, immediate health consequences of inhalant abuse may be severe: In addition to nausea or vomiting, users risk suffocation and heart failure—called “sudden sniffing death.” Serious long-term consequences include liver and kidney damage, hearing loss, bone marrow damage, and brain damage. Although addiction to inhalants is not very common, it can occur with repeated abuse.

Early abuse of inhalants may also be a warning sign for later abuse of other drugs. One study found that youth who used inhalants before age 14 were twice as likely to later use opiate drugs.³⁴ So it is important for parents to safeguard household products and be alert to signs that their younger teens may be abusing these substances.

5. **Is abuse of prescription medications as dangerous as other forms of illegal drug use?**

Psychoactive prescription drugs, which include opioid pain relievers, stimulants prescribed for ADHD, and central nervous system depressants prescribed to treat anxiety or sleep disorders, are all effective and safe when taken as prescribed by a doctor for the conditions they are intended to treat. However, they are frequently abused—that is, taken in other ways, in other quantities, or by people for whom they weren't prescribed—and this can have devastating consequences.

In the case of opioid pain relievers such as Vicodin® or OxyContin®, there is a great risk of addiction and death from overdose associated with such abuse. Especially when pills are crushed and injected or snorted, these medications affect the brain and body very much like heroin, including euphoric effects and a hazardous suppression of breathing (the reason for death in cases of fatal opioid overdose). In fact, some young people who develop prescription opioid addictions shift to heroin because it may be cheaper to obtain.³⁵

ADHD medications such as Adderall® (which contains the stimulant amphetamine) are increasingly popular among young people who take them believing it will improve their school performance. This too is a dangerous trend. Prescription stimulants act in the brain similarly to cocaine or illegal amphetamines, raising heart rate and blood pressure, as well as producing an addictive euphoria. Other than promoting wakefulness, it is unclear that such medications actually provide much or any cognitive benefit, however, beyond the benefits they provide when taken as prescribed to those with ADHD.³⁶

6. **Are steroids addictive and can steroid abuse be treated?**

Some adolescents—mostly male—abuse anabolic-androgenic steroids in order to improve their athletic performance and/or improve their appearance by helping build muscles. Steroid abuse may lead to serious, even irreversible, health problems including kidney impairment, liver damage, and cardiovascular problems that raise the risk of stroke and heart attack (even in young people). An undetermined percentage of steroid abusers may also become addicted to the drugs—that is, continuing to use them despite physical problems and negative effects on social relations—but the mechanisms causing this addiction are more complex than those for other drugs of abuse.

Steroids are not generally considered intoxicating, but animal studies have shown that chronic steroid use alters the same dopamine reward pathways in the brain that are affected by other substances. Other factors such as underlying body image problems also contribute to steroid abuse.³⁷ Moreover, when people stop

using steroids, they can experience withdrawal symptoms such as hormonal changes that produce fatigue, loss of muscle mass and sex drive, and other unpleasant physical changes. One of the more dangerous withdrawal symptoms is depression, which has led to suicide in some people discontinuing steroids. Steroid abuse is also frequently complicated by abuse of other substances taken either as part of a performance-enhancing regimen (such as stimulants) or to help manage pain-, sleep-, or mood-related side effects (such as opioids, cannabis, and alcohol).³⁸

Because of this complicated mix of issues, treatment for steroid abuse necessarily involves addressing all related mental and physical health issues and substance use disorders simultaneously. This may involve behavioral treatments as well as medications to help normalize the hormonal system and treat any depression or pain issues that may be present. If symptoms are severe or prolonged, hospitalization may be needed.

7. How do other mental health conditions relate to substance use in adolescents?

Drug use in adolescents frequently overlaps with other mental health problems. For example, a teen with a substance use disorder is more likely to have a mood, anxiety, learning, or behavioral disorder too. Sometimes drugs can make accurately diagnosing these other problems complicated. Adolescents may begin taking drugs to deal with depression or anxiety, for example; on the other hand, frequent drug use may also cause or precipitate those disorders. Adolescents entering drug abuse treatment should be given a comprehensive mental health screening to determine if other disorders are present. Effectively treating a substance use disorder requires addressing drug abuse and other mental health problems simultaneously.

Addiction occurs when repeated use of drugs changes how a person's brain functions over time.

8. Does treatment of ADHD with stimulant medications like Ritalin® and Adderall® increase risk of substance abuse later in life?

Prescription stimulants are effective at treating attention disorders in children and adolescents, but concerns have been raised that they could make a young person more vulnerable to developing later substance use disorders. On balance, the studies conducted so far have found no differences in later substance use for ADHD-affected children who received treatment versus those that did not. This suggests that treatment with ADHD medication does not affect (either negatively or positively) an individual's risk for developing a substance use disorder.³⁹

9. What are signs of drug use in adolescents, and what role can parents play in getting treatment?

If an adolescent starts behaving differently for no apparent reason—such as acting withdrawn, frequently tired or depressed, or hostile—it could be a sign he or she is developing a drug-related problem. Parents and others may overlook such signs, believing them to be a normal part of puberty.

Other signs include:

- a change in peer group
- carelessness with grooming
- decline in academic performance
- missing classes or skipping school
- loss of interest in favorite activities
- changes in eating or sleeping habits
- deteriorating relationships with family members and friends

Parents tend to underestimate the risks or seriousness of drug use. The symptoms listed here suggest a problem that may already have become serious and should be evaluated to determine the underlying cause—which could be a substance abuse problem or another



mental health or medical disorder. Parents who are unsure whether their child is abusing drugs can enlist the help of a primary care physician, school guidance counselor, or drug abuse treatment provider.

Parents seeking treatment for an adolescent child are encouraged to see NIDA's booklet, *Seeking Drug Abuse Treatment: Know What to Ask* (<http://www.drugabuse.gov/publications/seeking-drug-abuse-treatment>) and see the Treatment Referral Resources section of this guide (page 31).

10. How can parents participate in their adolescent child's treatment?

Parents can actively support their child and engage with him or her during the treatment and recovery process. Apart from providing moral and emotional support, parents can also play a crucial role in supporting the practical aspects of treatment, such as scheduling and making appointments, as well as providing needed structure and supervision through household rules and monitoring. Also, several evidence-based treatments for adolescents specifically address drug abuse within the family context. Family-based drug abuse treatment can help improve communication, problem-solving, and conflict resolution within the household. Treatment professionals can help parents and other family members identify ways they can support the changes the adolescent achieves through treatment (see "Family-Based Approaches," pages 25–26).

11. What role can medical professionals play in addressing substance abuse (including abuse of prescription drugs) among adolescents?

Medical professionals have an important role to play in screening their adolescent patients for drug use, providing brief interventions, referring them to substance abuse treatment if necessary, and providing ongoing monitoring and follow-up. Screening and brief interventions do not have to be time-consuming and can be integrated into general medical settings.

- **Screening.** Screening and brief assessment tools administered during annual routine medical checkups can detect drug use before it becomes a serious problem. The purpose of screening is to look for evidence of any use of alcohol, tobacco, or illicit drugs or abuse of prescription drugs and assess how severe the problem is. Results from such screens can indicate whether a more extensive assessment and possible treatment are necessary (see "Screening Tools and Brief Assessments Used with Adolescents," below).⁴⁰ Screening as a part of routine care also helps to reduce the stigma associated with being identified as having a drug problem.

Screening Tools and Brief Assessments Used with Adolescents

Screening tools are available and outlined in the American Academy of Pediatrics (AAP) publications, *Tobacco, Alcohol, and Other Drugs: The Role of the Pediatrician in Prevention, Identification, and Management of Substance Abuse*⁴¹ and *Substance Use Screening, Brief Intervention and Referral to Treatment for Pediatricians*.⁴²

In addition, the *Alcohol Screening and Brief Intervention for Youth: A Practitioner's Guide* developed by the National Institute on Alcohol Abuse and Alcoholism provides information on identifying adolescents at high risk for alcohol abuse.⁴³

- **Brief Intervention.** Adolescents who report using drugs can be given a brief intervention to reduce their drug use and other risky behaviors. Specifically, they should be advised how continued drug use may harm their brains, general health, and other areas of their life, including family relationships and education. Adolescents reporting no substance use can be praised for staying away from drugs and rescreened during their next physical.
- **Referral.** Adolescents with substance use disorders or those that appear to be developing a substance use disorder may need a referral to substance abuse treatment for more extensive assessment and care.
- **Follow-up.** For patients in treatment, medical professionals can offer ongoing support of treatment participation and abstinence from drugs during follow-up visits. Adolescent patients who relapse or show signs of continuing to use drugs may need to be referred back to treatment.
- **Before prescribing medications that can potentially be abused,** clinicians can assess patients for risk factors such as mental illness or a family history of substance abuse, consider an alternative medication with less abuse potential, more closely monitor patients at high risk, reduce the length of time between visits for refills so fewer pills are on hand, and educate both patients and their parents about appropriate use and potential risks of prescription medications, including the dangers of sharing them with others.

12. Is adolescent tobacco use treated similarly to other drug use?

Yes. People often don't think of tobacco use as a kind of "drug abuse" that requires treatment, and motives for quitting smoking may be somewhat different than motives for quitting other drugs. But tobacco use has well-known health risks—especially when begun in the teen years—and the highly addictive nicotine in tobacco can make treatment a necessity to help an adolescent quit. Laboratory research also suggests that nicotine may increase the rewarding and addictive effects of other drugs, making it a potential contributor to other substance use disorders.

Common treatment approaches like Cognitive-Behavioral Therapy are now being used to help adolescents quit smoking (and quit using other drugs) by helping them "train their brains" so they learn to recognize and control their cravings and better deal with life stress. Other therapies like Contingency Management and Motivational Enhancement use incentives and motivation techniques to help teens reduce or stop smoking.⁴⁴ (See page 24 for descriptions of these treatments.)

Tobacco use often accompanies other drug use and needs to be addressed as part of other substance use disorder treatment. In a recent survey, nearly 55 percent of current adolescent cigarette smokers (ages 12 to 17) were also illicit drug users (by comparison, only about 6 percent of those who did not smoke used any illicit drugs).⁴⁵ Also, cigarette smoking can be an indicator of other psychiatric disorders, which can be identified through comprehensive screening by a treatment provider.

13. Are there medications to treat adolescent substance abuse?

Several medications are approved by the FDA to treat addiction to opioids, alcohol, and nicotine in individuals 18 and older. In most cases, little research has been conducted to evaluate the safety and efficacy of these medications for adolescents; however, some health care providers do use these medications "off-label," especially in older adolescents (see "Addiction Medications," pages 26–28).

14. Do girls and boys have different treatment needs?

Adolescent girls and boys may have different developmental and social issues that may call for different treatment strategies or emphases. For example, girls with substance use disorders may be more likely to also have mood disorders such as depression or to have experienced physical or sexual abuse. Boys with substance use disorders are more likely

to also have conduct, behavioral, and learning problems, which may be very disruptive to their school, family, or community. Treatments should take into account the higher rate of internalizing and traumatic stress disorders among adolescent girls, the higher rate of externalizing disruptive disorders and juvenile justice problems among adolescent boys, and other gender differences that may play into adolescent substance use disorders.



15. What are the unique treatment needs of adolescents from different racial/ethnic backgrounds?

Treatment providers are urged to consider the unique social and environmental characteristics that may influence drug abuse and treatment for racial/ethnic minority adolescents, such as stigma, discrimination, and sparse community resources. With the growing number of immigrant children living in the United States, issues of culture of origin, language, and acculturation are important considerations for treatment. The demand for bilingual treatment providers to work with adolescents and their families will also be increasing as the diversity of the U.S. population increases.

16. What role can the juvenile justice system play in addressing adolescent drug abuse?

Involvement in the juvenile justice system is unfortunately a reality for many substance-abusing adolescents, but it presents a valuable opportunity for intervention. Substance use treatment can be incorporated into the juvenile justice system in several ways. These include:

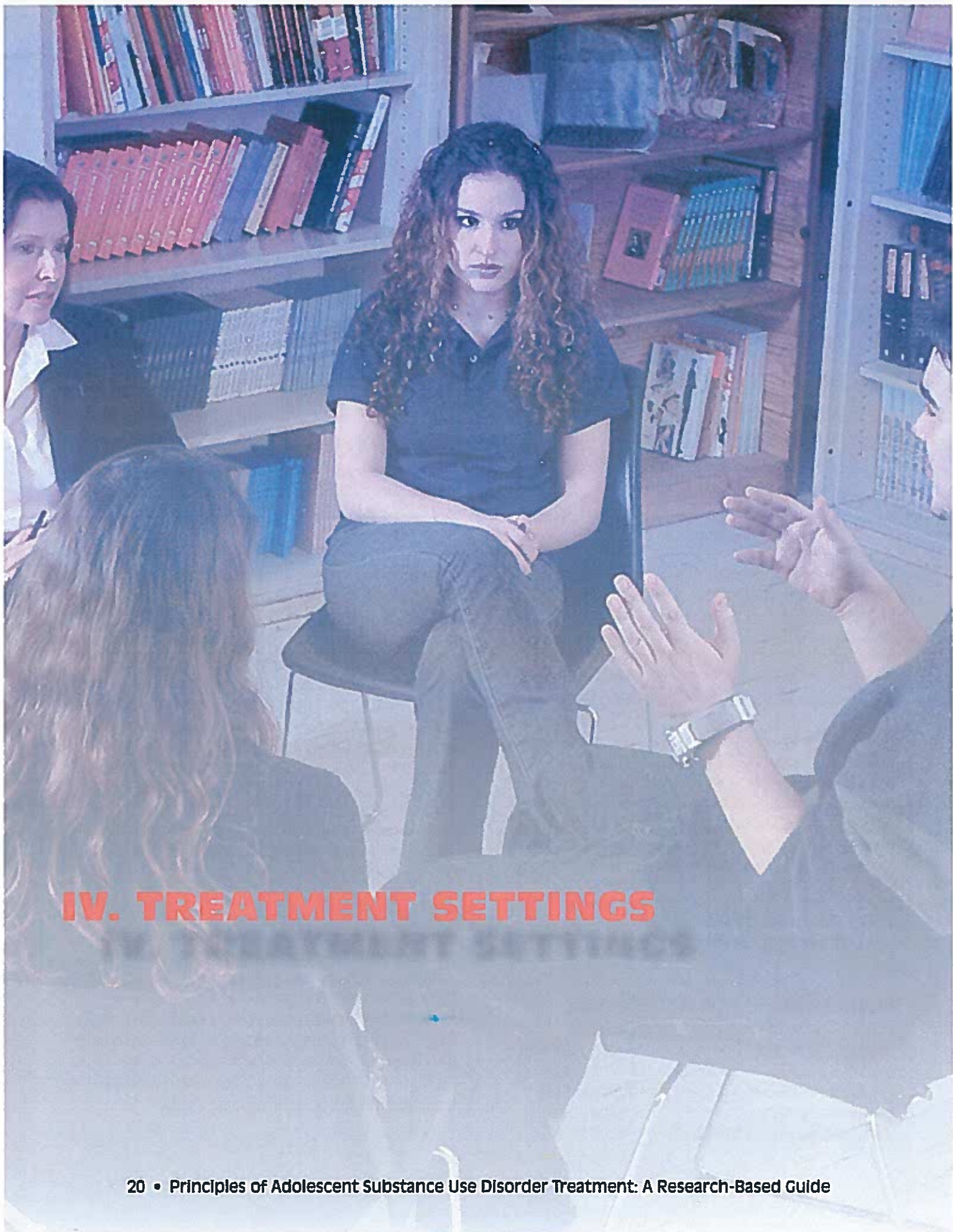
- screening and assessment for drug abuse upon arrest
- initiation of treatment while awaiting trial
- access to treatment programs in the community in lieu of incarceration (e.g., juvenile treatment drug courts)^{46,47}
- treatment during incarceration followed by community-based treatment after release

Coordination and collaboration between juvenile justice professionals, drug abuse treatment providers, and other social service agencies are essential in getting needed treatment to adolescent offenders, about one half of whom have substance use disorders.⁴⁸

17. What role do 12-step groups or other recovery support services play in addiction treatment for adolescents?

Adolescents may benefit from participation in self- or mutual-help groups like 12-step programs or other recovery support services, which can reinforce abstinence from drug use and other changes made during treatment, as well as support progress made toward important goals like succeeding in school and reuniting with family. Peer recovery support services and recovery high schools provide a community setting where fellow recovering adolescents can share their experiences and support each other in living a drug-free life.

It is important to note that recovery support services are not a substitute for drug abuse treatment. Also, there is sometimes a risk in support-group settings that conversation among adolescents can turn to talk extolling drug use; group leaders need to be aware of such a possibility and be ready to direct the discussion in more positive directions if necessary.



IV. TREATMENT SETTINGS

Treatment for substance use disorders is delivered at varying levels of care in many different settings. Because no single treatment is appropriate for every adolescent, treatments must be tailored for the individual. Based on the consensus of drug treatment experts, the American Society of Addiction Medicine (ASAM) has developed guidelines for determining the appropriate intensity and length of treatment for adolescents with substance abuse problems, based on an assessment involving six areas:⁴⁹

- (1) Level of intoxication and potential for withdrawal
- (2) Presence of other medical conditions
- (3) Presence of other emotional, behavioral, or cognitive conditions
- (4) Readiness or motivation to change
- (5) Risk of relapse or continued drug use
- (6) Recovery environment (e.g., family, peers, school, legal system)

With a substance use disorder—as with any other medical condition—treatment must be long enough and strong enough to be effective. Just as an antibiotic must be taken for sufficient time to kill a bacterial infection, even though symptoms may already have subsided, substance abuse treatment must continue for a sufficient length of time to treat the disease. Undertreating a substance use disorder—providing lower than the recommended level of care or a shorter length of treatment than recommended—will increase the risk of relapse and could cause the patient, his or her family members, or the referring juvenile justice system to lose hope in the treatment because they will see it as ineffective.

This section will review the settings in which adolescent drug abuse treatment most often occurs.

Outpatient/Intensive Outpatient

Adolescent drug abuse treatment is most commonly offered in outpatient settings. When delivered by well-trained clinicians, this can be highly effective. Outpatient treatment is traditionally recommended for adolescents with less severe addictions, few additional

mental health problems, and a supportive living environment, although evidence suggests that more severe cases can be treated in outpatient settings as well. Outpatient treatment varies in the type and intensity of services offered and may be delivered on an individual basis or in a group format (although research suggests group therapy can carry certain risks; see “Group Therapy for Adolescents,” page 23). Low- or moderate-intensity outpatient care is generally delivered once or twice a week. Intensive outpatient services are delivered more frequently, typically more than twice a week for at least 3 hours per day. Outpatient programs may offer drug abuse prevention programming (focused on deterring further drug use) or other behavioral and family interventions.^{50,51}

Partial Hospitalization

Adolescents with more severe substance use disorders but who can still be safely managed in their home living environment may be referred to a higher level of care called partial hospitalization or “day treatment.” This setting offers adolescents the opportunity to participate in treatment 4–6 hours a day at least 5 days a week while living at home.⁵²

Residential/Inpatient Treatment

Residential treatment is a resource-intensive high level of care, generally for adolescents with severe levels of addiction whose mental health and medical needs and addictive behaviors require a 24-hour structured environment to make recovery possible. These adolescents may have complex psychiatric or medical problems or family issues that interfere with their ability to avoid substance use. One well-known long-term residential treatment model is the therapeutic community (TC). TCs use a combination of techniques to “resocialize” the adolescent and enlist all the members of the community, including residents and staff, as active participants in treatment. Treatment focuses on building personal and social responsibility and developing new coping skills. Such programs offer a range of family services and may require family participation if the TC is sufficiently close to where the family lives. Short-term residential programs also exist.⁵³



**V. EVIDENCE-BASED
APPROACHES TO
TREATING ADOLESCENT
SUBSTANCE USE
DISORDERS**

Research evidence supports the effectiveness of various substance abuse treatment approaches for adolescents. Examples of specific evidence-based approaches are described below, including behavioral and family-based interventions as well as medications. Each approach is designed to address specific aspects of adolescent drug use and its consequences for the individual, family, and society. In order for any intervention to be effective, the clinician providing it needs to be trained and well-supervised to ensure that he or she adheres to the instructions and guidance described in treatment manuals. Most of these treatments have been tested over short periods of 12–16 weeks, but for some adolescents, longer treatments may be warranted; such a decision is made on a case-by-case basis. The provider should use clinical judgment to select the evidence-based approach that seems best suited to the patient and his or her family.*

BEHAVIORAL APPROACHES

Behavioral interventions help adolescents to actively participate in their recovery from drug abuse and addiction and enhance their ability to resist drug use. In such approaches, therapists may provide incentives to remain abstinent, modify attitudes and behaviors related to drug abuse, assist families in improving their communication and overall interactions, and increase life skills to handle stressful circumstances and deal with environmental cues that may trigger intense craving for drugs. Below are some behavioral treatments shown to be effective in addressing substance abuse in adolescents (listed in alphabetical order).

Group Therapy for Adolescents

Adolescents can participate in group therapy and other peer support programs during and following treatment to help them achieve abstinence. When led by well-trained clinicians following well-validated Cognitive-Behavioral Therapy (CBT) protocols (see page 24), groups can provide positive social reinforcement through peer discussion and help enforce incentives to staying off drugs and living a drug-free lifestyle.

However, group treatment for adolescents carries a risk of unintended adverse effects: Group members may steer conversation toward talk that glorifies or extols drug use, thereby undermining recovery goals. Trained counselors need to be aware of that possibility and direct group activities and discussions in a positive direction.

Adolescent Community Reinforcement Approach (A-CRA)

A-CRA is an intervention that seeks to help adolescents achieve and maintain abstinence from drugs by replacing influences in their lives that had reinforced substance use with healthier family, social, and educational or vocational reinforcers. After assessing the adolescent's needs and levels of functioning, the therapist chooses from among 17 A-CRA procedures to address problem-solving, coping, and communication skills and to encourage active participation in constructive social and recreational activities.⁵⁴

* The treatments listed in this book are not intended to be a comprehensive list of efficacious evidence-based treatment approaches for adolescents. NIDA continues supporting research developing new approaches to address adolescent drug abuse.

Cognitive-Behavioral Therapy (CBT)

CBT strategies are based on the theory that learning processes play a critical role in the development of problem behaviors like drug abuse. A core element of CBT is teaching participants how to anticipate problems and helping them develop effective coping strategies. In CBT, adolescents explore the positive and negative consequences of using drugs. They learn to monitor their feelings and thoughts and recognize distorted thinking patterns and cues that trigger their substance abuse; identify and anticipate high-risk situations; and apply an array of self-control skills, including emotional regulation and anger management, practical problem solving, and substance refusal. CBT may be offered in outpatient settings in either individual or group sessions (see "Group Therapy for Adolescents," page 23) or in residential settings.⁵⁵

Contingency Management (CM)

Research has demonstrated the effectiveness of treatment using immediate and tangible reinforcements for positive behaviors to modify problem behaviors like substance abuse. This approach, known as Contingency Management (CM), provides adolescents an opportunity to earn low-cost incentives such as prizes or cash vouchers (for food items, movie passes, and other personal goods) in exchange for participating in drug treatment, achieving important goals of treatment, and not using drugs. The goal of CM is to weaken the influence of reinforcement derived from using drugs and to substitute it with reinforcement derived from healthier activities and drug abstinence. For adolescents, CM has been offered in a variety of settings, and parents can be trained to apply this method at home. CM is typically combined either with a psychosocial treatment or a medication (where available). Recent evidence also supports the use of Web-based CM to help adolescents stop smoking.⁵⁶

Behavioral interventions help adolescents to actively participate in their recovery from drug abuse and addiction and enhance their ability to resist drug use.

Motivational Enhancement Therapy (MET)

MET is a counseling approach that helps adolescents resolve their ambivalence about engaging in treatment and quitting their drug use. This approach, which is based on a technique called motivational interviewing, typically includes an initial assessment of the adolescent's motivation to participate in treatment, followed by one to three individual sessions in which a therapist helps the patient develop a desire to participate in treatment by providing non-confrontational feedback. Being empathic yet directive, the therapist discusses the need for treatment and tries to elicit self-motivational statements from the adolescent to strengthen his or her motivation and build a plan for change. If the adolescent resists, the therapist responds neutrally rather than by contradicting or correcting the patient. MET, while better than no treatment, is typically not used as a stand-alone treatment for adolescents with substance use disorders but is used to motivate them to participate in other types of treatment.⁵⁷

Twelve-Step Facilitation Therapy

Twelve-Step Facilitation Therapy is designed to increase the likelihood that an adolescent with a drug abuse problem will become affiliated and actively involved in a 12-step program like Alcoholics Anonymous (AA) or Narcotics Anonymous (NA). Such programs stress the participant's acceptance that life has become unmanageable, that abstinence from drug use is needed, and that willpower alone cannot overcome the problem. The benefits of 12-step participation for adults in extending the benefits of addiction treatment appear to apply to adolescent outpatients as well, according to recent research. Research also suggests adolescent-specific 12-step facilitation strategies may help enhance outpatient attendance rates.⁵⁸

FAMILY-BASED APPROACHES

Family-based approaches to treating adolescent substance abuse highlight the need to engage the family, including parents, siblings, and sometimes peers, in the adolescent's treatment. Involving the family can be particularly important, as the adolescent will often be living with at least one parent and be subject to the parent's controls, rules, and/or supports. Family-based approaches generally address a wide array of problems in addition to the young person's substance problems, including family communication and conflict; other co-occurring behavioral, mental health, and learning disorders; problems with school or work attendance; and peer networks. Research shows that family-based treatments are highly efficacious; some studies even suggest they are superior to other individual and group treatment approaches.⁵⁹ Typically offered in outpatient settings, family treatments have also been tested successfully in higher-intensity settings such as residential and intensive outpatient programs. Below are specific types of family-based treatments shown to be effective in treating adolescent substance abuse.

Brief Strategic Family Therapy (BSFT)

BSFT is based on a family systems approach to treatment, in which one member's problem behaviors are seen to stem from unhealthy family interactions. Over the course of 12–16 sessions, the BSFT counselor establishes a relationship with each family member, observes how the members behave with one another, and assists the family in changing negative

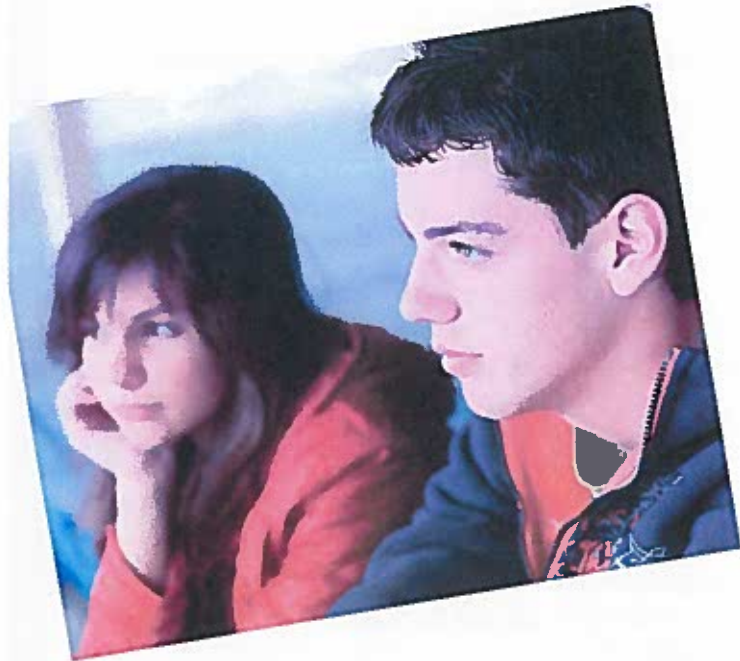
Involving the family can be particularly important in adolescent substance abuse treatment.



interaction patterns. BSFT can be adapted to a broad range of family situations in various settings (mental health clinics, drug abuse treatment programs, social service settings, families' homes) and treatment modalities (as a primary outpatient intervention, in combination with residential or day treatment, or as an aftercare/continuing-care service following residential treatment).⁶⁰

Family Behavior Therapy (FBT)

FBT, which has demonstrated positive results in both adults and adolescents, combines behavioral contracting with contingency management to address not only substance abuse but other behavioral problems as well. The adolescent and at least one parent participate in treatment planning and choose specific interventions from a menu of evidence-based treatment options. Therapists encourage family members to use behavioral strategies taught in sessions and apply their new skills to improve the home environment. They set behavioral goals for preventing substance use and reducing risk behaviors for sexually transmitted diseases like HIV, which are reinforced through a contingency management (CM) system (see description on page 24). Goals are reviewed and rewards provided at each session.⁶¹



Functional Family Therapy (FFT)

FFT combines a family systems view of family functioning (which asserts that unhealthy family interactions underlie problem behaviors) with behavioral techniques to improve communication, problem-solving, conflict resolution, and parenting skills. Principal treatment strategies include (1) engaging families in the treatment process and enhancing their motivation for change and (2) modifying family members' behavior using CM techniques, communication and problem solving, behavioral contracts, and other methods.⁶²

Undertreating a substance use disorder will increase the risk of relapse.

Multidimensional Family Therapy (MDFT)

MDFT is a comprehensive family- and community-based treatment for substance-abusing adolescents and those at high risk for behavior problems such as conduct disorder and delinquency. The aim is to foster family competency and collaboration with other systems like school or juvenile justice. Sessions may take place in a variety of locations, including in the home, at a clinic, at school, at family court, or in other community locations. MDFT has been shown to be effective even with more severe substance use disorders and can facilitate the reintegration of substance abusing juvenile detainees into the community.⁶³

Multisystemic Therapy (MST)

MST is a comprehensive and intensive family- and community-based treatment that has been shown to be effective even with adolescents whose substance abuse problems are severe and with those who engage in delinquent and/or violent behavior. In MST, the adolescent's substance abuse is viewed in terms of characteristics of the adolescent (e.g., favorable attitudes toward drug use) and those of his or her family (e.g., poor discipline, conflict, parental drug abuse), peers (e.g., positive attitudes toward drug use), school (e.g., dropout, poor performance), and neighborhood (e.g., criminal subculture). The therapist may work with the family as a whole but will also conduct sessions with just the caregivers or the adolescent alone.⁶⁴

ADDICTION MEDICATIONS

Several medications have been found to be effective in treating addiction to opioids, alcohol, or nicotine in adults, although none of these medications have been approved by the FDA to treat adolescents. In most cases, only preliminary evidence exists for the effectiveness and safety of these medications in people under 18, and there is no evidence on the neurobiological impact of these medications

on the developing brain. However, despite the relative lack of evidence, some health care providers do use medications “off-label” when treating adolescents (especially older adolescents) who are addicted to opioids, nicotine, or (less commonly) alcohol. Newer compounds continue to be studied for possibly treating substance use disorders in adults and adolescents, but none other than those listed here have shown conclusive results.

Note that there are currently no FDA-approved medications to treat addiction to cannabis, cocaine, or methamphetamine in any age group.

Opioid Use Disorders

Buprenorphine reduces or eliminates opioid withdrawal symptoms, including drug cravings, without producing the “high” or dangerous side effects of heroin and other opioids. It does this by both activating and blocking opioid receptors in the brain (i.e., it is what is known as a partial opioid agonist). It is available for sublingual (under-the-tongue) administration both in a stand-alone formulation (called Subutex®) and in combination with another agent called naloxone. The naloxone in the combined formulation (marketed as Suboxone®) is included to deter diversion or abuse of the medication by causing a withdrawal reaction if it is intravenously injected.⁶⁵ Physicians with special certification may provide office-based buprenorphine treatment for detoxification and/or maintenance therapy.⁶⁶ It is sometimes prescribed to older adolescents on the basis of two research studies indicating its efficacy for this population,^{67,68} even though it is not approved by the FDA for pediatric use.*

Methadone also prevents withdrawal symptoms and reduces craving in opioid-addicted individuals by activating opioid receptors in the brain (i.e., a full opioid agonist).

Adolescent drug abuse treatment is most commonly offered in outpatient settings.

It has a long history of use in treatment of opioid dependence in adults, and is available in specially licensed methadone treatment programs. In select cases and in some States, opioid-dependent adolescents between the ages of 16 and 18 may be eligible for methadone treatment, provided they have two documented failed treatments of opioid detoxification or drug-free treatment and have a written consent for methadone signed by a parent or legal guardian.⁶⁹

Naltrexone is approved for the prevention of relapse in adult patients following complete detoxification from opioids. It acts by blocking the brain’s opioid receptors (i.e., an opioid antagonist), preventing opioid drugs from acting on them and thus blocking the high the user would normally feel and/or causing withdrawal if recent opioid use has occurred. It can be taken orally in tablets or as a once-monthly injection given in a doctor’s office (a preparation called Vivitrol®).⁷⁰

Alcohol Use Disorders†

Acamprosate (Campral®) reduces withdrawal symptoms by normalizing brain systems disrupted by chronic alcohol consumption in adults.

Disulfiram (Antabuse®) inhibits an enzyme involved in the metabolism of alcohol, causing an unpleasant reaction if alcohol is consumed after taking the medication.⁷¹

* According to the FDA label, “SUBOXONE and SUBUTEX are not recommended for use in pediatric patients. The safety and effectiveness of SUBOXONE and SUBUTEX in patients below the age of 16 have not been established.”

† Medication-assisted therapies are rarely used to treat adolescent alcohol use disorders.



Naltrexone decreases alcohol-induced euphoria and is available in both oral tablets and long-acting injectable preparations (as in its use for the treatment of opioid addiction, above).

Nicotine Use Disorders

Bupropion, commonly prescribed for depression, also reduces nicotine cravings and withdrawal symptoms in adult smokers.⁷²

Nicotine Replacement Therapies (NRTs) help smokers wean off cigarettes by activating nicotine receptors in the brain. They are available in the form of a patch, gum, lozenge, nasal spray, or inhaler.⁷³

Varenicline reduces nicotine cravings and withdrawal in adult smokers by mildly stimulating nicotine receptors in the brain.⁷⁴

RECOVERY SUPPORT SERVICES

To reinforce gains made in treatment and to improve their quality of life more generally, recovering adolescents may benefit from recovery support services, which include continuing care, mutual help groups (such

as 12-step programs), peer recovery support services, and recovery high schools. Such programs provide a community setting where fellow recovering persons can share their experiences, provide mutual support to each other's struggles with drug or alcohol problems, and in other ways support a substance-free lifestyle. Note that recovery support services are not substitutes for treatment. Also, the existing research evidence for these approaches (with the exception of Assertive Continuing Care) is preliminary; anecdotal evidence supports the effectiveness of peer recovery support services and recovery high schools, for example, but their efficacy has not been established through controlled trials.

Assertive Continuing Care (ACC)

ACC is a home-based continuing-care approach delivered by trained clinicians to prevent relapse, and is typically used after an adolescent completes therapy utilizing the Adolescent Community Reinforcement Approach (A-CRA, see page 23). Using positive and negative reinforcement to shape behaviors, along with training in problem-solving and

communication skills, ACC combines A-CRA and assertive case management services (e.g., use of a multidisciplinary team of professionals, round-the-clock coverage, assertive outreach) to help adolescents and their caregivers acquire the skills to engage in positive social activities.⁷⁵

Mutual Help Groups

Mutual help groups such as the 12-step programs Alcoholics Anonymous (AA) and Narcotics Anonymous (NA) provide ongoing support for people with addictions to alcohol or drugs, respectively, free of charge and in a community setting. Participants meet in a group with others in recovery, once a week or more, sharing their experiences and offering mutual encouragement. Twelve-step groups are guided by a set of fundamental principles that participants are encouraged to adopt—including acknowledging that willpower alone cannot achieve sustained sobriety, that surrender to the group conscience must replace self-centeredness, and that long-term recovery involves a process of spiritual renewal.⁷⁶

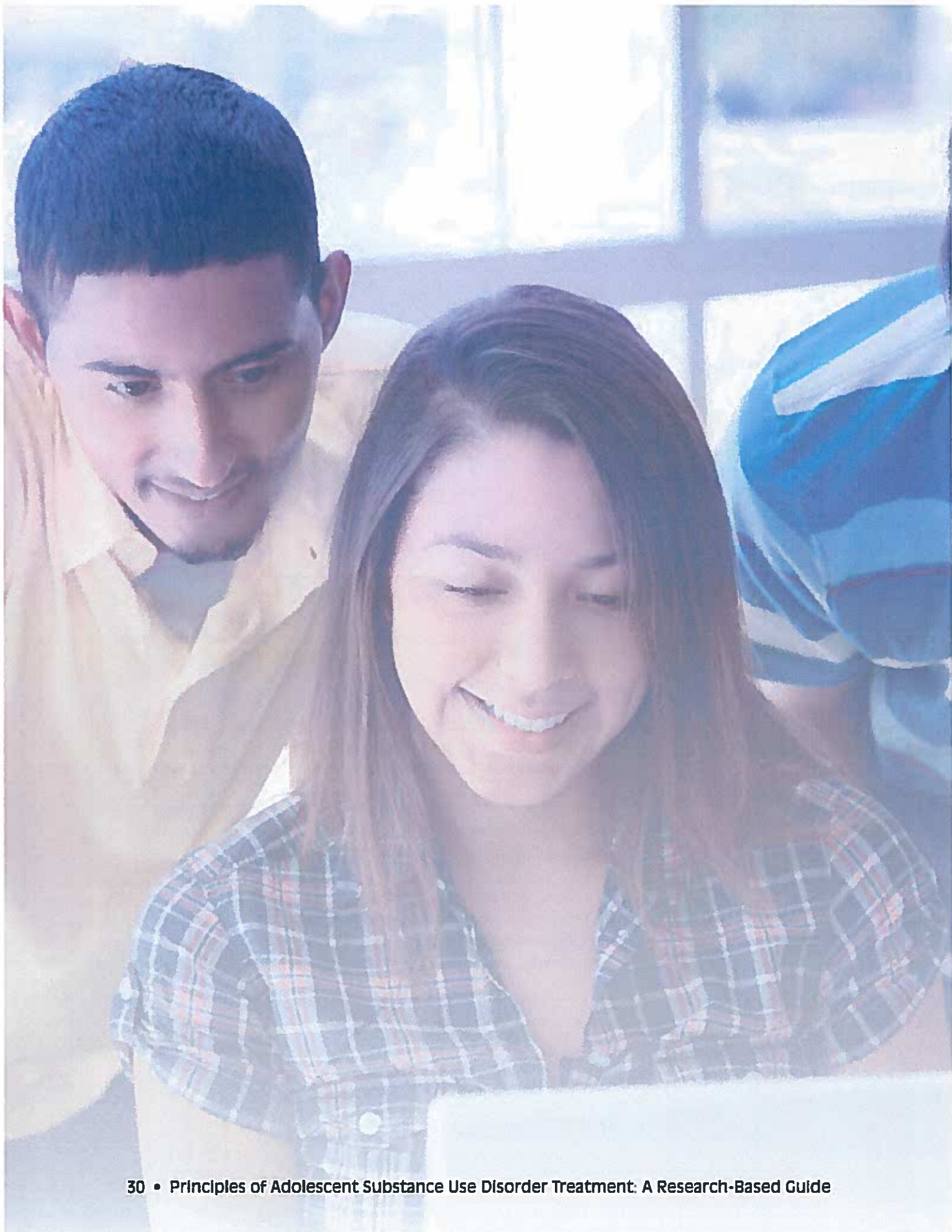
Peer Recovery Support Services

Peer recovery support services, such as recovery community centers, help individuals remain engaged in treatment and/or the recovery process by linking them together both in groups and in one-on-one relationships with peer leaders who have direct experience with addiction and recovery. Depending on the needs of the adolescent, peer leaders may provide mentorship and coaching and help connect individuals to treatment, 12-step groups, or other resources. Peer leaders may also facilitate or lead community-building activities, helping recovering adolescents build alternative social networks and have drug- and alcohol-free social options.⁷⁷



Recovery High Schools

Recovery high schools are schools specifically designed for students recovering from substance abuse issues. They are typically part of another school or set of alternative school programs within the public school system, but recovery school students are generally separated from other students by means of scheduling and physical barriers. Such programs allow adolescents newly in recovery to be surrounded by a peer group supportive of recovery efforts and attitudes. Recovery schools can serve as an adjunct to formal substance abuse treatment, with students often referred by treatment providers and enrolled in concurrent treatment for other mental health problems.⁷⁸





TREATMENT REFERRAL RESOURCES

Substance Abuse and Mental Health Services Administration (SAMHSA) Treatment Locator: 1-800-662-HELP or search www.findtreatment.samhsa.gov

The "Find A Physician" feature on the American Society of Addiction Medicine (ASAM) Web site:
<http://community.asam.org/search/default.asp?m=basic>

The Patient Referral Program on the American Academy of Addiction Psychiatry Web site:
<http://www.aaap.org/patient-referral-program>

The Child and Adolescent Psychiatrist Finder on the American Academy of Child and Adolescent Psychiatry Web site:
http://www.aacap.org/cs/root/child_and_adolescent_psychiatrist_finder/child_and_adolescent_psychiatrist_finder

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BILAG 9

The Washington Post

Wonkblog

Legal weed having little effect on teen marijuana use, federal data shows

By **Christopher Ingraham** December 18, 2015

Federal data released this week found there was no change in monthly marijuana use in nearly every U.S. state compared to last year. The only significant changes were in Rhode Island, Ohio and Hawaii, where monthly marijuana use fell year over year.

The latest state-level data, which asks participants if they used marijuana in the past month, is particularly useful, as it covers the first year of legal recreational marijuana in Colorado and Washington. While the rate of monthly teen marijuana use did tick upward in those states, the change wasn't statistically significant, according to the Substance Abuse and Mental Health Services Administration (SAMHSA), which released the data.

In Colorado, 12.6 percent of 12- to 17-year-olds used marijuana monthly in the combined years 2013 and 2014, up slightly from 11.2 percent in 2012-2013. (SAMHSA combines years for state-level estimates to increase the sample size.) Similarly, in Washington, the monthly teen marijuana use rate was 10.1 percent in 2013-2014, compared with 9.8 percent in 2012-2013.

Proponents and opponents of marijuana legalization gave different interpretations of the changing teen use rates.

"This data, combined with other federally-funded research released this week, shows that what our opponents say about legalization leading to skyrocketing youth marijuana use just isn't true," Tom Angell of Marijuana Majority, a pro-legalization group, said in an email.

Another recent federal survey of drug use among high school students found marijuana use was flat nationwide this year.

But legalization opponents pointed out that due partly to decreases in use in other states, Colorado now leads the nation in monthly adolescent marijuana use. "Now that Colorado has legalized and widely commercialized marijuana, their children use marijuana regularly more than children in any other state," said Kevin Sabet of Smart Approaches to Marijuana, an anti-legalization group.

Public health experts say the latest numbers are not particularly suggestive one way or another. "Most of the legal changes have pertained only to those 21 and over, so the absence of a big increase in teens is exactly what you'd expect," said Jonathan Caulkins of Carnegie Mellon University. "So it seems to me that the non-response of teens to the non-legalization for teens really tells us very little about the effects of legalization."

Like the national survey that came out earlier this month, the state-level data show significant decreases in the percentage of teens who say there's a "great risk of harm from smoking marijuana once a month." This has traditionally been understood as a risk factor for increased marijuana use -- if kids don't think pot is harmful, they'll be more likely to try it.

But that pattern hasn't held true over the past few years. Perceptions of risk are decreasing, and use among teens is flat. "Maybe this cohort is just plain well-behaved, but not being afraid of pot doesn't seem to be leading them to use a lot of it," Kleiman said.

Caulkins noted that teens have been saying that marijuana is easily available for decades now. "The availability reported in [the Monitoring the Future Survey] was already very high 20 years ago, so the liberalization couldn't do much more to increase availability. And it has not changed legal risk or consequences for teens," he said.

Christopher Ingraham writes about politics, drug policy and all things data. He previously worked at the Brookings Institution and the Pew Research Center. [Follow @_cingraham](#)

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BILAG 10

Legal pot in Oregon: One year later



By **Noelle Crombie** | [The Oregonian/OregonLive](#)

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Oregon is marking its first year of legal marijuana and with it some milestones: We are buying a lot of pot and the sales are generating millions in tax revenue -- but not in the eastern half of the state, where the idea remains particularly unpopular.

Other cannabis trends worth noting: Oregon recorded an uptick in marijuana-impaired drivers last year and the Oregon Poison Center fielded more calls from people who felt sick after overindulging.

Last July 1, Oregon became one of a handful of states where anyone 21 and older can possess pot and grow it in their backyard.

The state's official recreational marijuana marketplace, complete with seed-to-sale tracking, won't open until later this year. But the Legislature gave the go-ahead for early recreational pot sales earlier this year, allowing consumers to walk into one of hundreds of existing medical marijuana dispensaries to buy pot, including marijuana-infused edibles and extracts.

Some key takeaways since the landmark law took effect:

Oregonians have embraced the industry, at least with their wallets.

Oregon has collected \$14.9 million in tax revenues from the sales of recreational marijuana since January - translating into an estimated \$60 million in sales.

Marijuana sales are taxed at 25 percent, though medical marijuana remains untaxed. The revenue has far outpaced state economists' expectations and that doesn't include the recently expanded sales of spendier edibles and concentrates.

The tax on recreational pot eventually will be replaced with one ranging from 17 percent to 20 percent once the Oregon Liquor Control Commission begins regulating recreational marijuana sales later this year.

What's next

The Oregon Liquor Control Commission eventually will oversee marijuana production, processing and sales. But the agency isn't expected to open the market until October. Meanwhile consumers 21 and older can shop for pot at any one of the 362 medical marijuana dispensaries selling to the recreational market.

According to the latest statistics, the liquor commission has received 1,088 applications for the six kinds of licenses the agency is charged with issuing: labs, producer, processor, wholesaler, retailer, researcher.

The agency has received 734 applications for marijuana producer licenses, 123 of them in Jackson County.

The Legislature set the base tax rate at 17 percent, but cities and counties can adopt ordinances that add up to 3 percent more.

In Portland, home to 147 dispensaries selling recreational marijuana, the City Council in June voted unanimously to place a 3 percent pot tax on the Nov. 8 ballot. City officials said the tax could conservatively raise an estimated \$3 million to \$5 million a year for Portland.

Leafly, a marijuana review site and guide to dispensaries, says recreational cannabis sells for an average of \$13.67 a gram in Oregon, compared with \$14.68 a gram in Washington.

In June, dispensaries started selling marijuana-infused edibles, extracts and topical products that had until now been available only on the medical marijuana market. The new choices have been an additional boon to sales, shop owners say.

Case Van Dorne and Joel Jennings -- owners of a dispensary on Portland's east side and another near the Beaverton border -- say business is brisk. Their west-side location on bustling Southwest Beaverton-Hillsdale Highway sees 400 to 800 customers on a typical Friday, and the east-side shop sees between 250 and 400.

"Doctors come in in scrubs, lawyers in suits, chefs fresh out of a greasy kitchen - people are stopping by to pick up some weed and going home to watch a movie," Van Dorne said.

Police are finding more drivers under the influence of marijuana.

Between July 1 and Dec. 31 of last year, 50 drivers were accused of driving under the influence of marijuana, compared with 19 for the same time period the previous year, according to the latest Oregon State Police statistics.

Another 93 drivers were accused of having marijuana along with other drugs in their systems at the time they were stopped, compared with 44 the previous year.

Overall, the agency's data shows driving under the influence of any substance rose by 7 percent in 2015.

Sgt. Bob Ray, spokesman for the Washington County Sheriff's Office, said deputies have seen a similar upward trend among drivers, especially those combining alcohol and marijuana. His agency plans eventually to train all 186 deputies in evaluating whether a motorist is under the influence of drugs, including cannabis, he said.

"It's clearly much more than it was before" legalization, Ray said. "I don't know that people realize the effects, especially when you combine marijuana and alcohol, how much more impaired that makes you."

Much remains unknown about the impact of legal marijuana on public health in Oregon.

Public health experts have begun gathering a wide range of data on how much marijuana Oregonians are consuming and in what form now that it's legal to possess, grow and buy.

The latest data, collected in 2014 before recreational sales began, shows 1 in 10 adults in Oregon use marijuana. That rate has exceeded the national average for the past decade.

The state won't get a clear picture of teen marijuana consumption until 2017 when it conducts the next Oregon Healthy Teens Survey, said Julia Dilley, a senior research scientist and epidemiologist who works for Multnomah County.

Among young adults in the county pot use isn't only common but, according to 2013 data, appears to be on the rise. Already, Multnomah County teens use marijuana at rates higher than teens in the rest of Oregon and the country, and they say the drug is easy to get, according to 2014 public health surveys.

Using a federal grant from the National Institute of Drug Abuse, Oregon and Washington are looking at how local regulation, including bans on pot shops, affects public health.

They're looking at rates of treatment for marijuana dependence and emergency room visits, data that's not yet available.

Oregon Poison Center statistics show the number of calls related to marijuana ingestion has ticked up each year since 2013, when the center received 112 marijuana-related calls. Last year, the agency handled 158.

In the first three months of this year, the center received 86 calls about marijuana, which associate medical director Rob Hendrickson speculated is a "gross underestimation of total statewide harm" since most emergency doctors don't often report mild cases involving adults seeking medical treatment after consuming pot.

The poison center is studying what symptoms people experience when they seek emergency room care after smoking or eating marijuana and at what doses they experience problems, said Hendrickson, a professor of emergency medicine and a medical toxicologist at Oregon Health & Science University.

Dilley said even Colorado hasn't drawn solid conclusions from the public health data that it's collected since legalizing marijuana in 2012.

"Oregon is in the same boat," she said. "Oregon is unique in that the regulated recreational market isn't officially open even though we have retail sales. We are in a bit of a gray period of implementation."

Many communities, especially in eastern Oregon, remain opposed to recreational pot.

According to the latest tally kept by the Oregon Liquor Control Commission, more than 100 cities and counties throughout eastern

Oregon, have opted out of allowing licensed marijuana businesses.

They are allowed to ban recreational marijuana production and sales under a law passed by the Legislature in 2015. Communities where at least 55 percent opposed Oregon's legalization measure could opt out without referring an ordinance to the voters if they decided before last December. Any city or county, however, can still refer an opt-out measure to voters at the next general election in November.

Marijuana activists in two communities - Grant and Klamath counties - tried to overturn local bans earlier this year with referendums that local voters rejected.

One consequence of opting out: Governments that reject legal pot don't get a share of the tax revenue generated statewide by recreational marijuana sales.

Hundreds of Oregonians with marijuana-related arrests and convictions are seeking to have old cases set aside.

Nearly 400 people with marijuana-related arrests or convictions sought to have those crimes set aside last year, according to statistics kept by the Oregon Judicial Department.

The Legislature last year made significant changes to the way the criminal justice system treats marijuana. Lawmakers reduced penalties for most marijuana-related offenses, including growing and selling cannabis, and made it easier for people to have old pot convictions set aside, meaning sealed from public view.

Under the new law, when someone applies to have a previous marijuana-related conviction set aside, the court must consider how that person's crime would be classified today.

While the process doesn't erase the crimes from their records, it allows people to claim on an employment application or housing form that they've never been convicted of a crime.

The judicial department data shows an increasing number of people are apparently taking advantage of the set-aside provision. In 2013, for instance, 213 people applied to have arrests or convictions in marijuana cases sealed; last year, the number rose to 385. So far this year the state has received 249 applications.

Paul Armentano, deputy director of the National Organization for the Reform of Marijuana Laws, said Oregon has among the "most progressive" policies on marijuana in the country, especially when compared with places like Florida, where possession of more than 20 grams of marijuana is a felony.

In states such as Alaska and Washington, where voters have approved marijuana reform, lawmakers have been slow to adapt, Armentano said.

"Lawmakers are resistant to those changes and they have used the time period after these laws are voted on to try to amend the laws to make them more restrictive than the voters intended them to be," he said. "Oregon is going down a very different road."

Even in the era of legal marijuana, some activities remain off-limits.

People can't consume marijuana in public. State and local regulations have put a damper on large-scale social events in Portland that feature pot consumption, essentially outlawing them. Employers can drug-test their workers and landlords can prohibit cannabis consumption and cultivation on their property.

— Noelle Cromble

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The Washington Post

Wonkblog

Here's how legal pot changed Colorado and Washington

By **Christopher Ingraham** October 13, 2016

Marijuana has had little impact so far on various public health measures in states where it has been legalized, according to a report from the Drug Policy Alliance released Thursday.

Three years after commercial marijuana markets first opened in Colorado and Washington, the nonprofit organization, which favors marijuana legalization, acknowledges that it is “too early to draw any line-in-the-sand conclusion about the effects of marijuana legalization.”

But in the DPA's reading, the preliminary numbers are encouraging: “so far, so good,” as the report sums things up. The DPA report echoes the findings of a study by the libertarian Cato Institute earlier this year.

Here's what the DPA report found:

1. Teen marijuana use is unchanged.

In both Colorado and Washington, state surveys have shown no significant change in marijuana use among teens since voters passed legalization measures.

This is an important issue, as researchers generally agree that people who start using marijuana in their teens are more likely to become dependent on the drug later in their lives, and may be at higher risk of other physical and mental health problems related to marijuana use.

Opponents of legalization often point out that one highly regarded federal survey on drug use shows that Colorado is No. 1 in the nation when it comes to teen marijuana use. But experts say that the trend in that survey was in place long before Colorado voters legalized marijuana.

Experts also point out that the official state survey, which uses a much larger sample size than the federal survey, indicates that Colorado teens are middle-of-the-pack on marijuana use compared to teens in the rest of the nation.

“Preliminary data show that the legalization of marijuana has had little to no impact on the overall rate of youth use of marijuana,” the DPA report concludes.

2. Marijuana arrests are way down — but racial disparities remain.

“Arrests in all states and Washington, D.C. for the possession, cultivation and distribution of marijuana have plummeted since voters legalized the adult use of marijuana,” the DPA finds, citing official state and municipal numbers. The reduction in arrests is “saving those jurisdictions millions of dollars and preventing the criminalization of thousands of people.”

In Colorado, marijuana arrests fell by nearly half from 2012 to 2014. Marijuana possession charges in Washington state fell by a more dramatic 98 percent between 2012 and 2013. Alaska, Oregon and D.C. show similar declines.

From a criminal justice standpoint, that's a significant development. A report out yesterday from the ACLU and Human Rights Watch found that in a given year, American police typically arrest more people for marijuana use than for all violent crimes combined.

“By no longer arresting and prosecuting possession and other low-level marijuana offenses, states are saving hundreds of millions of dollars,” the Drug Policy Alliance writes, citing the \$200 million spent on marijuana enforcement in Washington state between 2000 and 2010.

Still, the DPA notes that disparities in marijuana arrest rates between black and white citizens remain, even after legalization: “While legalization substantially reduces the total number of blacks and Latinos arrested for marijuana offenses, it does not eliminate the forces that contributed to the disparity in the first place.”

3. Marijuana legalization appears to have had little impact on traffic fatalities.

“In Colorado and Washington the post-legalization traffic fatality rate has remained statistically consistent with pre-legalization levels, is lower in each state than it was a decade prior, and is lower than the national rate,” the DPA writes, citing federal traffic statistics through 2014.

More recent data through 2015 and 2016 analyzed by the Cato Institute yields similar conclusions.

Opponents of legalization point out that while overall fatal crash rates are little changed, drivers in fatal crashes are now more likely to test positive for marijuana in places like Washington.

But one challenge to these figures is that marijuana impairment can't be measured via blood tests the same way alcohol impairment can: “it is difficult to establish a relationship between a person's THC [the active psychoactive compound in marijuana] blood or plasma concentration and performance impairing effects,” the National Highway Transit Safety Administration writes.

This is because the active compounds in marijuana are absorbed slowly into the body, and may be detectable in blood samples long after impairment has passed. Post-legalization, if more drivers are testing positive for marijuana that may simply “demonstrate an as-expected increase in marijuana use by adults over 21 years of age in the states that have legalized,” according to the Drug Policy Alliance.

4. Tax revenues have gone up, but make up a small slice of state budgets overall.

By the second year of legalization, marijuana tax revenues exceeded projections in both Colorado and Washington. In the most recent fiscal years, recreational marijuana brought in \$129 million in taxes in Colorado and \$220 million in Washington.

“These revenues fund school construction, marijuana enforcement and general state needs,” the DPA writes.

Relative to the overall size of the state budgets, these numbers aren't huge — they represent less than 1 percent of total state expenditures in both cases.

5. Other effects

The Drug Policy Alliance report doesn't make note of other effects of legalization frequently mentioned by marijuana opponents.

Rates of marijuana poisonings among small children in Colorado increased post-legalization, although the overall numbers remain negligible: There were 47 marijuana-related poison control center calls in Colorado in 2015, up from 25 in 2013.

The rate of adult emergency department visits for marijuana use also increased following legalization. This was mostly attributable to more emergency department visits from tourists who had come to the state and had a negative experience with marijuana.

Christopher Ingraham writes about politics, drug policy and all things data. He previously worked at the Brookings Institution and the Pew Research Center. 🐦 Follow @_cingraham

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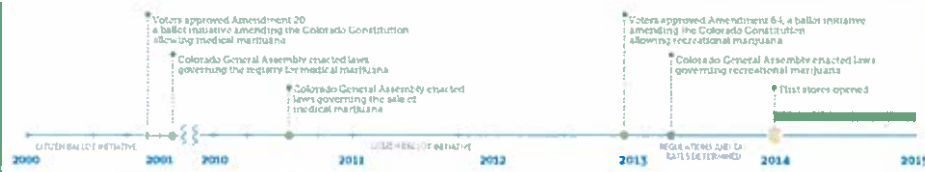
Nikkei Asian Review

Marijuana Use in Colorado

Colorado adults, ages 18 and older, 2014

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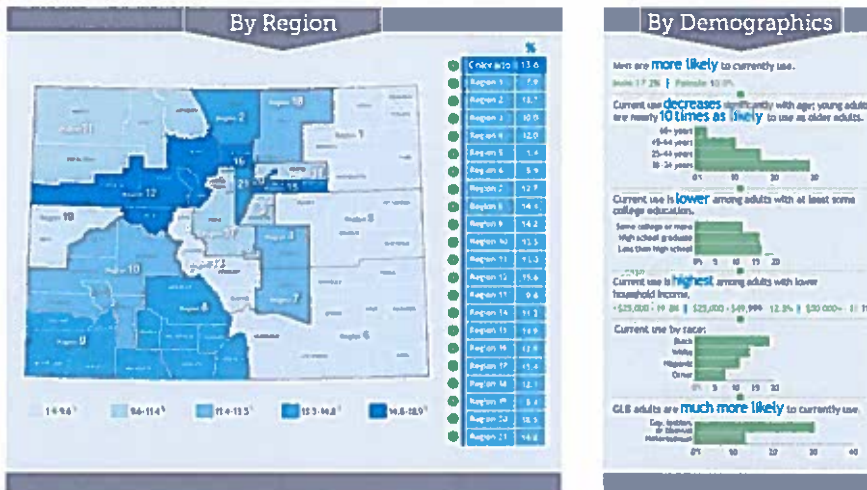
RESULTS FROM THE COLORADO BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM



CURRENTLY USE 2014

ADULTS 18+ YEARS CURRENT USE: ● 13.6% ADULTS 21+ YEARS CURRENT USE: ● 12.9%

AMONG ALL CURRENT USERS: ● 33.2% reported using marijuana daily ● 18.8% reported driving after using.

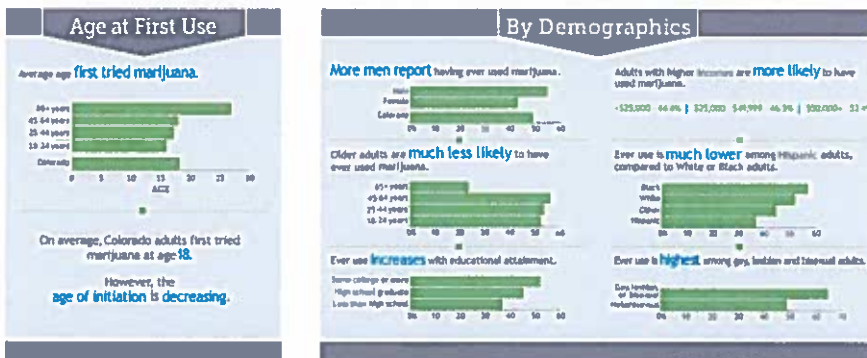


COMPARING DATA SOURCES: COLORADO ADULTS



EVER USED 2014

ADULTS 18+ YEARS EVER USED: ● 48.9% ADULTS 21+ YEARS EVER USED: ● 49.5%



EXPOSURE AMONG CHILDREN

In the Home

Of parents with children ages 1-14:

- 6.9% report having marijuana in or around the home;
- 71.3% of those with it in the home kept it locked away.

Of children ages 1-14:

- 3.9% live in homes where marijuana had recently been used inside.

Of parents reporting recent marijuana use inside the home:

- 76.4% said marijuana was smoked;
- 38.5% said marijuana was vaporized;
- 14.2% said marijuana was eaten.



BILAG 13



AMERICAN PSYCHOLOGICAL ASSOCIATION

FEATURE

Marijuana and the developing brain

More states are legalizing marijuana, but concerns remain about its long-term effects on the adolescent brain.

By Kirsten Weir

November 2015, Vol 46, No. 10

Print version: page 48

Marijuana is the most widely used illicit drug in the United States — but the term "illicit" may not apply much longer. Twenty-three states have legalized *Cannabis sativa* for medical use since 1996. Alaska, Colorado, Oregon, Washington and Washington, D.C., now allow recreational use of the drug for people over 21. Acceptance of marijuana is growing (ahem) like a weed.

Those laws are not without controversy. Among the critics' concerns is the worry that, despite age limits, legalization might make marijuana more accessible to young people. And adolescents' developing brains may be particularly vulnerable to lasting damage from the drug.

"There are a lot of open questions" about the long-term effects of marijuana, says Susan Weiss, PhD, director of the division of extramural research at the National Institute on Drug Abuse (NIDA). "But there's a growing literature, and it's all pointing in the same direction: Starting young and using frequently may disrupt brain development."

Brain under construction

Marijuana shows considerable promise for treating medical conditions including pain, muscle spasms, seizure disorders and nausea from cancer chemotherapy. At least some of those benefits are thought to come from cannabidiol, a chemical component of the marijuana plant not thought to produce mind-altering effects. But there's a lot left to learn about this and other chemical compounds in marijuana. Recently, the Senate recommended \$800,000 for an Institute of Medicine study on medical marijuana, and has also encouraged the National Institutes of Health to support more research on cannabidiol.

What's clear, however, is that marijuana's signature high comes from a psychoactive component known as tetrahydrocannabinol (THC). And evidence is mounting, says Weiss, that THC is not risk-free.

In the short term, marijuana use has been shown to impair functions such as attention, memory, learning and decision-making. Those effects can last for days after the high wears off. Heavy marijuana use in adolescence or early adulthood has been associated with a dismal set of life outcomes including poor school performance, higher dropout rates, increased welfare dependence, greater unemployment and lower life satisfaction.

But it's not clear that marijuana deserves the bulk of the blame. Some researchers have suggested that factors such as peer influence, emotional distress or a tendency toward problem behavior could predispose people to drug use as well as poor life outcomes. "Is marijuana the causal agent in these outcomes, or is it part of a variety of vulnerability factors?" Weiss asks.

Few longitudinal studies have been conducted to follow the trajectories of young people before and after they take their first hit of marijuana. But one long-term prospective study from New Zealand showed worrisome findings.

Duke University psychologist Terrie Moffitt, PhD, and colleagues collected data from the Dunedin Multidisciplinary Health and Development Study, longitudinal research that has followed 1,000 New Zealanders born in 1972. Participants answered questions about marijuana use at 18, 21, 26, 32 and 38. They also underwent neuropsychological testing at ages 13 and 38.

The team found that persistent marijuana use was linked to a decline in IQ, even after the researchers controlled for educational differences. The most persistent users — those who reported using the drug in three or more waves of the study — experienced a drop in neuropsychological functioning equivalent to about six IQ points (*PNAS* (<http://www.pnas.org/content/109/40/E2657.full>), 2012). "That's in the same realm as what you'd see with lead exposure," says Weiss. "It's not a trifle."

There are some reasons to think that adolescents may be uniquely susceptible to lasting damage from marijuana use. At least until the early or mid-20s, "the brain is still under construction," says Staci Gruber, PhD, a neuroscientist and director of the Cognitive and Clinical Neuroimaging Core and the Marijuana Investigations for Neuroscientific Discovery (MIND) Program at McLean Hospital/Harvard Medical School. During this period of neurodevelopment, the brain is thought to be particularly sensitive to damage from drug exposure. And the frontal cortex — the region critical to planning, judgment, decision-making and personality — is one of the last areas to fully develop, Gruber says.

Also immature in teens is the endocannabinoid system. As its name implies, this system comprises the physiological mechanisms that respond to THC. That system is important for cognition, neurodevelopment, stress response and emotional control, and it helps to modulate other major neurotransmitter systems, says Krista Lisdahl, PhD, director of the Brain Imaging and Neuropsychology Laboratory at the University of Wisconsin, Milwaukee.

Repeated exposure to marijuana can dial down cellular activity in the endocannabinoid system. Such interference might be a bigger problem for immature brains, says Lisdahl. "That sets the stage for why adolescents may be more sensitive to the effects of repeated marijuana exposure, from a neuroscience perspective."

Altered brains

Indeed, a number of studies have found evidence of brain changes in teens and young adults who smoke marijuana. In 2013, Rocío Martín-Santos, MD, PhD, at the University of Barcelona, and colleagues reviewed 43 studies of chronic cannabis use and the brain. They found consistent evidence of both structural brain abnormalities and altered neural activity in marijuana users. Only eight of those studies focused on adolescents, but the findings from those studies suggested that both structural and functional brain changes emerge soon after adolescents start using the drug. Those changes may still be evident after a month of abstaining from the drug, the researchers reported (*PLOS ONE*, 2013).

Some of those brain abnormalities have been linked to cognitive differences. Gruber found that regular, heavy marijuana users — those who reported smoking five of the last seven days, and more than 2,500 times in their lives — had damage to their brains' white matter, which helps enable communication among neurons. Those white matter changes were correlated with higher impulsivity, she found, particularly in people who began smoking before age 16 (*Psychopharmacology* (<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3967072/>), 2013).

Much of Gruber's work compares heavy, regular marijuana users who began before and after age 16. Her results suggest there's greater risk in starting young. Compared with users who began after 16, early-onset smokers made twice as many mistakes on tests of executive function, which included planning, flexibility, abstract thinking and inhibition of inappropriate responses. As adults, those who

started using before 16 reported smoking nearly 25 times per week, while those who started later smoked half as often, about 12 times per week. The early-onset smokers also reported smoking an average of nearly 15 grams each week, versus about 6 grams for their late-onset counterparts (*Psychology of Addictive Behaviors*, 2012).

Gruber's participants had reported using marijuana at least five times in the past week. But other labs have found structural differences in the brains of less frequent users. Jodi Gilman, PhD, at Massachusetts General Hospital/Harvard Center for Addiction Medicine, and colleagues used MRI to look for brain changes in 18- to 25-year-olds who smoked marijuana at least once per week, but were not dependent on the drug.

Compared with nonusers, the smokers had changes in the shape, volume and gray matter density of two brain regions associated with addiction: the nucleus accumbens (which plays a role in motivation, pleasure and reward processing) and the amygdala (a region involved in memory, emotion and decision-making). Participants who smoked more often had more significant differences (*Journal of Neuroscience* (<http://jn.sfn.org/press/April-16-2014-Issue/zns01614005529.pdf>), 2014).

Open questions

But the case against marijuana isn't closed. Other studies have failed to turn up evidence that marijuana use results in brain abnormalities. In one recent example, Barbara Weiland, PhD, at the University of Colorado at Boulder, and colleagues attempted to replicate Gilman's study in adolescents and adults who smoked marijuana daily. But Weiland's team argued that previous studies, including Gilman's, failed to adequately control for alcohol use by the participants. After carefully matching for alcohol intake in the control and experimental subjects, the researchers failed to find physical differences in the nucleus accumbens or the amygdala of daily marijuana smokers (*Journal of Neuroscience* (<http://www.jneurosci.org/content/35/4/1505.full>), 2015).

On the other hand, says Lisdahl, Weiland's subjects were primarily male — and some research suggests females might be more sensitive to marijuana's effects during adolescence.

In other cases, too, the evidence against marijuana is frustratingly mixed. While some studies have found increased risk for mood disorders and psychotic symptoms among marijuana users, for instance, a new study by Jordan Bechtold, PhD, at the University of Pittsburgh Medical Center, and colleagues found that chronic use among teenage boys did not raise the risk of later depression, lung cancer, asthma or psychotic symptoms (*Psychology of Addictive Behaviors* (<http://www.apa.org/pubs/journals/releases/adb-adb0000103.pdf>), 2015).

In hopes of painting a clearer picture of marijuana's potential risks to youth, NIDA plans to launch the Adolescent Brain and Cognitive Development (ABCD) study later this year. The prospective longitudinal study will follow 10,000 individuals across the United States over a decade, starting when they're 9 or 10. "The idea is to look at what these kids are like before they start using substances, and then follow over time what happens to their brains," Weiss says.

Other important questions remain to be answered. Much of the research on the long-term cognitive effects of cannabis has focused on heavy users. It's not clear whether there's a safe level of use, Lisdahl says. Nor is it known whether the brain changes associated with marijuana use are permanent, or if the brain can recover with time. "A lot of people have used marijuana for a few years during adolescence," says Lisdahl. "Have they done damage that's irreversible?"

Finding answers to these questions may be complicated by the fact that marijuana potency has risen dramatically in recent years. Thirty years ago, THC concentrations were typically well below 10 percent, and even below 5 percent. But a recent analysis of marijuana samples sold in Colorado found THC potency approaching 30 percent, according to results presented at the 2015 meeting of the American Chemical Society.

New methods of administering the drug are also springing up, including smoking new varieties of highly concentrated cannabis resins, which contain even more THC than high-potency pot. Recently popular edible products — think marijuana gummy bears — also present problems. Users might not have a clear sense of what constitutes a reasonable "dose." And since edible products take longer to be metabolized and produce their psychoactive effects, people can easily overindulge while they're waiting for a high to kick in. "What's clearly lacking and sorely needed are studies that look at the effect of increased potency, and different modes and methods of use, on brain-related measures," Gruber says.

Access and attitudes

Despite these questions, nearly half of U.S. states have already legalized marijuana in some form, and more are likely to follow suit. A number of researchers are now turning their attention to the question of how those laws might affect young people.

Esther K. Choo, MD, MPH, of Brown University, and colleagues used data on more than 11 million high school students from the Centers for Disease Control and Prevention's national Youth Risk Behavioral Surveillance Survey collected between 1991 and 2011. Marijuana use was common among the students — about one in five reported having smoked marijuana in the last month. But in states that legalized marijuana, the researchers found no increases in teen use following passage of the new laws (*Journal of Adolescent Health* (<http://www.jahonline.org/article/S1054-139X%2814%2900107-4/abstract>), 2014).

In a similar study, Deborah Hasin, PhD, at Columbia University Medical Center, and colleagues analyzed survey data from more than one million adolescents collected between 1991 and 2014 as part of NIDA's Monitoring the Future survey. During that period, 21 states passed laws legalizing cannabis for medical purposes. Hasin and her colleagues found no apparent differences in marijuana use among adolescents before and after the medical marijuana laws were passed (*The Lancet* (<http://www.thelancet.com/journals/lanpsy/article/PIIS2215-0366%2815%2900217-5/abstract>), 2015).

Yet Hasin and her colleagues did find that in states where medical marijuana was legal, teen marijuana use was already higher even before the laws were passed. That suggests more permissive attitudes toward marijuana in those states, rather than increased access to the drug, may influence teen use.

Indeed, the Monitoring the Future survey has shown that when perception of marijuana's risk drops, use of the drug rises in short order. And the perceived risk of marijuana has been declining over the last decade. In 2014, less than 40 percent of high school seniors said they believed regular marijuana use was very risky — the lowest proportion since the 1970s.

Other researchers are exploring how families interpret the new laws. W. Alex Mason, PhD, director of research at the National Institute for Child and Family Studies, Boys Town, and colleagues have studied parents' perceptions and knowledge of marijuana laws in Washington state. They found that parents often remained uncertain about what was legal or illegal, and only discussed the laws with their children occasionally. "Parents as a theme expressed frustration about not knowing the facts," Mason says. "In many cases, teenagers are following this more closely than their parents."

Parents may not be talking to their kids about marijuana often, but retailers seem to be, Lisdahl says. "In Colorado, there are marijuana ads in the free magazines that are clearly marketed to young people."

Unfortunately, marijuana producers have a strong incentive to hook young users. While about 9 percent of adults who use cannabis become addicted, the rate is 17 percent for people who start smoking in their teens, according to NIDA figures. And as the tobacco and alcohol industries have demonstrated, she says, such companies make the majority of their profits on a relatively small proportion of chronic users. "The minute there's a profit motive, companies tend to make a product

more addictive," says Lisdahl. "I think legalization is moving ahead prematurely without considering the lessons we've learned from nicotine and alcohol prevention policy research."

Gruber, too, has concerns that marijuana policy is outpacing science. "As we're on the precipice of all this legislation," she says, "the take-home message is, there's a lot that we know, but a lot more we don't."

Much of the research on the long-term cognitive effects of cannabis has focused on heavy users. It's not clear whether there's a safe level of use. Nor is it known whether the brain changes associated with marijuana use are permanent, or if the brain can recover with time.

Find this article at:

<http://www.apa.org/monitor/2015/11/marijuana-brain.aspx>

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August 9, 2014

Regular Marijuana Use Bad for Teens' Brains

Psychology and public health experts weigh in on potential effects of legalization on youth

WASHINGTON — Frequent marijuana use can have a significant negative effect on the brains of teenagers and young adults, including cognitive decline, poor attention and memory, and decreased IQ, according to psychologists discussing public health implications of marijuana legalization at the American Psychological Association's 122nd Annual Convention.

"It needs to be emphasized that regular cannabis use, which we consider once a week, is not safe and may result in addiction and neurocognitive damage, especially in youth," said Krista Lisdahl, PhD, director of the brain imaging and neuropsychology lab at University of Wisconsin-Milwaukee.

Marijuana use is increasing, according to Lisdahl, who pointed to a 2012 study (http://monitoringthefuture.org/pubs/monographs/mtf-vol2_2012.pdf) (PDF, 6.43MB) showing that 6.5 percent of high school seniors reported smoking marijuana daily, up from 2.4 percent in 1993. Additionally, 31 percent of young adults (ages 18 to 25) reported using marijuana in the last month. People who have become addicted to marijuana can lose an average of six IQ points by adulthood, according to Lisdahl, referring to a 2012 longitudinal study of 1,037 participants (<http://www.pnas.org/content/early/2012/08/22/1206820109.abstract>) who were followed from birth to age 38.

Brain imaging studies of regular marijuana users have shown significant changes in their brain structure, particularly among adolescents, Lisdahl said. Abnormalities in the brain's gray matter, which is associated with intelligence, have been found in 16- to 19-year-olds who increased their marijuana use in the past year, she said. These findings remained even after researchers controlled for major medical conditions, prenatal drug exposure, developmental delays and learning disabilities, she added.

"When considering legalization, policymakers need to address ways to prevent easy access to marijuana and provide additional treatment funding for adolescent and young adult users," she said. She also recommended that legislators consider regulating levels of tetrahydrocannabinol, or THC, the major psychoactive chemical in marijuana, in order to reduce potential neurocognitive effects.

Some legalized forms of marijuana have higher levels of THC than other strains, said Alan Budney, PhD, of Dartmouth College. THC is responsible for most of marijuana's psychological effects. Some research has shown that frequent use of high potency THC can increase risk of acute and future problems with depression, anxiety and psychosis. "Recent studies suggest that this relationship between marijuana and mental illness may be moderated by how often marijuana is used and potency of the substance," Budney said. "Unfortunately, much of what we know from earlier research is based on smoking marijuana with much lower doses of THC than are commonly used today." Current treatments for marijuana addiction among adolescents, such as brief school interventions and outpatient counseling, can be helpful but more research is needed to develop more effective strategies and interventions, he added.

Additionally, people's acceptance of legalized medical marijuana use appears to have an effect on adolescents' perception of the drug's risks, according to Bettina Friese, PhD, of the Pacific Institute for Research and Evaluation (<http://www.pire.org/index.asp>) in California. She presented results from a 2013 study of 17,482 teenagers in Montana, which found marijuana use among teenagers was higher in counties where larger numbers of people voted to legalize medical marijuana in 2004. In addition, teens in counties with more votes for the legalization of medical marijuana perceived marijuana use to be less risky. The research findings suggest that a more accepting attitude toward medical marijuana may have a greater effect on marijuana use among teens than the actual number of medical marijuana licenses available, Friese said.

Session 3163: "Considering Cannabis? Potential Public Health Implications of Marijuana Legalization," symposium, Saturday, Aug. 9, 10-11:50 a.m. EDT, Room 150B, Walter E. Washington Convention Center, 801 Mount Vernon Pl., NW, Washington, D.C.

Presentations and contact information:

"Neurocognitive Consequences of Chronic Marijuana Use: Preventing Early Onset Is Critical (</news/press/releases/2014/08/considering-cannabis.pdf>)" (PDF, 352KB)

Krista Lisdahl can be contacted by email (<mailto:krista.medina@gmail.com>), or by phone at (414) 229-7159 (office) or (262) 290-7646 (cell).

"Clinical Epidemiology, Characteristics, Services, and Outcomes for Youth With Cannabis-Use Disorders (</news/press/releases/2014/08/clinical-epidemiology.pdf>)" (PDF, 1.84MB)

Alan Budney can be contacted by email (<mailto:Alan.J.Budney@dartmouth.edu>) or, by phone at (603) 653-1821 (office).

"Is Legalization of Medical Marijuana Related to Youths' Marijuana Beliefs and Behaviors? (<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3638722/>)"

Bettina Friese can be contacted by email (<mailto:bfriese@prev.org>) or by phone at (510) 883-5716.

The American Psychological Association, in Washington, D.C., is the largest scientific and professional organization representing psychology in the United States. APA's

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REVIEW ARTICLE

Dan L. Longo, M.D., Editor

Adverse Health Effects of Marijuana Use

Nora D. Volkow, M.D., Ruben D. Baler, Ph.D., Wilson M. Compton, M.D.,
and Susan R.B. Weiss, Ph.D.

IN LIGHT OF THE RAPIDLY SHIFTING LANDSCAPE REGARDING THE LEGALIZATION of marijuana for medical and recreational purposes, patients may be more likely to ask physicians about its potential adverse and beneficial effects on health. The popular notion seems to be that marijuana is a harmless pleasure, access to which should not be regulated or considered illegal. Currently, marijuana is the most commonly used "illicit" drug in the United States, with about 12% of people 12 years of age or older reporting use in the past year and particularly high rates of use among young people.¹ The most common route of administration is inhalation. The greenish-gray shredded leaves and flowers of the *Cannabis sativa* plant are smoked (along with stems and seeds) in cigarettes, cigars, pipes, water pipes, or "blunts" (marijuana rolled in the tobacco-leaf wrapper from a cigar). Hashish is a related product created from the resin of marijuana flowers and is usually smoked (by itself or in a mixture with tobacco) but can be ingested orally. Marijuana can also be used to brew tea, and its oil-based extract can be mixed into food products.

The regular use of marijuana during adolescence is of particular concern, since use by this age group is associated with an increased likelihood of deleterious consequences² (Table 1). Although multiple studies have reported detrimental effects, others have not, and the question of whether marijuana is harmful remains the subject of heated debate. Here we review the current state of the science related to the adverse health effects of the recreational use of marijuana, focusing on those areas for which the evidence is strongest.

ADVERSE EFFECTS

RISK OF ADDICTION

Despite some contentious discussions regarding the addictiveness of marijuana, the evidence clearly indicates that long-term marijuana use can lead to addiction. Indeed, approximately 9% of those who experiment with marijuana will become addicted³ (according to the criteria for dependence in the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition [DSM-IV]). The number goes up to about 1 in 6 among those who start using marijuana as teenagers and to 25 to 50% among those who smoke marijuana daily.⁴ According to the 2012 National Survey on Drug Use and Health, an estimated 2.7 million people 12 years of age and older met the DSM-IV criteria for dependence on marijuana, and 5.1 million people met the criteria for dependence on any illicit drug¹ (8.6 million met the criteria for dependence on alcohol¹). There is also recognition of a bona fide cannabis withdrawal syndrome⁵ (with symptoms that include irritability, sleeping difficulties, dysphoria, craving, and anxiety), which makes cessation difficult and contributes to relapse. Marijuana use by adolescents is particularly troublesome. Adolescents' increased vulnerability to adverse long-term outcomes from marijuana use is probably related

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Table 1. Adverse Effects of Short-Term Use and Long-Term or Heavy Use of Marijuana.

Effects of short-term use
Impaired short-term memory, making it difficult to learn and to retain information
Impaired motor coordination, interfering with driving skills and increasing the risk of injuries
Altered judgment, increasing the risk of sexual behaviors that facilitate the transmission of sexually transmitted diseases
In high doses, paranoia and psychosis
Effects of long-term or heavy use
Addiction (in about 9% of users overall, 17% of those who begin use in adolescence, and 25 to 50% of those who are daily users)*
Altered brain development*
Poor educational outcome, with increased likelihood of dropping out of school*
Cognitive impairment, with lower IQ among those who were frequent users during adolescence*
Diminished life satisfaction and achievement (determined on the basis of subjective and objective measures as compared with such ratings in the general population)*
Symptoms of chronic bronchitis
Increased risk of chronic psychosis disorders (including schizophrenia) in persons with a predisposition to such disorders

* The effect is strongly associated with initial marijuana use early in adolescence.

to the fact that the brain, including the endocannabinoid system, undergoes active development during adolescence.⁶ Indeed, early and regular marijuana use predicts an increased risk of marijuana addiction, which in turn predicts an increased risk of the use of other illicit drugs.⁷ As compared with persons who begin to use marijuana in adulthood, those who begin in adolescence are approximately 2 to 4 times as likely to have symptoms of cannabis dependence within 2 years after first use.⁸

EFFECT ON BRAIN DEVELOPMENT

The brain remains in a state of active, experience-guided development from the prenatal period through childhood and adolescence until the age of approximately 21 years.⁹ During these developmental periods, it is intrinsically more vulnerable than a mature brain to the adverse long-term effects of environmental insults, such as exposure to tetrahydrocannabinol, or THC, the primary active ingredient in marijuana. This view has received considerable support from studies in animals, which have shown, for example, that prenatal or adolescent exposure to

THC can recalibrate the sensitivity of the reward system to other drugs¹⁰ and that prenatal exposure interferes with cytoskeletal dynamics, which are critical for the establishment of axonal connections between neurons.¹¹

As compared with unexposed controls, adults who smoked marijuana regularly during adolescence have impaired neural connectivity (fewer fibers) in specific brain regions. These include the precuneus, a key node that is involved in functions that require a high degree of integration (e.g., alertness and self-conscious awareness), and the fimbria, an area of the hippocampus that is important in learning and memory.¹² Reduced functional connectivity has also been reported in the prefrontal networks responsible for executive function (including inhibitory control) and the subcortical networks, which process habits and routines.¹³ In addition, imaging studies in persons who use cannabis have revealed decreased activity in prefrontal regions and reduced volumes in the hippocampus.¹⁴ Thus, certain brain regions may be more vulnerable than others to the long-term effects of marijuana. One study showed that selective down-regulation of cannabinoid-1 (CB1) receptors in several cortical brain regions in long-term marijuana smokers was correlated with years of cannabis smoking and was reversible after 4 weeks of abstinence.¹⁵ Changes in CB1 receptors were not seen in subcortical regions.

The negative effect of marijuana use on the functional connectivity of the brain is particularly prominent if use starts in adolescence or young adulthood,¹² which may help to explain the finding of an association between frequent use of marijuana from adolescence into adulthood and significant declines in IQ.¹⁶ The impairments in brain connectivity associated with exposure to marijuana in adolescence are consistent with preclinical findings indicating that the cannabinoid system plays a prominent role in synapse formation during brain development.¹⁷

POSSIBLE ROLE AS GATEWAY DRUG

Epidemiologic and preclinical data suggest that the use of marijuana in adolescence could influence multiple addictive behaviors in adulthood. In rodents exposed to cannabinoids during adolescence, there is decreased reactivity of the dopamine neurons that modulate the brain's reward regions.¹⁸ The exposure of rodents to

cannabis in utero alters the developmental regulation of the mesolimbic dopamine system of affected offspring.¹⁹ If reduced dopamine reactivity in the brain's reward regions does follow early exposure to marijuana, this effect could help to explain the increased susceptibility to drug abuse and addiction to several drugs later in life, which has been reported in most epidemiologic studies.²⁰ This theory is also consistent with animal models showing that THC can prime the brain for enhanced responses to other drugs.²¹ Although these findings support the idea that marijuana is a gateway drug, other drugs, such as alcohol and nicotine, can also be categorized as gateway drugs, since they also prime the brain for a heightened response to other drugs.²² However, an alternative explanation is that people who are more susceptible to drug-taking behavior are simply more likely to start with marijuana because of its accessibility and that their subsequent social interactions with other drug users would increase the probability that they would try other drugs.

RELATION TO MENTAL ILLNESS

Regular marijuana use is associated with an increased risk of anxiety and depression,²³ but causality has not been established. Marijuana is also linked with psychoses (including those associated with schizophrenia), especially among people with a preexisting genetic vulnerability,²⁴ and exacerbates the course of illness in patients with schizophrenia. Heavier marijuana use, greater drug potency, and exposure at a younger age can all negatively affect the disease trajectory (e.g., by advancing the time of a first psychotic episode by 2 to 6 years).²⁵

However, it is inherently difficult to establish causality in these types of studies because factors other than marijuana use may be directly associated with the risk of mental illness. In addition, other factors could predispose a person to both marijuana use and mental illness. This makes it difficult to confidently attribute the increased risk of mental illness to marijuana use.

EFFECT ON SCHOOL PERFORMANCE AND LIFETIME ACHIEVEMENT

In the 2013 Monitoring the Future survey of high-school students,²⁶ 6.5% of students in grade 12 reported daily or near-daily marijuana use, and this figure probably represents an underesti-

mate of use, since young people who have dropped out of school may have particularly high rates of frequent marijuana use.²⁷ Since marijuana use impairs critical cognitive functions, both during acute intoxication and for days after use,²⁸ many students could be functioning at a cognitive level that is below their natural capability for considerable periods of time. Although acute effects may subside after THC is cleared from the brain, it nonetheless poses serious risks to health that can be expected to accumulate with long-term or heavy use. The evidence suggests that such use results in measurable and long-lasting cognitive impairments,¹⁶ particularly among those who started to use marijuana in early adolescence. Moreover, failure to learn at school, even for short or sporadic periods (a secondary effect of acute intoxication), will interfere with the subsequent capacity to achieve increasingly challenging educational goals, a finding that may also explain the association between regular marijuana use and poor grades.²⁹

The relationship between cannabis use by young people and psychosocial harm is likely to be multifaceted, which may explain the inconsistencies among studies. For example, some studies suggest that long-term deficits may be reversible and remain subtle rather than disabling once a person abstains from use.³⁰ Other studies show that long-term, heavy use of marijuana results in impairments in memory and attention that persist and worsen with increasing years of regular use³¹ and with the initiation of use during adolescence.³² As noted above, early marijuana use is associated with impaired school performance and an increased risk of dropping out of school,^{27,29} although reports of shared environmental factors that influence the risks of using cannabis at a young age and dropping out of school³³ suggest that the relationship may be more complex. Heavy marijuana use has been linked to lower income, greater need for socioeconomic assistance, unemployment, criminal behavior, and lower satisfaction with life.^{2,34}

RISK OF MOTOR-VEHICLE ACCIDENTS

Both immediate exposure and long-term exposure to marijuana impair driving ability; marijuana is the illicit drug most frequently reported in connection with impaired driving and accidents, including fatal accidents.³⁵ There is a relationship between the blood THC concentration

and performance in controlled driving-simulation studies,³⁶ which are a good predictor of real-world driving ability. Recent marijuana smoking and blood THC levels of 2 to 5 ng per milliliter are associated with substantial driving impairment.³⁷ According to a meta-analysis, the overall risk of involvement in an accident increases by a factor of about 2 when a person drives soon after using marijuana.³⁷ In an accident culpability analysis, persons testing positive for THC (typical minimum level of detection, 1 ng per milliliter), and particularly those with higher blood levels, were 3 to 7 times as likely to be responsible for a motor-vehicle accident as persons who had not used drugs or alcohol before driving.³⁸ In comparison, the overall risk of a vehicular accident increases by a factor of almost 5 for drivers with a blood alcohol level above 0.08%, the legal limit in most countries, and increases by a factor of 27 for persons younger than 21 years of age.³⁹ Not surprisingly, the risk associated with the use of alcohol in combination with marijuana appears to be greater than that associated with the use of either drug alone.³⁷

RISK OF CANCER AND OTHER EFFECTS ON HEALTH

The effects of long-term marijuana smoking on the risk of lung cancer are unclear. For example, the use of marijuana for the equivalent of 30 or more joint-years (with 1 joint-year of marijuana use equal to 1 cigarette [joint] of marijuana smoked per day for 1 year) was associated with an increased incidence of lung cancer and several cancers of the upper aerodigestive tract; however, the association disappeared after adjustment for potential confounders such as cigarette smoking.⁴⁰ Although the possibility of a positive association between marijuana smoking and cancer cannot be ruled out,⁴¹ the evidence suggests that the risk is lower with marijuana than with tobacco.⁴⁰ However, the smoking of cigarettes that contain both marijuana and tobacco products is a potential confounding factor with a prevalence that varies dramatically among countries.

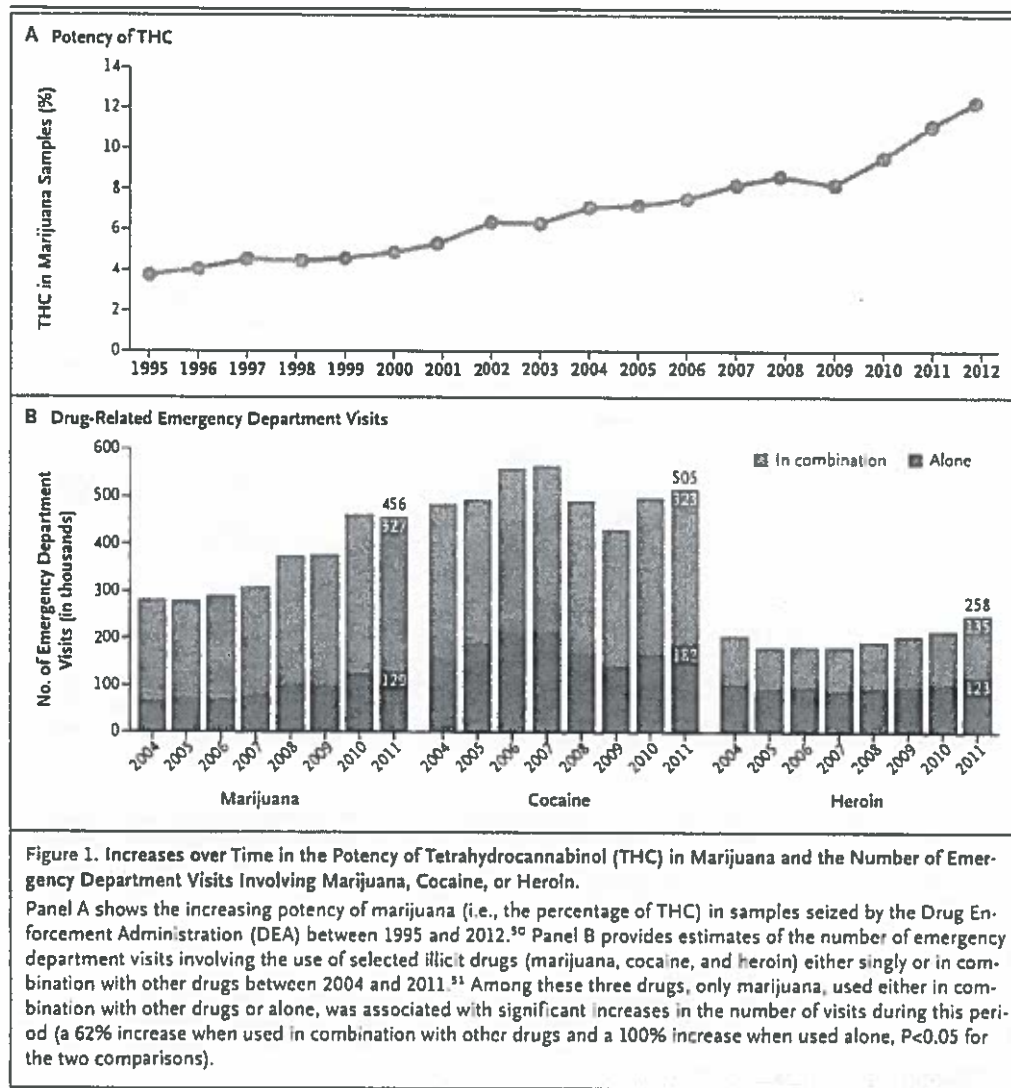
Marijuana smoking is also associated with inflammation of the large airways, increased airway resistance, and lung hyperinflation, associations that are consistent with the fact that regular marijuana smokers are more likely to report symptoms of chronic bronchitis than are nonsmokers⁴²; however, the long-term effect of low levels of marijuana exposure does not ap-

pear to be significant.⁴³ The immunologic competence of the respiratory system in marijuana smokers may also be compromised, as indicated by increased rates of respiratory infections and pneumonia.⁴⁴ Marijuana use has also been associated with vascular conditions that increase the risks of myocardial infarction, stroke, and transient ischemic attacks during marijuana intoxication.⁴⁵ The actual mechanisms underlying the effects of marijuana on the cardiovascular and cerebrovascular systems are complex and not fully understood. However, the direct effects of cannabinoids on various target receptors (i.e., CB1 receptors in arterial blood vessels) and the indirect effects on vasoactive compounds⁴⁶ may help explain the detrimental effects of marijuana on vascular resistance and coronary microcirculation.⁴⁷

LIMITATIONS OF THE EVIDENCE AND GAPS IN KNOWLEDGE

Most of the long-term effects of marijuana use that are summarized here have been observed among heavy or long-term users, but multiple (often hidden) confounding factors detract from our ability to establish causality (including the frequent use of marijuana in combination with other drugs). These factors also complicate our ability to assess the true effect of intrauterine exposure to marijuana. Indeed, despite the use of marijuana by pregnant women,⁴⁸ and animal models suggesting that cannabis exposure during pregnancy may alter the normal processes and trajectories of brain development,⁴⁹ our understanding of the long-term effects of prenatal exposure to marijuana in humans is very poor.

The THC content, or potency, of marijuana, as detected in confiscated samples, has been steadily increasing from about 3% in the 1980s to 12% in 2012⁵⁰ (Fig. 1A). This increase in THC content raises concerns that the consequences of marijuana use may be worse now than in the past and may account for the significant increases in emergency department visits by persons reporting marijuana use⁵¹ (Fig. 1B) and the increases in fatal motor-vehicle accidents.³⁵ This increase in THC potency over time also raises questions about the current relevance of the findings in older studies on the effects of marijuana use, especially studies that assessed long-term outcomes.



There is also a need to improve our understanding of how to harness the potential medical benefits of the marijuana plant without exposing people who are sick to its intrinsic risks. The authoritative report by the Institute of Medicine, *Marijuana and Medicine*,⁵² acknowledges the potential benefits of smoking marijuana in stimulating appetite, particularly in patients with the acquired immunodeficiency syndrome (AIDS) and the related wasting syndrome, and in combating chemotherapy-induced nausea and vomiting, severe pain, and some forms of spasticity. The report also indicates that there is some evidence for the benefit of using marijuana

to decrease intraocular pressure in the treatment of glaucoma. Nonetheless, the report stresses the importance of focusing research efforts on the therapeutic potential of synthetic or pharmaceutically pure cannabinoids.⁵² Some physicians continue to prescribe marijuana for medicinal purposes despite limited evidence of a benefit (see box). This practice raises particular concerns with regard to long-term use by vulnerable populations. For example, there is some evidence to suggest that in patients with symptoms of human immunodeficiency virus (HIV) infection or AIDS, marijuana use may actually exacerbate HIV-associated cognitive deficits.⁷⁵ Simi-

Clinical Conditions with Symptoms That May Be Relieved by Treatment with Marijuana or Other Cannabinoids.*

Glaucoma

Early evidence of the benefits of marijuana in patients with glaucoma (a disease associated with increased pressure in the eye) may be consistent with its ability to effect a transient decrease in intraocular pressure,^{53,54} but other, standard treatments are currently more effective. THC, cannabidiol, and nabilone (a synthetic cannabinoid similar to THC), but not cannabidiol, were shown to lower intraocular pressure in rabbits.^{55,56} More research is needed to establish whether molecules that modulate the endocannabinoid system may not only reduce intraocular pressure but also provide a neuroprotective benefit in patients with glaucoma.⁵⁷

Nausea

Treatment of the nausea and vomiting associated with chemotherapy was one of the first medical uses of THC and other cannabinoids.⁵⁸ THC is an effective antiemetic agent in patients undergoing chemotherapy,⁵⁹ but patients often state that marijuana is more effective in suppressing nausea. Other, unidentified compounds in marijuana may enhance the effect of THC (as appears to be the case with THC and cannabidiol, which operate through different antiemetic mechanisms).⁶⁰ Paradoxically, increased vomiting (hyperemesis) has been reported with repeated marijuana use.

AIDS-associated anorexia and wasting syndrome

Reports have indicated that smoked or ingested cannabis improves appetite and leads to weight gain and improved mood and quality of life among patients with AIDS.⁶¹ However, there is no long-term or rigorous evidence of a sustained effect of cannabis on AIDS-related morbidity and mortality, with an acceptable safety profile, that would justify its incorporation into current clinical practice for patients who are receiving effective antiretroviral therapy.⁶² Data from the few studies that have explored the potential therapeutic value of cannabinoids for this patient population are inconclusive.⁶²

Chronic pain

Marijuana has been used to relieve pain for centuries. Studies have shown that cannabinoids acting through central CB1 receptors, and possibly peripheral CB1 and CB2 receptors,⁶³ play important roles in modeling nociceptive responses in various models of pain. These findings are consistent with reports that marijuana may be effective in ameliorating neuropathic pain,^{64,65} even at very low levels of THC (1.29%).⁶⁶ Both marijuana and dronabinol, a pharmaceutical formulation of THC, decrease pain, but dronabinol may lead to longer-lasting reductions in pain sensitivity and lower ratings of rewarding effects.⁶⁷

Inflammation

Cannabinoids (e.g., THC and cannabidiol) have substantial antiinflammatory effects because of their ability to induce apoptosis, inhibit cell proliferation, and suppress cytokine production.⁶⁸ Cannabidiol has attracted particular interest as an antiinflammatory agent because of its lack of psychoactive effects.³⁸ Animal models have shown that cannabidiol is a promising candidate for the treatment of rheumatoid arthritis³⁸ and for inflammatory diseases of the gastrointestinal tract (e.g., ulcerative colitis and Crohn's disease).⁶⁹

Multiple sclerosis

Nabiximols (Sativex, GW Pharmaceuticals), an oromucosal spray that delivers a mix of THC and cannabidiol, appears to be an effective treatment for neuropathic pain, disturbed sleep, and spasticity in patients with multiple sclerosis. Sativex is available in the United Kingdom, Canada, and several other countries^{70,71} and is currently being reviewed in phase 3 trials in the United States in order to gain approval from the Food and Drug Administration.

Epilepsy

In a recent small survey of parents who use marijuana with a high cannabidiol content to treat epileptic seizures in their children,⁷² 11% (2 families out of the 19 that met the inclusion criteria) reported complete freedom from seizures, 42% (8 families) reported a reduction of more than 80% in seizure frequency, and 32% (6 families) reported a reduction of 25 to 60% in seizure frequency. Although such reports are promising, insufficient safety and efficacy data are available on the use of cannabis botanicals for the treatment of epilepsy.⁷³ However, there is increasing evidence of the role of cannabidiol as an antiepileptic agent in animal models.⁷⁴

* AIDS denotes acquired immunodeficiency syndrome, CB1 cannabinoid-1 receptor, and CB2 cannabinoid-2 receptor, HIV human immunodeficiency virus, and THC tetrahydrocannabinol.

larly, more research is needed to understand the potential effects of marijuana use on age-related cognitive decline in general and on memory impairment in particular.

Research is needed on the ways in which government policies on marijuana affect public health outcomes. Our understanding of the ef-

fects of policy on market forces is quite limited (e.g., the allure of new tax-revenue streams from the legal sale of marijuana, pricing wars, youth-targeted advertising, and the emergence of cannabis-based medicines approved by the Food and Drug Administration), as is our understanding of the interrelated variables of perceptions about

Figure 2. Use of Marijuana in Relation to Perceived Risk and Daily Use of Tobacco Cigarettes or Marijuana among U.S. Students in Grade 12, 1975–2013.

Panel A shows the inverse correlation between the perception of the risk associated with marijuana use and actual use. Perceived risk corresponds to the percentage of teenagers who reported that the use of marijuana is dangerous. Panel B shows the percentage of students who reported daily use of tobacco cigarettes or marijuana in the previous 30 days. Data for both graphs are from Johnston et al.⁴⁶

use, types of use, and outcomes. Historically, there has been an inverse correlation between marijuana use and the perception of its risks among adolescents (Fig. 2A). Assuming that this inverse relationship is causal, would greater permissiveness in culture and social policy lead to an increase in the number of young people who are exposed to cannabis on a regular basis? Among students in grade 12, the reported prevalence of regular marijuana smoking has been steadily increasing in recent years and may soon intersect the trend line for regular tobacco smoking (Fig. 2B). We also need information about the effects of second-hand exposure to cannabis smoke and cannabinoids. Second-hand exposure is an important public health issue in the context of tobacco smoking, but we do not have a clear understanding of the effects of second-hand exposure to marijuana smoking.⁷⁶ Studies in states (e.g., Colorado, California, and Washington) and countries (e.g., Uruguay, Portugal, and the Netherlands) where social and legal policies are shifting may provide important data for shaping future policies.

CONCLUSIONS

Marijuana use has been associated with substantial adverse effects, some of which have been determined with a high level of confidence (Table 2). Marijuana, like other drugs of abuse, can result in addiction. During intoxication, marijuana can interfere with cognitive function (e.g., memory and perception of time) and motor function (e.g., coordination), and these effects can have detrimental consequences (e.g., motor-vehicle accidents). Repeated marijuana use during adolescence may result in long-lasting changes in brain function that can jeopardize educational, professional, and social achievements. However, the ef-

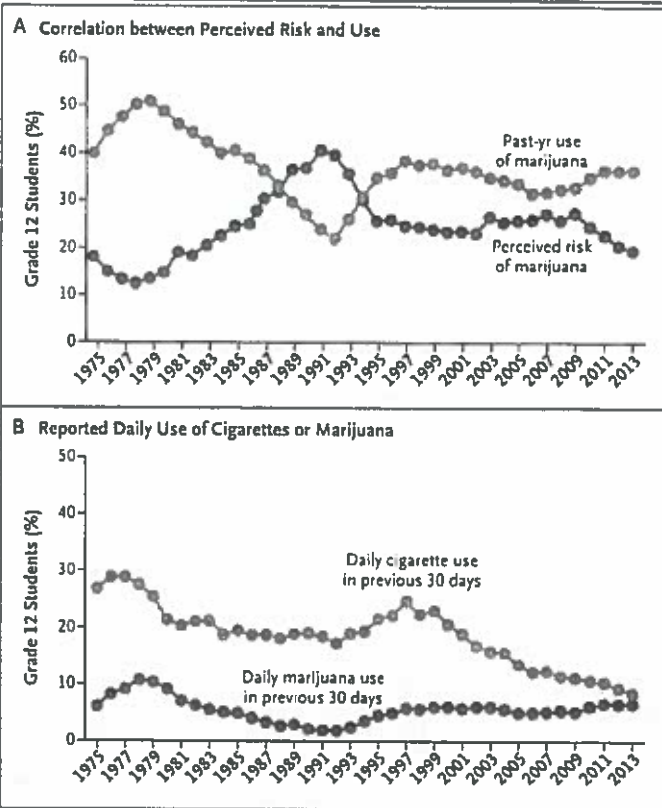


Table 2. Level of Confidence in the Evidence for Adverse Effects of Marijuana on Health and Well-Being.

Effect	Overall Level of Confidence*
Addiction to marijuana and other substances	High
Abnormal brain development	Medium
Progression to use of other drugs	Medium
Schizophrenia	Medium
Depression or anxiety	Medium
Diminished lifetime achievement	High
Motor vehicle accidents	High
Symptoms of chronic bronchitis	High
Lung cancer	Low

* The indicated overall level of confidence in the association between marijuana use and the listed effects represents an attempt to rank the strength of the current evidence, especially with regard to heavy or long-term use and use that starts in adolescence.

fects of a drug (legal or illegal) on individual health are determined not only by its pharmacologic properties but also by its availability and social acceptability. In this respect, legal drugs

(alcohol and tobacco) offer a sobering perspective, accounting for the greatest burden of disease associated with drugs⁷⁷ not because they are more dangerous than illegal drugs but because their legal status allows for more widespread exposure. As policy shifts toward legalization of marijuana, it is reasonable and probably prudent

to hypothesize that its use will increase and that, by extension, so will the number of persons for whom there will be negative health consequences.

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Disclosure forms provided by the authors are available with the full text of this article at NEJM.org.

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NIDA review summarizes research on marijuana's negative health effects

Comprehensive review published in the New England Journal of Medicine also discusses why risks are greatest for teen users

The current state of science on the adverse health effects of marijuana use links the drug to several significant adverse effects including addiction, a review reports. The article, published today in the New England Journal of Medicine, is authored by scientists from the National Institute on Drug Abuse (NIDA), part of the National Institutes of Health.

The review describes the science establishing that marijuana can be addictive and that this risk for addiction increases for daily or young users. It also offers insights into research on the gateway theory indicating that marijuana use, similar to nicotine and alcohol use, may be associated with an increased vulnerability to other drugs.

The authors review literature showing that marijuana impairs driving, increasing the risk of being involved in a car accident and that these risks are further enhanced when combining marijuana with alcohol. The authors also discuss the implications of rising marijuana potencies and note that, because older studies are based on the effects of lower-potency (less THC) marijuana, stronger adverse health effects may occur with today's more potent marijuana. (THC is the psychoactive or mind-altering chemical delta-9-tetrahydrocannabinol found in marijuana.)

The reviewers consider areas in which little research has been conducted. This includes possible health consequences of secondhand marijuana smoke; the long-term impact of prenatal marijuana exposure; the therapeutic potential of the individual chemicals found in the marijuana plant; and effects of marijuana legalization policies on public health.

The scientists focus on marijuana's harmful effects on teens, an age group in which the brain rapidly develops, which is one factor that could help explain increased risks from marijuana use in this population. Research suggests that marijuana impairs critical thinking and memory functions during use and that these deficits persist for days after using. In addition, a long-term study showed that regular marijuana use in the early teen years lowers IQ into adulthood, even if users stopped smoking marijuana as adults.

The NIDA-supported 2013 Monitoring the Future Survey says that 6.5 percent of 12th graders report daily or near-daily marijuana use, with 60 percent not perceiving that regular marijuana use can be harmful. "It is important to alert the public that using marijuana in the teen years brings health, social, and academic risk," said lead author and NIDA Director Dr. Nora D. Volkow. "Physicians in particular can play a role in conveying to families that early marijuana use can interfere with crucial social and developmental milestones and can impair cognitive development."

This review emphasizes that marijuana use is likely to increase as state and local policies move toward legalizing marijuana for medical or recreational purposes. As use increases, so might the number of people likely to suffer negative health consequences, the review says.

For more information on marijuana and its health consequences, go to: <http://www.drugabuse.gov/publications/drugfacts/marijuana>.

The National Institute on Drug Abuse is a component of the National Institutes of Health, U.S. Department of Health and Human Services. NIDA supports most of the world's research on the health aspects of drug abuse and addiction. The Institute carries out a large variety of programs to inform policy and improve practice. Fact sheets on the health effects of drugs of abuse and information on NIDA research and other activities can be found on the NIDA home page at <http://www.drugabuse.gov>, which is now compatible with your smartphone, iPad or tablet. To order publications in English or Spanish, call NIDA's DrugPubs research dissemination center at 1-877-NIDA-NIH or 240-645-0228 (TDD) or fax or email requests to 240-645-0227 or drugpubs@nida.nih.gov. Online ordering is available at <http://drugpubs.drugabuse.gov>. NIDA's media guide can be found at <http://drugabuse.gov/medlaguide>, and its new easy-to-read website can be found at <http://www.easyread.drugabuse.gov>.

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Adverse Health Effects of Marijuana Use, by Nora D. Volkow, M.D., Ruben D. Baler, Ph.D., Wilson M. Compton, M.D., and Susan R.B. Weiss, Ph.D., published online June 4, 2014 in The New England Journal of Medicine.

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MEMORY/PERCEPTION/BEHAVIOR

1. Attention, memory and learning are impaired among heavy marijuana users, even after users discontinued its use for at least 24 hours. Heavy marijuana use is associated with residual neuropsychological effects even after a day of supervised abstinence from the drug. Heavy users displayed significantly greater impairment than light users on attention/executive functions, as evidenced particularly by greater preservations on card sorting and reduced learning of word lists. These differences remained after controlling for potential confounding variables, such as estimated levels of premorbid cognitive functioning, and for use of alcohol and other substances in the two groups. However, the question remains open as to whether this impairment is due to a residuc of drug in the brain, a withdrawal effect from the drug, or a frank neurotoxic effect of the drug. ("The Residual Cognitive Effects of Heavy Marijuana Use in College Students," Pope, HG Jr., Yurgelun-Todd, D., Biological Psychiatry Laboratory, McLean Hospital, Belmont, MA, JAMA February 21, 1996.)

2. Impaired memory for recent events, difficulty concentrating, dreamlike states, impaired motor coordination, impaired driving and other psychomotor skills, slowed reaction time, impaired goal-directed mental activity, and altered peripheral vision are common associated effects. (Adams and Martin 1996; Fehr and Kalant 1983; Hollister 1988a; Institute of Medicine 1982; Tart 1971)

3. A roadside study of reckless drivers who were not impaired by alcohol, showed that 45% of these drivers tested positive for marijuana. (Dr. Dan Brookoff, published in the New England Journal of Medicine)

4. Marijuana smoking affects the brain and leads to impaired short-term memory, perception, judgment and motor skills. ([Marijuana Facts: Parents Need to Know](#), National Institute on Drug Abuse)

5. In a survey of 150 marijuana using students, 59% surveyed report they sometimes forget what a conversation is about before it has ended. 41% report if they read while stoned they remembered less of what they had read hours later. (Dr. Richard Schwartz, Vienna Pediatric Associates in Psychiatric Annals as reported in NIDA Capsules)

Neurobiological Effects

6. Marijuana activates the same pleasure centers in the brain that are targeted by heroin, cocaine and alcohol. (Dr. Gaetano Di Chiara, University of Caligari, Italy)

Cardiovascular Effects

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7. Physiological effects of marijuana include an alteration of heart rate. Use of marijuana may result in intense anxiety, panic attacks or paranoia. (National Institute of Drug Abuse)

Chronic Effects

Respiratory System Effects

8. The daily use of 1 to 3 marijuana joints appears to produce approximately the same lung damage and potential cancer risk as smoking 5 times as many cigarettes. (UCLA) The study results suggest that the way smokers inhale marijuana, in addition to its chemical composition, increases the adverse physical effects. The same lung cancer risks associated with tobacco also apply to marijuana users, even though they smoke far less. (reported in NIDA Capsules)

9. Benzopyrene is the chemical in tobacco that causes lung cancer. An average marijuana cigarette contains nearly 50% more benzopyrene than a tobacco cigarette. An average marijuana cigarette contains 30 nanograms of this carcinogen compared to 21 nanograms in an average tobacco cigarette (Marijuana and Health, National Academy of Sciences. Institute of Medicine Report, 1982) Benzopyrene suppresses a gene that controls growth of cells. When this gene is damaged the body becomes more susceptible to cancer. This gene is related to half of all human cancers and as many as 70% of lung cancers.

10. Marijuana users may have many of the same respiratory problems that tobacco smokers have, such as chronic bronchitis and inflamed sinuses. (Marijuana Facts: Parents Need to Know, National Institute on Drug Abuse)

11. Marijuana smokers, when compared to non marijuana smokers, have more respiratory illness. (Polen et al. 1993).

12. Marijuana smoke produces airway injury, acute and chronic bronchitis, lung inflammation, and decreased pulmonary defenses against infection. Smoking one marijuana cigarette leads to air deposition of four times as much cancer-causing tar as does tobacco smoke (Dr. D. Tashkin, Western Journal of Medicine)

13. Heavy marijuana use can affect hormones in both males and females. Heavy doses of the drugs may delay the onset of puberty in young men. Marijuana also can have adverse effects on sperm production. Among women, regular marijuana use can disrupt the normal monthly menstrual cycle and inhibit the discharge of eggs from the ovaries. (Marijuana Facts: Parents Need to know, National Institute on Drug Abuse)

Adverse Mental Effects

14. An "amotivational syndrome" can develop in heavy, chronic marijuana users. It is characterized by decreased drive and ambition, shortened attention span, poor judgment, high distractibility, impaired communication skills, and diminished effectiveness in interpersonal situations. (National Institute of Drug Abuse)

15. Adults who smoked marijuana daily believed it helped them function better, improved self-awareness and improved relationships with others. However, researchers found that users were more willing to tolerate problems, suggesting that the drug served as a buffer for those who would rather avoid confronting problems than make changes that might increase their satisfaction with life. The study indicated that these

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subjects used marijuana to avoid dealing with their difficulties and the avoidance inevitably made their problems worse. Although users believed the drug enhanced understanding of themselves, it actually served as a barrier against self-awareness. (case studies by research team from Center for Psychosocial Studies in New York.)

16. Marijuana and some of its compounds influence the immune system and affect the body's ability to resist viruses, bacteria, fungi and protozoa, and decreases the body's anti tumor activities. Marijuana has the potential to alter the backup safeguards of the immune system because it affects diverse types of cells in the body. This could compromise the immune system's ability to screen out cancer cells and eliminate infection. (Dr. Guy A. Cabral, Professor, Medical College of Virginia, speaking at NIDA's National Conference on Marijuana Use: Prevention, Treatment and Research.)

"Unfortunately, much of what is known about the human pharmacology of smoked marijuana comes from experiments with plant material containing about 2% THC or less, or occasionally up to 4% THC. In addition, human experiments typically are done in laboratory settings where only one or two smoked doses were administered to relatively young, medically screened, healthy male volunteers well experienced with the effects of marijuana. Females rarely participated in past marijuana research because of prohibitions (now removed) against their inclusion. Thus the clinical pharmacology of single or repeated smoked marijuana doses given to older people or to people with serious diseases has hardly been researched at all in a controlled laboratory or clinic setting. Some of the very few reports of experiments that have included older or sicker people, particularly patients less experienced in using marijuana suggest the profile of adverse effects may differ from healthy student volunteers smoking in a laboratory experiment (Hollister, 1986a, 1988a)

THC administered alone in its pure form is the most thoroughly research cannabinoid. Much of what has been written has been inferred from the results of experiments using only pure THC. Generally, in experiments actually using marijuana, the assumed dose of marijuana was based only on the concentration of THC in the plant material. The amounts of cannabidiol and other cannabinoids in the plant also vary so that pharmacological interactions modifying the effects THC may occur when marijuana is used instead of pure THC.

The result of this research strategy is that a good deal is known about the pharmacology of THC, but experimental confirmation that the pharmacology of a marijuana cigarette is indeed entirely or mainly determined by the amount of THC it contains remains to be completed. The scientific literature contains occasional hints that the pharmacology of pure THC, although similar, is not always the same as the clinical pharmacology of smoked marijuana containing the same amount of THC (Graham 1976, Harvey 1985, Institute of Medicine 1982)" (Report to the Director, National Institutes of Health, by the Ad-Hoc Group of Experts, "Workshop on the Medical Utility of Marijuana.")



U.S. Department of Justice


Office of the Deputy Attorney General

The Deputy Attorney General

Washington, D.C. 20530

August 29, 2013

MEMORANDUM FOR ALL UNITED STATES ATTORNEYS

FROM: James M. Cole 
Deputy Attorney General

SUBJECT: Guidance Regarding Marijuana Enforcement

In October 2009 and June 2011, the Department issued guidance to federal prosecutors concerning marijuana enforcement under the Controlled Substances Act (CSA). This memorandum updates that guidance in light of state ballot initiatives that legalize under state law the possession of small amounts of marijuana and provide for the regulation of marijuana production, processing, and sale. The guidance set forth herein applies to all federal enforcement activity, including civil enforcement and criminal investigations and prosecutions, concerning marijuana in all states.

As the Department noted in its previous guidance, Congress has determined that marijuana is a dangerous drug and that the illegal distribution and sale of marijuana is a serious crime that provides a significant source of revenue to large-scale criminal enterprises, gangs, and cartels. The Department of Justice is committed to enforcement of the CSA consistent with those determinations. The Department is also committed to using its limited investigative and prosecutorial resources to address the most significant threats in the most effective, consistent, and rational way. In furtherance of those objectives, as several states enacted laws relating to the use of marijuana for medical purposes, the Department in recent years has focused its efforts on certain enforcement priorities that are particularly important to the federal government:

- 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;
- 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.

These priorities will continue to guide the Department's enforcement of the CSA against marijuana-related conduct. Thus, this memorandum serves as guidance to Department attorneys and law enforcement to focus their enforcement resources and efforts, including prosecution, on persons or organizations whose conduct interferes with any one or more of these priorities, regardless of state law.¹

Outside of these enforcement priorities, the federal government has traditionally relied on states and local law enforcement agencies to address marijuana activity through enforcement of their own narcotics laws. For example, the Department of Justice has not historically devoted resources to prosecuting individuals whose conduct is limited to possession of small amounts of marijuana for personal use on private property. Instead, the Department has left such lower-level or localized activity to state and local authorities and has stepped in to enforce the CSA only when the use, possession, cultivation, or distribution of marijuana has threatened to cause one of the harms identified above.

The enactment of state laws that endeavor to authorize marijuana production, distribution, and possession by establishing a regulatory scheme for these purposes affects this traditional joint federal-state approach to narcotics enforcement. The Department's guidance in this memorandum rests on its expectation that states and local governments that have enacted laws authorizing marijuana-related conduct will implement strong and effective regulatory and enforcement systems that will address the threat those state laws could pose to public safety, public health, and other law enforcement interests. A system adequate to that task must not only contain robust controls and procedures on paper; it must also be effective in practice. Jurisdictions that have implemented systems that provide for regulation of marijuana activity

¹ These enforcement priorities are listed in general terms; each encompasses a variety of conduct that may merit civil or criminal enforcement of the CSA. By way of example only, the Department's interest in preventing the distribution of marijuana to minors would call for enforcement not just when an individual or entity sells or transfers marijuana to a minor, but also when marijuana trafficking takes place near an area associated with minors; when marijuana or marijuana-infused products are marketed in a manner to appeal to minors; or when marijuana is being diverted, directly or indirectly, and purposefully or otherwise, to minors.

must provide the necessary resources and demonstrate the willingness to enforce their laws and regulations in a manner that ensures they do not undermine federal enforcement priorities.

In jurisdictions that have enacted laws legalizing marijuana in some form and that have also implemented strong and effective regulatory and enforcement systems to control the cultivation, distribution, sale, and possession of marijuana, conduct in compliance with those laws and regulations is less likely to threaten the federal priorities set forth above. Indeed, a robust system may affirmatively address those priorities by, for example, implementing effective measures to prevent diversion of marijuana outside of the regulated system and to other states, prohibiting access to marijuana by minors, and replacing an illicit marijuana trade that funds criminal enterprises with a tightly regulated market in which revenues are tracked and accounted for. In those circumstances, consistent with the traditional allocation of federal-state efforts in this area, enforcement of state law by state and local law enforcement and regulatory bodies should remain the primary means of addressing marijuana-related activity. If state enforcement efforts are not sufficiently robust to protect against the harms set forth above, the federal government may seek to challenge the regulatory structure itself in addition to continuing to bring individual enforcement actions, including criminal prosecutions, focused on those harms.

The Department's previous memoranda specifically addressed the exercise of prosecutorial discretion in states with laws authorizing marijuana cultivation and distribution for medical use. In those contexts, the Department advised that it likely was not an efficient use of federal resources to focus enforcement efforts on seriously ill individuals, or on their individual caregivers. In doing so, the previous guidance drew a distinction between the seriously ill and their caregivers, on the one hand, and large-scale, for-profit commercial enterprises, on the other, and advised that the latter continued to be appropriate targets for federal enforcement and prosecution. In drawing this distinction, the Department relied on the common-sense judgment that the size of a marijuana operation was a reasonable proxy for assessing whether marijuana trafficking implicates the federal enforcement priorities set forth above.

As explained above, however, both the existence of a strong and effective state regulatory system, and an operation's compliance with such a system, may allay the threat that an operation's size poses to federal enforcement interests. Accordingly, in exercising prosecutorial discretion, prosecutors should not consider the size or commercial nature of a marijuana operation alone as a proxy for assessing whether marijuana trafficking implicates the Department's enforcement priorities listed above. Rather, prosecutors should continue to review marijuana cases on a case-by-case basis and weigh all available information and evidence, including, but not limited to, whether the operation is demonstrably in compliance with a strong and effective state regulatory system. A marijuana operation's large scale or for-profit nature may be a relevant consideration for assessing the extent to which it undermines a particular federal enforcement priority. The primary question in all cases – and in all jurisdictions – should be whether the conduct at issue implicates one or more of the enforcement priorities listed above.

As with the Department's previous statements on this subject, this memorandum is intended solely as a guide to the exercise of investigative and prosecutorial discretion. This memorandum does not alter in any way the Department's authority to enforce federal law, including federal laws relating to marijuana, regardless of state law. Neither the guidance herein nor any state or local law provides a legal defense to a violation of federal law, including any civil or criminal violation of the CSA. Even in jurisdictions with strong and effective regulatory systems, evidence that particular conduct threatens federal priorities will subject that person or entity to federal enforcement action, based on the circumstances. This memorandum 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. It applies prospectively to the exercise of prosecutorial discretion in future cases and does not provide defendants or subjects of enforcement action with a basis for reconsideration of any pending civil action or criminal prosecution. Finally, nothing herein precludes investigation or prosecution, even in the absence of any one of the factors listed above, in particular circumstances where investigation and prosecution otherwise serves an important federal interest.

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The CBHSQ Report

Short Report

July 26, 2016

MARIJUANA USE AND PERCEIVED RISK OF HARM FROM MARIJUANA USE VARIES WITHIN AND ACROSS STATES

AUTHORS

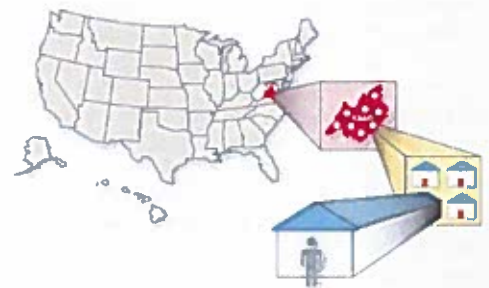
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INTRODUCTION

Marijuana is the most commonly used illicit drug in the United States,¹ and many Americans do not perceive it as potentially harmful.² Although the laws regarding marijuana use have changed in several states over the past decade, marijuana remains classified as a Schedule I drug, meaning that it is categorized as having a high potential for abuse and has no currently accepted medical use in treatment in the United States.³ In other words, marijuana use remains illegal under federal laws in all states and the District of Columbia e.g., Controlled Substances Act; (<http://www.fda.gov/regulatoryinformation/legislation/ucm148726.htm>).

Across the United States, the increasing number of marijuana users has a public health impact on state and local communities. For example, research indicates that 1 in 11 marijuana users aged 15 or older become dependent on marijuana.⁴ In addition, marijuana use has resulted in approximately 4.2 million people meeting the diagnostic criteria for abuse or dependence on marijuana, is a major cause for visits to emergency rooms, and is the second leading substance for which people receive drug treatment (behind alcohol).^{1,5,6} These and other consequences of marijuana use have placed a significant strain on the U.S. health care system according to the White House Office of National Drug Control Policy.³

Educating people about the dangers of starting marijuana use is an effective way to reduce the impact of marijuana use in the future. One way to anticipate future marijuana use is to measure perceptions of the risk of harm from marijuana use because it has been a leading indicator of future use.⁷ Data from a collection of national cross-sectional surveys of secondary students has indicated that attitudes about the risks associated with substance use are often closely related to use, with an inverse association between use and risk perceptions (e.g., the percentage of those who use a substance is lower among those who perceive high risk of harm from use).⁸ Thus, states and other geographic areas with low percentages of people who perceive that there is a great risk of harm from using marijuana would be expected to have high percentages using marijuana. As a result, it is useful for



In Brief

- National Survey on Drug Use and Health from 2012 to 2014 data collected from 204,000 people aged 12 or older show that marijuana use and perceptions of the risk associated with marijuana use vary extensively among regions within each state and throughout the nation.
- About 7.73 percent of people aged 12 or older used marijuana in the past month. Past month marijuana use varied across census regions: 9.70 percent in the West, 8.36 percent in the Northeast, 7.28 percent in the Midwest, and 6.43 percent in the South. At the substate level, past month marijuana use ranged from 3.93 percent in a substate region in the southernmost part of Texas to 15.46 percent in San Francisco, California.
- Across the nation, 28.50 percent of people aged 12 or older perceived a great risk of harm from monthly marijuana use; however, the percentages of people who perceive a great risk of harm from monthly marijuana use varied across census regions: 32.60 percent in the South, 26.56 percent in the Northeast, 26.11 percent in the Midwest, and 25.64 percent in the West. At the substate level, perceptions of great risk of harm from monthly marijuana use ranged from 14.15 percent in Ward 3 in the District of Columbia to 49.29 percent in Florida's combined Circuits 11 and 16, which include Miami-Dade and Monroe Counties.

state and local policymakers and prevention specialists to understand the association between marijuana use and perception of great risk of harm and potential consequences to a person's health and well-being.

Although marijuana is the most commonly used illicit drug in America, the percentages using marijuana and the attitudes regarding the risk of marijuana use are not the same across states or even within each state. Within each state, patterns of substance use and corresponding attitudes differ. Data on small geographic areas provide insight into marijuana use and attitudes about marijuana use that can help state and local public health authorities better understand and address any needs in their communities. The National Survey on Drug Use and Health (NSDUH) can help address the need for more localized information.

This issue of *The CBHSQ Report* uses combined 2012 to 2014 NSDUH data to present estimates of past month marijuana use and perceptions of great risk of harm from smoking marijuana once a month among people aged 12 or older in 362 substate regions, the 50 states, and the District of Columbia. In most states, the substate regions are defined in terms of single counties or groups of counties; in some states, the regions are defined entirely in terms of census tracts (in Connecticut, the District of Columbia, and Massachusetts), parishes (in Louisiana), boroughs/census areas (in Alaska), a combination of counties and census tracts (in California and Delaware), and a combination of counties and independent cities (in Maryland, Missouri, Nevada, and Virginia). The Substance Abuse and Mental Health Services Administration (SAMHSA) works with state substance abuse/mental health agency representatives to define substate areas that meet state needs and reporting requirements while ensuring that the NSDUH sample sizes were large enough to provide estimates with adequate precision. These substate-level estimates provide local-level information on behavioral health outcomes that states find useful for planning, reporting, and providing useful data for prevention and intervention efforts.⁹ The 2012 to 2014 estimates in this report are based on substate boundaries that reflect the current state needs and reporting requirements and may not be comparable with substate estimates from prior years.

Marijuana use estimates are displayed on a U.S. map (Figure 1). To produce the map, substate region estimates (shown to two decimal places in Table S1) were first ordered from lowest to highest percentage of past month marijuana use. The substate regions were then categorized into three approximately equal groups based on their percentage. Substate regions in the lowest third (i.e., with the lowest percentages) are indicated in blue (122 substate regions), the middle third are in white (119 substate regions), and the third with the highest percentages are in red (121 substate regions). To distinguish among the substate regions that display relatively higher percentages, the "highest" third in red was further subdivided into dark red for the 16 substate regions with the highest estimates, medium red for the 33 substate regions with the next highest estimates, and light red for the 72 substate regions in the third highest group. The "lowest" third was categorized in a similar way using three distinct shades of blue. Estimates of perceptions of risk of harm from using marijuana are displayed in Figure 2. On this map, the colors are reversed from those in Figure 1, so the highest estimates of perceived risk of harm from using marijuana are shown in blue and the lowest estimates are shown in red. Overall, the seven groups in each map were constructed to represent a distribution that is somewhat symmetric, like a normal distribution (in terms of the number of estimates assigned to each group). In some cases, a category could have more or fewer substate regions because two (or more) substate regions have the same estimate (to two decimal places). When such ties occurred at the "boundary" between two groups, all substate regions with the same estimate were assigned to the lower group. Individual state maps at <http://www.samhsa.gov/data/> provide more granularity in areas too small to display clearly on the U.S. maps. Table S1 provides estimates associated with each map. Ninety-five percent confidence intervals are included as a measure of precision for each estimate.¹⁰ For state-specific maps that show the variations across substate areas within each state, see <http://www.samhsa.gov/data/>.

Findings in this report are annual averages based on combined 2012 to 2014 NSDUH data from approximately 204,000 respondents in the civilian noninstitutionalized population aged 12 or older. Estimates were derived from a complex statistical model in which substate data from NSDUH were combined with other local area data to enhance statistical power and analytic capability.¹¹

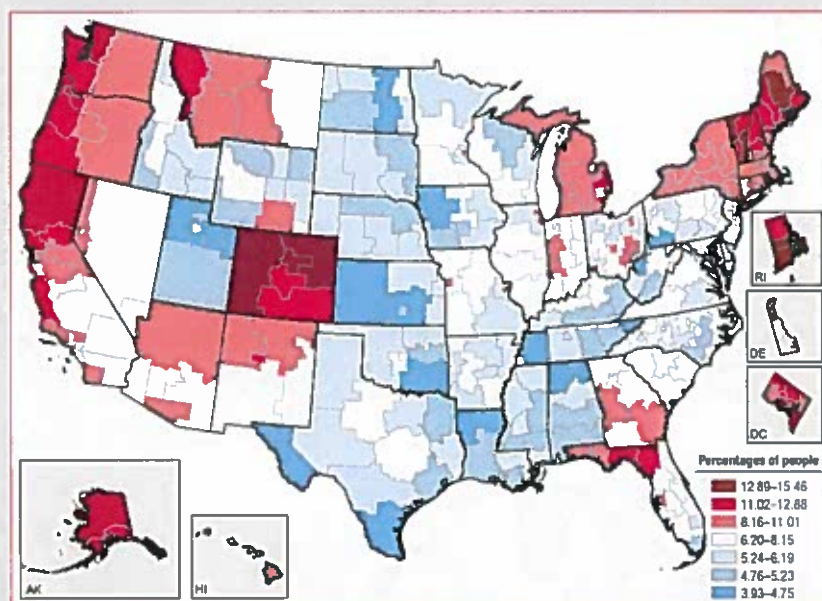
SUBSTATE-LEVEL MARIJUANA USE

Nationally, an annual average of 20.3 million people aged 12 or older used marijuana in the past month based on combined 2012 to 2014 NSDUH data. This is equivalent to approximately 1 in 13 or 7.73 percent of people aged 12 or older using marijuana in the past month. Across census regions, estimates of past month marijuana use were 9.70 percent in the West, 8.36 percent in the Northeast, 7.28 percent in the Midwest, and 6.43 percent in the South (Table S1).¹² At the substate level, past month marijuana use ranged from 3.93 percent in a substate region in the southernmost part of Texas¹³ to 15.46 percent in San Francisco, California (Figure 1 and Table S1).

Of the 16 substate regions with the highest percentages of past month marijuana use, 8 were in the West (3 in Colorado; 2 in California; and 1 each in Alaska, Oregon, and Washington), 7 were in the Northeast (3 in Rhode Island, 2 in Vermont, and 1 each in Maine and Massachusetts), and 1 was in the South (District of Columbia). No substate areas in the Midwest were included in the category with the highest percentages of past month marijuana use.

Of the 17 substate regions that had the lowest percentages of marijuana use, 8 were in the South (2 each in Tennessee and Texas; and 1 each in Alabama, Louisiana, Oklahoma, and West Virginia), 5 were in the Midwest (2 each in Kansas and North Dakota and 1 in Iowa), 3 were in the West (all in Utah), and 1 was in the Northeast (Pennsylvania).

Figure 1. Marijuana use in the past month among people aged 12 or older, by substate region: percentages, annual averages based on combined 2012 to 2014 data



Note: For substate region definitions, see the "2012-2014 National Survey on Drug Use and Health Substate Region Definitions" at <http://www.samhsa.gov/data/>.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Surveys on Drug Use and Health (NSDUHs), 2012 to 2014.

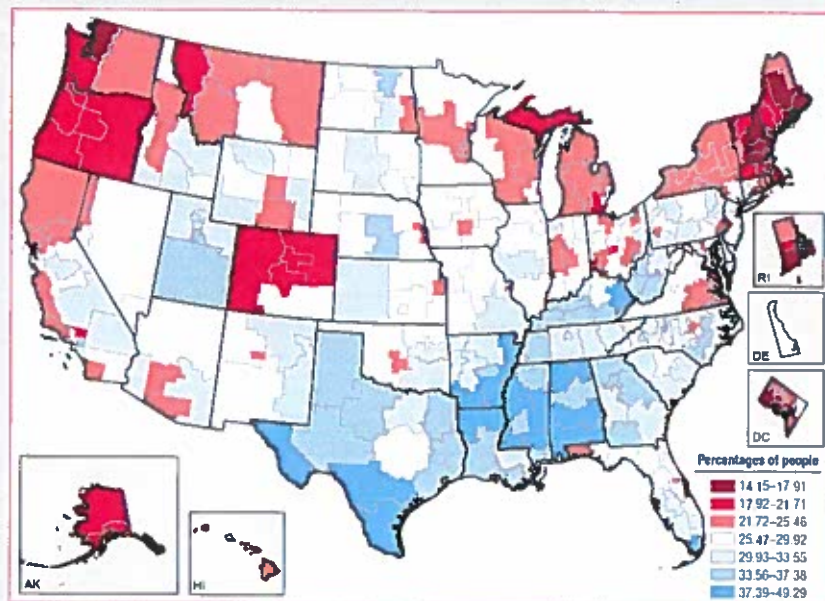
SUBSTATE-LEVEL PERCEPTIONS OF GREAT RISK OF HARM FROM MARIJUANA USE

The combined 2012 to 2014 data indicate that an annual average of 74.9 million people aged 12 or older perceived great risk of harm from smoking marijuana once a month. This translates to about 2 out of every 7 people (28.50 percent) perceiving a great risk of harm from monthly marijuana use. Across census regions, perceptions of great risk of harm from smoking marijuana once a month were 32.60 percent in the South, 26.56 percent in the Northeast, 26.11 percent in the Midwest, and 25.64 percent in the West (Table S1). At the substate level, perceptions of great risk of harm from smoking marijuana once a month ranged from 14.15 percent in Ward 3 in the District of Columbia—in the western section of the District—to 49.29 percent in Florida's combined Circuits 11 and 16, which include Miami-Dade and Monroe Counties in the southernmost part of the state (Figure 2).

Of the 16 substate regions that had the highest percentages of perception of great risk of harm from smoking marijuana once a month (i.e., regions with higher percentages of people aged 12 or older indicating that there was a great risk of harm from monthly marijuana use), all 16 were in the South (4 in Mississippi; 3 each in Alabama, Arkansas, and Texas; and 1 each in Florida, Kentucky, and Louisiana).

Of the 16 substate regions that had the lowest percentages of perception of great risk of harm from smoking marijuana once a month (i.e., regions with fewer percentages of people aged 12 or older indicating that there was a great risk of harm from monthly marijuana use), 10 were in the Northeast (5 in Maine, 3 in New Hampshire, and 1 each in Massachusetts and Rhode Island), 4 were in the South (all in the District of Columbia), 2 were in the West (1 each in Oregon and Washington).

Figure 2. Perceived great risk of harm from smoking marijuana once a month among people aged 12 or older, by substate region: percentages, annual averages based on combined 2012 to 2014 data



Note: For substate region definitions, see the "2012–2014 National Survey on Drug Use and Health Substate Region Definitions" at <http://www.samhsa.gov/data/>.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Surveys on Drug Use and Health (NSDUHs), 2012 to 2014.

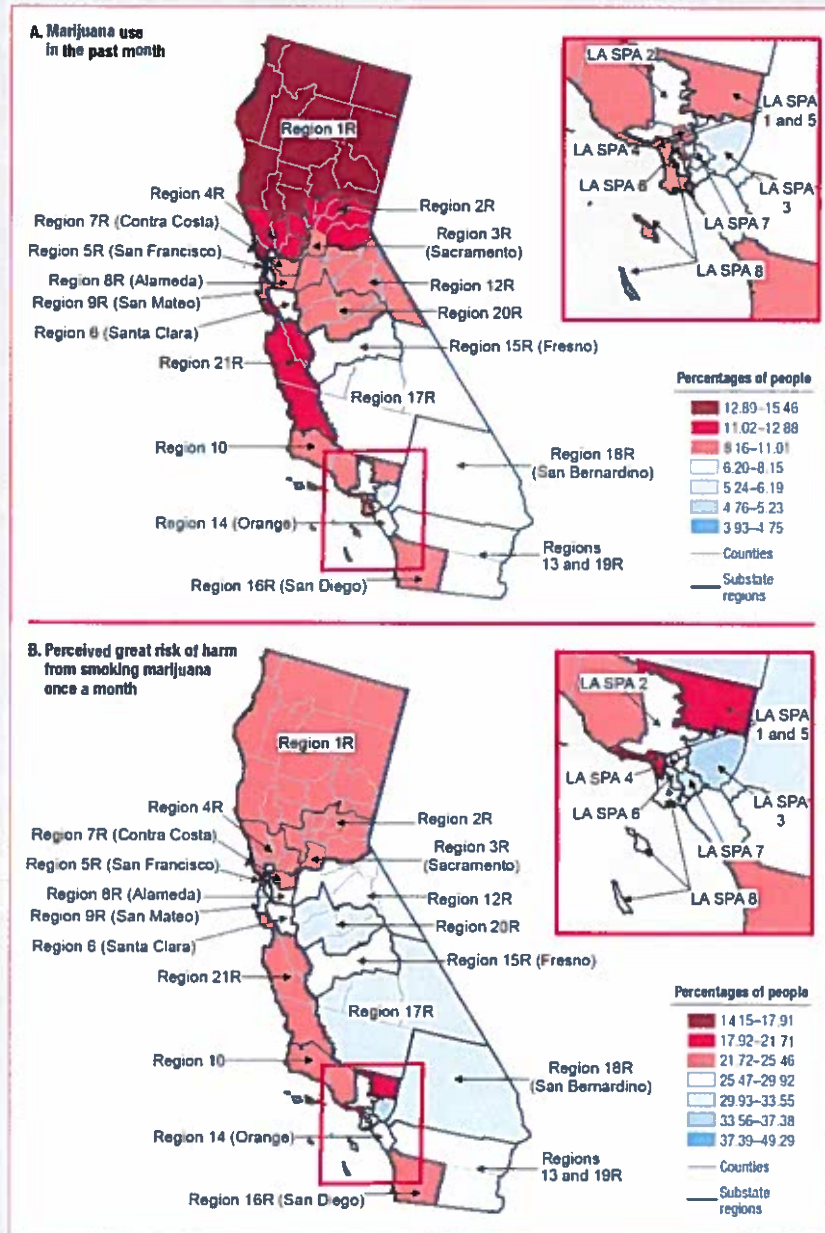
VARIATION WITHIN STATES

Some substate regions within the same state and the District of Columbia have notable variations in the percentages of marijuana use and the perceptions of risk associated with marijuana use among people aged 12 or older. Notable variations can occur in large areas, such as California, and in small areas, such as the District of Columbia.

Figures 3 and 4 show substate estimates for California and the District of Columbia. As with the maps shown previously, the assignments of the substate areas in California and the District of Columbia were created by dividing 362 substate regions, nationally, into 7 groups based on the magnitude of their percentages. Figures 3 and 4 present close-up looks at the variations across substate regions for California and the District of Columbia that were previously shown in the national maps (Figures 1 and 2). The substate regions within California and the District of Columbia are labeled in Figures 3 and 4. For substate region definitions, see the "2012–2014 National Survey on Drug Use and Health Substate Region Definitions" at <http://www.samhsa.gov/data/>.

In California, past month marijuana use ranged from 6.18 percent in Los Angeles Service Planning Area (SPA) 3—in the San Gabriel Valley in the southeastern part of Los Angeles County—to 15.46 percent in San Francisco (Figure 3 Panel A) and Table S1).¹⁴ A high percentage of marijuana use also occurred in California's Region 1R (13.97 percent), consisting of 15 counties in the northern section of the state. Lower percentages of marijuana use occurred mostly in areas in the central and southern sections of the state (Los Angeles SPA 3 [San Gabriel Valley] and SPA 7 [East], Region 17R, Region 18R [San Bernardino], Region 6 [Santa Clara], Regions 13 and 19R, Los Angeles SPA 2 [San Fernando Valley], Region 14 [Orange], and Region 15R [Fresno]) and ranged from 6.18 percent to 8.10 percent.

Figure 3. Marijuana use in the past month and perceived great risk of harm from smoking marijuana once a month among people aged 12 or older in California, by substate region: percentages, annual averages based on combined 2012 to 2014 data

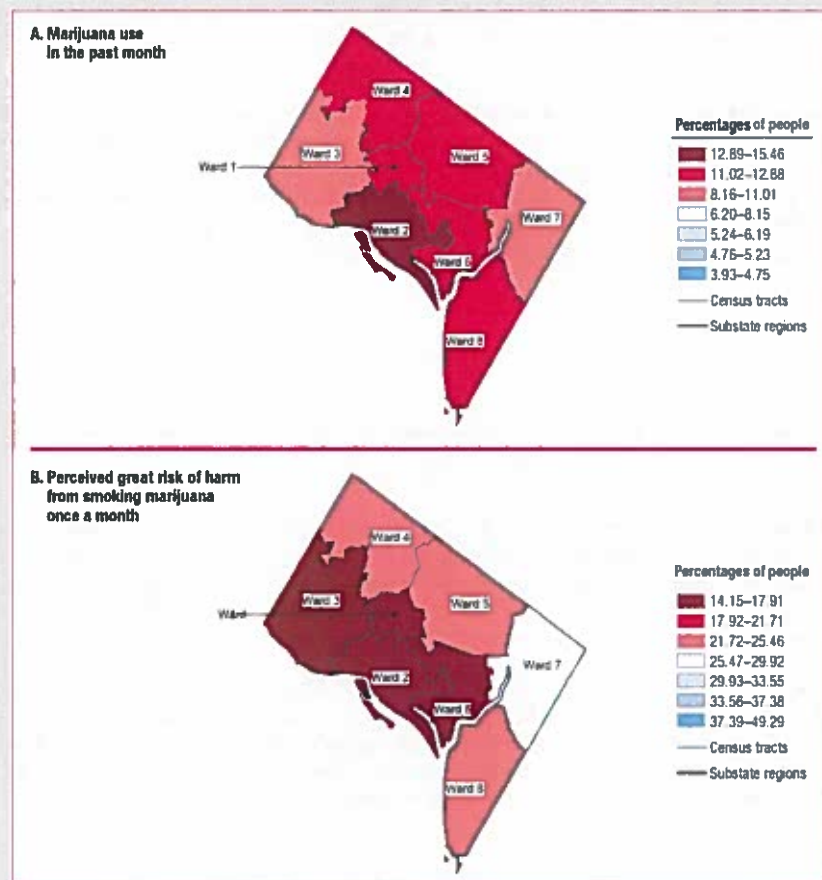


Note: The legend's ranges were created by dividing 362 substate regions, nationally, into 7 groups based on the magnitude of their percentages.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Surveys on Drug Use and Health (NSDUHs), 2012 to 2014.

In the District of Columbia, percentages of perception of great risk of harm from smoking marijuana once a month among people aged 12 or older varied from 14.15 percent in Ward 3 (in the western part of the District) to 25.55 percent in Ward 7 (in the eastern part of the District). Along with Ward 3, the lowest percentages of perception of great risk of harm from smoking marijuana once a month occurred in Wards 1, 2, and 6 (between 14.20 percent and 17.46 percent). The remaining Wards 4, 5, and 8 had relatively higher percentages ranging from 21.84 percent to 24.49 percent (Figure 4 [bottom panel] and Table S1). Overall, lower percentages of perceived great risk appeared in wards in the western and central sections of the District, whereas higher percentages appeared in wards in the southeastern and northeastern sections of the District.

Figure 4. Marijuana use in the past month and perceived great risk of harm from smoking marijuana once a month among people aged 12 or older in the District of Columbia, by substate region: percentages, annual averages based on combined 2012 to 2014 data



Note: The legend's ranges were created by dividing 362 substate regions, nationally, into 7 groups based on the magnitude of their percentages.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Surveys on Drug Use and Health (NSDUHs), 2012 to 2014.

DISCUSSION

This report shows that the percentages of marijuana use and perceptions of the risk associated with marijuana use by substate region vary across the country and within each state and the District of Columbia. The maps and tables presented can help state policymakers and prevention specialists quickly see if prevention or education efforts are needed in their state and where. For example, the highest percentages of marijuana use occurred in substate areas in several northeastern and western states and in the District of Columbia. Most of the substate areas with the lowest percentages of perception of great risk of harm from smoking marijuana are in the District of Columbia, Maine, and New Hampshire.

As seen in Figures 1 and 2 and Table 51, there is a significant negative relationship between marijuana use and perceived great risk at the substate level across the United States. That is, substate regions with higher percentages of marijuana use were more likely to have lower percentages of the population who think there is great risk in using marijuana, whereas substate regions with lower percentages of marijuana use tend to have higher percentages of the population who think there is great risk in using marijuana. In fact, the correlation between the 362 substate estimates of past month marijuana use and the 362 substate estimates of perceived great risk of harm in using marijuana monthly is -0.72.

Across the United States, discourse continues over the public health implications of marijuana use in the general public, the media, the substance use research community, and among federal, state, and local policymakers. Marijuana use in the general population is an ongoing challenge for the nation as a whole and for the states individually. As states continue to examine their laws regarding marijuana use, monitoring national, regional, state, and substate estimates of marijuana use and attitudes toward use may also help state and local policymakers plan for and allocate resources to address marijuana use. For more information on addressing marijuana use, see <http://www.samhsa.gov/capt/tools-learning-resources/youth-marijuana-risk-protective-factor-resources> and <https://www.drugabuse.gov/drugs-abuse/marijuana>.

OTHER AVAILABLE NSDUH SUBSTATE MEASURES

The combined 2012 to 2014 NSDUH estimates for marijuana use and perceptions of risk of harm from marijuana use are available, along with 23 additional behavioral health measures for 384 substate areas, 25 aggregate substate areas, 50 states and the District of Columbia, 4 census regions, and the United States. The methodology that generated these estimates is available online at <http://samhsa.gov/data/>. Of the combined 384 substate areas and 25 aggregate substate areas, 362 of these are shown in the maps (mostly substate areas, but for some states, the areas shown in the maps are aggregate substate areas). This report discusses two of the estimates for the 362 substate areas displayed in the maps.

The 23 additional estimates include measures of substance use and mental health issues, including use of illicit drugs (e.g., marijuana use, cocaine use, nonmedical use of prescription pain relievers), alcohol, and tobacco; substance use disorders; needing but not receiving treatment for a substance use problem; serious mental illness; depression; and suicidal thoughts. Also provided are national maps for all measures and detailed tables including percentages for each substate region, state, census region, and the nation for people aged 12 or older; detailed tables by age group; and state-specific tables and maps. The state maps are particularly useful in areas too small to display clearly on the U.S. maps.

Table S1. Marijuana use in the past month and perceived great risk of harm from smoking marijuana once a month among people aged 12 or older, by state and substate region: percentages, annual averages based on combined 2012 to 2014 data

State	Substate region	Marijuana use in the past month				Perceived great risk of harm from smoking marijuana once a month			
		Small area estimate	95% CI (lower)	95% CI (upper)	Substate area group	Small area estimate	95% CI (lower)	95% CI (upper)	Substate area group
Total United States	Total United States	7.73%	7.54%	7.92%		28.50%	28.11%	28.89%	
West	West	9.70%	9.24%	10.17%		25.64%	24.89%	26.42%	
Northeast	Northeast	8.36%	7.95%	8.79%		26.56%	25.77%	27.36%	
Midwest	Midwest	7.28%	6.97%	7.60%		26.11%	25.47%	26.76%	
South	South	6.43%	6.15%	6.73%		32.60%	31.97%	33.23%	
Alabama	Alabama	5.16%	4.29%	6.20%		37.74%	35.17%	40.39%	
Alabama	Region 1	4.71%	3.40%	6.32%	1	39.39%	35.08%	43.87%	7
Alabama	Region 2	5.91%	4.58%	7.59%	3	33.73%	29.87%	37.82%	6
Alabama	Region 3	4.63%	3.69%	6.31%	2	38.87%	34.89%	43.00%	7
Alabama	Region 4	4.94%	3.64%	6.66%	2	40.55%	36.09%	45.18%	7
Alaska	Alaska	12.59%	10.96%	14.30%		19.90%	16.98%	21.10%	
Alaska	Anchorage	12.37%	10.28%	14.82%	6	18.68%	16.12%	21.53%	2
Alaska	Northern	14.93%	11.76%	18.76%	7	18.71%	15.56%	22.32%	2
Alaska	South Central	11.49%	9.02%	14.54%	6	19.44%	16.28%	23.05%	2
Alaska	Southeast	11.23%	8.40%	14.86%	6	18.85%	15.26%	23.06%	2
Arizona	Arizona	8.06%	6.96%	9.39%		26.46%	24.06%	29.06%	
Arizona	Maricopa	7.64%	6.34%	9.18%	4	25.40%	22.54%	28.50%	3
Arizona	Pima	9.89%	7.40%	13.10%	5	24.72%	20.73%	29.18%	3
Arizona	Rural North	8.22%	5.97%	11.22%	5	29.06%	24.10%	34.59%	4
Arizona	Rural South	7.68%	5.57%	10.50%	4	30.88%	26.50%	35.63%	5
Arkansas	Arkansas	6.24%	5.25%	7.41%		34.99%	32.53%	37.54%	
Arkansas	Catchment Area 1	6.46%	4.87%	8.53%	4	33.02%	28.65%	37.71%	5
Arkansas	Catchment Area 2	5.48%	3.91%	7.61%	3	33.08%	28.28%	38.26%	5
Arkansas	Catchment Area 3	5.76%	4.21%	7.83%	3	39.74%	35.22%	44.45%	7
Arkansas	Catchment Area 4	6.10%	4.36%	8.47%	3	31.39%	26.72%	36.48%	5
Arkansas	Catchment Area 5	7.42%	5.59%	9.84%	4	32.94%	28.46%	37.75%	5
Arkansas	Catchment Area 6	6.98%	5.09%	9.61%	4	41.33%	36.20%	46.65%	7
Arkansas	Catchment Area 7	5.49%	3.91%	7.86%	3	39.01%	33.71%	44.59%	7
Arkansas	Catchment Area 8	6.07%	4.51%	8.13%	3	33.85%	29.40%	38.60%	6
California	California	9.19%	8.53%	9.90%		27.60%	26.39%	28.84%	
California	LA SPA 1 and 5	9.77%	7.52%	12.61%	5	21.44%	17.89%	25.47%	2
California	LA SPA 2	8.03%	6.39%	10.05%	4	25.49%	22.17%	29.11%	4
California	LA SPA 3	8.18%	4.71%	8.07%	3	34.66%	30.36%	39.23%	6
California	LA SPA 4	10.50%	8.15%	13.42%	5	30.18%	26.06%	34.65%	5
California	LA SPA 6	10.62%	8.18%	13.68%	5	32.00%	27.54%	36.81%	5
California	LA SPA 7	7.00%	5.48%	8.92%	4	35.10%	31.13%	39.29%	6
California	LA SPA 8	9.01%	7.10%	11.37%	5	27.35%	23.78%	31.24%	4
California	Region 10	10.23%	7.92%	13.10%	5	24.32%	20.73%	28.32%	3
California	Region 12R	9.28%	6.92%	12.33%	5	28.02%	23.90%	32.67%	4
California	Region 14 (Orange)	8.09%	6.58%	9.89%	4	28.48%	25.23%	31.98%	4
California	Region 15R (Fresno)	8.10%	6.17%	10.58%	4	28.94%	24.86%	33.39%	4
California	Region 16R (San Diego)	9.42%	7.70%	11.47%	5	25.35%	22.48%	28.45%	3
California	Region 17R	7.59%	5.90%	9.71%	4	31.83%	28.06%	35.85%	5
California	Region 18R (San Bernardino)	7.62%	6.03%	9.59%	4	32.11%	28.44%	36.01%	5
California	Region 1R	13.97%	10.71%	18.04%	7	22.05%	18.36%	26.24%	3
California	Region 20R	8.76%	6.80%	11.23%	5	31.26%	27.01%	35.85%	5
California	Region 21R	11.20%	8.66%	14.36%	6	24.45%	20.61%	28.74%	3
California	Region 2R	11.00%	8.54%	14.28%	6	22.80%	19.25%	26.78%	3
California	Region 3R (Sacramento)	10.19%	8.04%	12.83%	5	24.40%	20.91%	28.27%	3
California	Region 4R	11.34%	9.08%	14.07%	6	22.34%	19.03%	26.05%	3
California	Region 5R (San Francisco)	15.46%	11.52%	20.44%	7	22.71%	18.66%	27.35%	3
California	Region 6 (Santa Clara)	7.78%	6.10%	9.89%	4	28.47%	24.77%	32.48%	4
California	Region 7R (Contra Costa)	9.53%	7.32%	12.36%	5	23.86%	20.20%	27.95%	3
California	Region 8R (Alameda)	10.67%	8.41%	13.44%	5	26.84%	23.28%	30.74%	4
California	Region 9R (San Mateo)	9.07%	6.72%	12.13%	5	26.15%	22.00%	30.77%	4
California	Regions 13 and 19R	7.90%	6.44%	9.87%	4	29.72%	26.42%	33.26%	4

(continued)

State	Substate region	Marijuana use in the past month			Perceived great risk of harm from smoking marijuana once a month				
		Small area estimate	95% CI (lower)	95% CI (upper)	Substate area group	Small area estimate	95% CI (lower)	95% CI (upper)	Substate area group
Colorado	Colorado	14.01%	12.32%	15.68%		19.86%	17.73%	22.18%	
Colorado	Region 1	13.33%	10.30%	17.07%	7	19.96%	16.15%	24.40%	2
Colorado	Region 3	11.73%	9.10%	14.99%	6	21.04%	17.40%	25.19%	2
Colorado	Region 4	12.03%	8.79%	16.26%	6	29.86%	24.65%	35.66%	4
Colorado	Regions 2 and 7	14.80%	12.61%	17.30%	7	18.37%	15.88%	21.15%	2
Colorado	Regions 5 and 6	14.84%	11.34%	19.18%	7	20.91%	16.94%	25.53%	2
Connecticut	Connecticut	9.21%	7.95%	10.45%		25.15%	22.74%	27.73%	
Connecticut	Eastern	10.12%	7.88%	12.91%	5	22.78%	19.06%	26.98%	3
Connecticut	North Central	9.21%	7.27%	11.60%	5	25.51%	21.96%	29.42%	4
Connecticut	Northwestern	7.66%	5.79%	10.07%	4	27.04%	23.00%	31.51%	4
Connecticut	South Central	10.12%	8.04%	12.67%	5	24.20%	20.61%	28.20%	3
Connecticut	Southwest	8.92%	6.75%	11.72%	5	25.61%	21.38%	30.36%	4
Delaware	Delaware	8.12%	7.03%	9.35%		27.46%	25.16%	29.89%	
Delaware	Kent	7.09%	5.39%	9.27%	4	26.65%	22.98%	31.11%	4
Delaware	New Castle (excluding Wilmington City)	8.87%	7.50%	10.46%	5	27.28%	24.41%	30.34%	4
Delaware	Sussex	6.17%	4.60%	8.23%	3	28.07%	23.95%	32.60%	4
Delaware	Wilmington City	11.01%	8.07%	14.85%	5	28.30%	23.33%	33.87%	4
District of Columbia	District of Columbia	11.88%	10.44%	13.48%		19.65%	17.56%	21.91%	
District of Columbia	Ward 1	12.60%	9.77%	16.10%	6	17.46%	14.32%	21.13%	1
District of Columbia	Ward 2	13.91%	10.72%	17.84%	7	14.20%	11.31%	17.68%	1
District of Columbia	Ward 3	9.97%	7.62%	12.94%	5	14.15%	11.22%	17.67%	1
District of Columbia	Ward 4	11.40%	8.67%	14.64%	6	23.93%	19.90%	28.49%	3
District of Columbia	Ward 5	11.64%	9.15%	14.69%	6	21.84%	18.10%	26.11%	3
District of Columbia	Ward 6	11.71%	9.02%	15.07%	6	17.15%	13.96%	20.88%	1
District of Columbia	Ward 7	10.92%	8.20%	14.40%	5	25.55%	20.90%	30.84%	4
District of Columbia	Ward 8	12.87%	10.11%	16.26%	6	24.49%	20.64%	28.81%	3
Florida	Florida	7.24%	6.63%	7.81%		32.08%	30.70%	33.50%	
Florida	Broward (Circuit 17)	6.92%	5.47%	8.72%	4	32.23%	28.82%	35.84%	5
Florida	Circuit 1	6.63%	6.64%	11.14%	5	25.48%	21.58%	29.78%	3
Florida	Circuit 10	6.63%	5.02%	8.71%	4	32.51%	28.18%	37.10%	5
Florida	Circuit 12	6.61%	4.90%	8.76%	4	31.23%	27.04%	35.75%	5
Florida	Circuit 13 (Hillsborough)	8.37%	6.78%	10.29%	5	29.66%	26.21%	33.35%	4
Florida	Circuit 14	8.30%	6.13%	11.14%	5	28.36%	23.56%	33.71%	4
Florida	Circuit 15 (Palm Beach)	6.04%	4.89%	7.73%	3	31.88%	28.14%	36.07%	5
Florida	Circuit 18	7.54%	5.92%	9.56%	4	24.84%	21.23%	28.84%	3
Florida	Circuit 19	7.85%	5.83%	10.48%	4	28.05%	23.81%	32.71%	4
Florida	Circuit 2 plus Madison and Taylor	11.71%	9.37%	14.55%	6	28.02%	22.12%	30.35%	4
Florida	Circuit 20	6.71%	5.12%	8.75%	4	30.66%	26.63%	35.01%	5
Florida	Circuit 4	8.00%	6.34%	10.06%	4	29.39%	25.61%	33.25%	4
Florida	Circuit 5	6.81%	5.20%	8.88%	4	27.34%	23.48%	31.57%	4
Florida	Circuit 6	7.86%	6.14%	10.01%	4	27.24%	23.62%	31.18%	4
Florida	Circuit 7	7.55%	5.80%	9.78%	4	28.41%	24.42%	32.78%	4
Florida	Circuit 8 plus Columbia, Duval, Hamilton, Lafayette, and Suwannee	11.08%	8.62%	14.12%	6	28.31%	24.27%	32.73%	4
Florida	Circuit 9	7.42%	5.99%	9.16%	4	30.54%	27.30%	33.99%	5
Florida	South (Circuits 11 and 16)	5.23%	4.28%	6.38%	2	49.29%	46.10%	52.49%	7
Georgia	Georgia	7.74%	6.65%	8.89%		34.03%	31.57%	36.58%	
Georgia	Region 1	7.41%	5.77%	9.47%	4	34.38%	30.45%	38.53%	6
Georgia	Region 2	6.45%	4.79%	8.63%	4	34.73%	30.62%	39.08%	6
Georgia	Region 3	7.95%	6.34%	9.93%	4	34.09%	30.42%	37.97%	6
Georgia	Region 4	7.18%	5.26%	9.74%	4	33.84%	28.96%	39.09%	6
Georgia	Region 5	8.53%	6.29%	11.47%	5	32.94%	27.98%	38.31%	5
Georgia	Region 6	8.66%	6.54%	11.38%	5	33.55%	28.86%	38.58%	5

(continued)

State	Substate region	Marijuana use in the past month				Perceived great risk of harm from smoking marijuana once a month			
		Small area estimate	95% CI (lower)	95% CI (upper)	Substate area group	Small area estimate	95% CI (lower)	95% CI (upper)	Substate area group
Hawaii	Hawaii	8.28%	7.02%	9.70%		28.53%	24.05%	29.18%	
Hawaii	Hawaii Island	9.66%	7.03%	13.15%	5	22.86%	18.83%	27.46%	3
Hawaii	Honolulu	7.81%	6.30%	9.18%	4	27.88%	25.03%	30.91%	4
Hawaii	Kauai	10.00%	6.90%	14.28%	5	24.27%	19.55%	29.71%	3
Hawaii	Mauai	9.93%	7.34%	13.31%	5	23.54%	19.50%	28.11%	3
Idaho	Idaho	6.02%	5.10%	7.10%		28.41%	26.12%	30.82%	
Idaho	Region 1	5.64%	4.10%	7.71%	3	28.44%	24.07%	33.26%	4
Idaho	Region 2	8.11%	5.80%	11.21%	4	22.93%	18.58%	27.93%	3
Idaho	Region 3	5.10%	3.78%	6.88%	2	31.38%	27.22%	35.85%	5
Idaho	Region 4	6.80%	5.35%	8.60%	4	23.81%	20.63%	27.33%	3
Idaho	Region 5	5.43%	3.93%	7.44%	3	32.92%	28.39%	37.79%	5
Idaho	Region 6	6.11%	4.35%	8.52%	3	28.77%	24.16%	33.85%	4
Idaho	Region 7	5.33%	3.93%	7.18%	3	32.84%	28.58%	37.39%	5
Illinois	Illinois	7.26%	6.65%	7.83%		28.34%	26.08%	29.74%	
Illinois	Region I (Cook)	8.31%	7.32%	9.43%	5	29.54%	27.54%	31.62%	4
Illinois	Region II	6.08%	5.25%	7.02%	3	27.28%	25.15%	29.53%	4
Illinois	Region III	7.09%	5.81%	8.62%	4	26.57%	23.83%	29.51%	4
Illinois	Region IV	6.37%	5.07%	7.98%	4	30.18%	26.87%	33.72%	5
Illinois	Region V	7.54%	6.09%	9.23%	4	27.43%	24.13%	31.00%	4
Indiana	Indiana	6.97%	5.98%	8.14%		27.18%	24.85%	29.65%	
Indiana	Central	6.64%	5.17%	8.50%	4	24.87%	21.35%	28.75%	3
Indiana	East	7.41%	5.48%	9.96%	4	28.84%	24.31%	33.85%	4
Indiana	North Central	6.56%	4.92%	8.69%	4	28.30%	24.23%	32.77%	4
Indiana	Northwest	6.70%	4.92%	9.07%	4	26.93%	22.38%	32.03%	4
Indiana	Northwest	6.18%	4.60%	8.25%	3	30.91%	26.28%	35.95%	5
Indiana	Southeast	6.98%	5.09%	9.51%	4	29.64%	24.73%	35.06%	4
Indiana	Southwest	6.92%	5.09%	9.36%	4	25.89%	21.52%	30.79%	4
Indiana	West	8.96%	6.81%	11.70%	5	24.96%	20.89%	29.52%	3
Iowa	Iowa	5.48%	4.55%	6.57%		27.59%	25.20%	30.11%	
Iowa	Central	4.76%	3.48%	6.49%	2	25.14%	21.29%	29.42%	3
Iowa	North Central	7.19%	5.31%	9.68%	4	26.01%	21.67%	30.67%	4
Iowa	Northwest	5.48%	4.16%	7.17%	3	28.35%	24.62%	32.49%	4
Iowa	Northwest	4.74%	3.36%	6.65%	1	29.85%	25.19%	34.97%	4
Iowa	Southwest	6.01%	4.47%	8.03%	3	28.91%	23.17%	31.01%	4
Iowa	Southwest	4.84%	3.47%	6.70%	2	29.87%	25.31%	34.88%	4
Kansas	Kansas	5.25%	4.36%	6.30%		28.08%	23.83%	28.41%	
Kansas	Kansas City Metro	5.80%	4.37%	7.16%	3	24.48%	21.46%	27.77%	3
Kansas	Northwest	5.41%	3.98%	7.32%	3	25.62%	21.73%	29.93%	4
Kansas	South Central	4.45%	3.19%	6.18%	1	25.50%	21.60%	29.84%	4
Kansas	Southeast	5.45%	3.79%	7.79%	3	27.06%	22.18%	32.56%	4
Kansas	West	4.70%	3.31%	6.63%	1	31.38%	26.86%	36.28%	5
Kansas	Wichita (Sedgwick)	5.20%	3.79%	7.10%	2	26.28%	22.39%	30.59%	4
Kentucky	Kentucky	6.19%	5.27%	7.29%		32.12%	29.64%	34.71%	
Kentucky	Atlanta, Cumberland River, and Lifeskills	4.95%	3.66%	6.66%	2	34.00%	29.50%	38.81%	6
Kentucky	Bluegrass, Comprehend, and North Key	6.50%	5.11%	8.24%	4	28.36%	24.89%	32.10%	4
Kentucky	Communicare and River Valley	6.66%	4.78%	9.21%	4	34.90%	30.16%	39.95%	6
Kentucky	Four Rivers and Pennyroyal	5.37%	3.79%	7.57%	3	35.95%	30.47%	41.82%	6
Kentucky	Kentucky River, Mountain, and Pathways	5.23%	3.78%	7.20%	2	37.40%	32.19%	42.92%	7
Kentucky	Seven Counties	7.32%	5.69%	9.38%	4	29.97%	26.04%	34.21%	5
Louisiana	Louisiana	5.54%	4.84%	6.60%		34.54%	32.10%	37.07%	
Louisiana	Region 1	7.67%	5.48%	10.84%	4	29.44%	24.47%	34.95%	4
Louisiana	Region 10 (Jefferson)	5.70%	4.07%	7.93%	3	34.70%	29.90%	40.02%	6
Louisiana	Region 3	5.15%	3.60%	7.32%	2	35.30%	30.27%	40.67%	6
Louisiana	Regions 2 and 9	5.84%	4.57%	7.43%	3	33.43%	29.80%	37.27%	5
Louisiana	Regions 4, 5, and 6	5.09%	3.82%	6.76%	2	34.28%	30.32%	38.49%	6
Louisiana	Regions 7 and 8	4.75%	3.59%	6.25%	1	38.48%	34.35%	42.79%	7

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		Small area estimate	95% CI (lower)	95% CI (upper)	Substate area group	Small area estimate	95% CI (lower)	95% CI (upper)	Substate area group
Maine	Maine	11.72%	10.22%	13.41%		18.00%	15.84%	20.27%	
Maine	Aroostook	9.05%	6.57%	12.34%	5	23.56%	18.97%	28.85%	3
Maine	Central	11.90%	9.13%	15.36%	6	18.79%	15.47%	22.63%	2
Maine	Cumberland	12.88%	10.16%	16.20%	6	16.45%	13.45%	19.96%	1
Maine	Downeast	12.11%	8.54%	16.91%	6	17.39%	13.73%	21.78%	1
Maine	Midcoast	11.62%	8.74%	15.30%	6	17.23%	13.64%	21.53%	1
Maine	Penquis	13.25%	10.36%	16.80%	7	17.27%	13.90%	21.25%	1
Maine	Western	11.89%	9.32%	15.04%	6	20.63%	16.92%	24.92%	2
Maine	York	9.29%	6.95%	12.32%	5	16.45%	13.16%	20.37%	1
Maryland	Maryland	7.76%	6.68%	9.03%		28.36%	25.81%	31.05%	
Maryland	Anne Arundel	7.67%	5.69%	10.27%	4	25.50%	21.15%	30.40%	4
Maryland	Baltimore City	9.99%	7.67%	12.91%	5	31.86%	27.11%	37.01%	5
Maryland	Baltimore County	7.80%	5.80%	10.43%	4	26.83%	22.46%	31.70%	4
Maryland	Montgomery	6.91%	5.06%	9.36%	4	29.35%	24.04%	34.18%	4
Maryland	North Central	6.43%	4.65%	8.83%	4	24.68%	20.15%	29.86%	3
Maryland	Northeast	7.81%	5.79%	10.45%	4	28.56%	23.68%	33.99%	4
Maryland	Prince George's	8.55%	6.56%	11.08%	5	30.51%	26.00%	35.44%	5
Maryland	South	6.55%	4.79%	8.90%	4	27.46%	23.13%	32.25%	4
Maryland	West	7.95%	5.87%	10.67%	4	28.22%	23.72%	33.31%	4
Massachusetts	Massachusetts	10.77%	9.39%	12.32%		20.25%	18.16%	22.52%	
Massachusetts	Boston	13.12%	10.27%	16.61%	7	19.36%	15.86%	23.41%	2
Massachusetts	Central	10.70%	8.16%	13.91%	5	20.29%	16.63%	24.51%	2
Massachusetts	Metrowest	10.00%	7.81%	12.72%	5	17.91%	14.90%	21.38%	1
Massachusetts	Northeast	10.04%	7.87%	12.72%	5	23.15%	19.58%	27.15%	3
Massachusetts	Southeast	10.95%	8.64%	13.79%	5	20.14%	16.74%	24.03%	2
Massachusetts	Western	10.77%	8.32%	13.82%	5	21.06%	17.43%	25.23%	2
Michigan	Michigan	9.74%	8.00%	10.34%		23.52%	22.28%	24.81%	
Michigan	Region 1	9.58%	7.29%	12.48%	5	20.66%	17.27%	24.53%	2
Michigan	Region 1D	11.15%	9.13%	13.56%	6	22.18%	19.19%	25.48%	3
Michigan	Region 2	8.39%	6.34%	11.01%	5	24.05%	20.22%	28.34%	3
Michigan	Region 3	9.16%	7.60%	11.01%	5	23.05%	20.37%	25.98%	3
Michigan	Region 4	10.24%	8.29%	12.58%	5	24.84%	21.73%	28.24%	3
Michigan	Region 5	10.08%	8.89%	11.65%	5	23.10%	20.68%	25.71%	3
Michigan	Region 6	8.40%	6.84%	10.27%	5	20.55%	17.82%	23.57%	2
Michigan	Region 7	11.15%	9.46%	13.05%	6	26.09%	23.31%	29.09%	4
Michigan	Region 8	8.14%	6.63%	9.96%	4	21.81%	19.09%	24.81%	3
Michigan	Region 8	9.87%	8.05%	12.04%	5	25.56%	22.33%	29.08%	4
Minnesota	Minnesota	8.84%	6.82%	9.02%		24.08%	21.84%	26.48%	
Minnesota	Region 7A (Hennepin)	7.40%	5.66%	9.60%	4	22.19%	18.67%	26.16%	3
Minnesota	Region 7B (Ramsey)	8.61%	6.25%	11.75%	5	21.57%	17.48%	26.31%	2
Minnesota	Region 7C	6.16%	4.81%	7.87%	3	22.63%	19.30%	26.36%	3
Minnesota	Regions 1 and 2	6.14%	4.38%	8.55%	3	25.76%	21.14%	30.98%	4
Minnesota	Regions 3 and 4	6.76%	5.11%	8.90%	4	25.30%	21.37%	29.69%	3
Minnesota	Regions 5 and 6	6.50%	4.88%	8.63%	4	27.35%	23.25%	31.87%	4
Mississippi	Mississippi	5.54%	4.68%	6.56%		38.13%	35.54%	40.80%	
Mississippi	Region 1	5.64%	4.29%	7.38%	3	36.17%	32.08%	40.47%	6
Mississippi	Region 2	5.86%	4.38%	7.79%	3	43.38%	38.41%	48.48%	7
Mississippi	Region 3	4.80%	3.56%	6.44%	2	38.60%	33.98%	43.44%	7
Mississippi	Region 4	6.18%	4.72%	8.05%	3	36.79%	32.09%	41.76%	6
Mississippi	Region 5	4.93%	3.45%	7.00%	2	42.34%	36.55%	48.33%	7
Mississippi	Region 6	4.95%	3.61%	6.75%	2	41.31%	36.60%	46.19%	7
Mississippi	Region 7	5.69%	4.17%	7.72%	3	34.55%	29.48%	39.58%	6

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		Small area estimate	95% CI (lower)	95% CI (upper)	Substate area group	Small area estimate	95% CI (lower)	95% CI (upper)	Substate area group
Missouri	Missouri	7.20%	6.12%	8.45%		27.56%	25.21%	30.05%	
Missouri	Central	7.15%	5.54%	9.19%	4	29.22%	24.94%	33.91%	4
Missouri	Eastern (excluding St. Louis)	5.97%	4.48%	7.91%	3	27.75%	23.65%	32.26%	4
Missouri	Eastern (St. Louis City and County)	8.30%	6.42%	10.67%	5	24.89%	21.20%	28.99%	3
Missouri	Northwest (excluding Jackson)	7.03%	5.13%	9.58%	4	26.38%	21.98%	31.31%	4
Missouri	Northwest (Jackson)	9.27%	6.86%	12.40%	5	26.67%	22.31%	31.53%	4
Missouri	Southwest	5.48%	3.93%	7.59%	3	32.27%	27.57%	37.35%	5
Missouri	Southwest	6.66%	4.91%	8.98%	4	27.77%	23.59%	32.37%	4
Montana	Montana	10.46%	8.07%	12.00%		23.75%	21.36%	26.27%	
Montana	Region 1	7.88%	5.59%	11.01%	4	25.31%	20.72%	30.53%	3
Montana	Region 2	10.69%	8.12%	13.95%	5	25.09%	21.19%	29.44%	3
Montana	Region 3	10.26%	7.99%	13.07%	5	27.00%	23.31%	31.04%	4
Montana	Region 4	10.23%	8.15%	12.78%	5	23.47%	19.81%	27.56%	3
Montana	Region 5	11.34%	9.07%	14.08%	6	20.78%	17.52%	24.47%	2
Nebraska	Nebraska	6.97%	5.04%	7.09%		26.82%	24.44%	29.35%	
Nebraska	Region 1	6.13%	4.20%	8.86%	3	29.21%	24.06%	34.96%	4
Nebraska	Region 2	6.06%	4.13%	8.81%	3	29.30%	23.97%	35.27%	4
Nebraska	Region 3	5.33%	3.96%	7.14%	3	35.13%	30.36%	40.17%	6
Nebraska	Region 4	4.93%	3.50%	6.90%	2	29.24%	24.45%	34.54%	4
Nebraska	Region 5	5.60%	4.33%	7.22%	3	25.58%	22.16%	29.31%	4
Nebraska	Region 6	6.63%	5.32%	8.23%	4	23.88%	20.69%	27.39%	3
Nevada	Nevada	7.84%	6.67%	9.42%		27.33%	24.78%	30.04%	
Nevada	Capital District	8.30%	5.68%	11.09%	5	27.39%	21.98%	33.55%	4
Nevada	Clark - Region 1	7.60%	6.19%	9.30%	4	27.83%	24.90%	30.94%	4
Nevada	Rural/Frontier	7.37%	5.15%	10.45%	4	29.40%	24.19%	35.21%	4
Nevada	Washoe - Region 2	9.58%	7.36%	12.39%	5	24.15%	20.33%	28.44%	3
New Hampshire	New Hampshire	10.92%	8.62%	12.37%		17.29%	15.47%	19.28%	
New Hampshire	Central	11.67%	9.77%	13.88%	6	16.97%	14.52%	19.73%	1
New Hampshire	Northern	12.40%	9.47%	16.08%	6	17.26%	13.78%	21.42%	1
New Hampshire	Southern	10.22%	8.73%	11.93%	5	17.45%	15.32%	19.81%	1
New Jersey	New Jersey	6.01%	5.08%	7.12%		30.72%	28.27%	33.28%	
New Jersey	Central	5.32%	4.02%	7.01%	3	27.88%	24.05%	32.05%	4
New Jersey	Metropolitan	5.56%	4.23%	7.28%	3	32.52%	28.73%	36.55%	5
New Jersey	Northern	6.19%	4.74%	8.06%	3	32.28%	28.45%	36.37%	5
New Jersey	Southern	6.99%	5.43%	8.95%	4	29.36%	25.46%	33.59%	4
New Mexico	New Mexico	9.61%	8.21%	11.23%		27.36%	25.01%	29.85%	
New Mexico	Region 1	8.99%	6.82%	11.76%	5	26.45%	22.79%	30.46%	4
New Mexico	Region 2	8.76%	6.44%	11.51%	5	30.41%	25.78%	35.48%	5
New Mexico	Region 3 (Bernalillo)	12.00%	9.65%	14.83%	6	24.00%	20.60%	27.77%	3
New Mexico	Region 4	7.72%	5.72%	10.35%	4	30.55%	26.32%	35.12%	5
New Mexico	Region 5	8.15%	6.16%	10.70%	4	29.63%	25.76%	33.82%	4
New York	New York	8.59%	7.90%	9.34%		27.87%	26.54%	29.24%	
New York	Region A	8.43%	7.46%	9.50%	5	31.05%	29.14%	33.03%	5
New York	Region B	8.74%	7.60%	10.02%	5	26.81%	24.73%	28.99%	4
New York	Region C	8.53%	7.58%	9.59%	5	24.13%	22.34%	26.01%	3
New York	Region D	9.21%	7.80%	10.85%	5	25.41%	22.86%	28.13%	3

(continued)

State	Substate region	Marijuana use in the past month				Perceived great risk of harm from smoking marijuana once a month			
		Small area estimate	95% CI (lower)	95% CI (upper)	Substate area group	Small area estimate	95% CI (lower)	95% CI (upper)	Substate area group
North Carolina	North Carolina	6.51%	5.52%	7.67%		30.40%	28.00%	32.95%	
North Carolina	Alliance Behavioral Healthcare 1	6.91%	5.11%	9.29%	4	30.03%	25.75%	34.69%	5
North Carolina	Alliance Behavioral Healthcare 2	5.68%	4.07%	7.89%	3	23.83%	19.78%	28.41%	3
North Carolina	Cardinal Innovations Healthcare Solutions 1	6.29%	4.50%	8.73%	4	30.23%	25.23%	35.74%	5
North Carolina	Cardinal Innovations Healthcare Solutions 2	6.59%	4.86%	8.88%	4	31.06%	26.50%	36.01%	5
North Carolina	Cardinal Innovations Healthcare Solutions 3	7.22%	5.23%	9.89%	4	28.35%	23.78%	33.41%	4
North Carolina	CenterPoint Human Services	5.98%	4.31%	8.23%	3	33.73%	28.60%	39.27%	6
North Carolina	Eastpointe	5.19%	3.72%	7.19%	2	37.38%	32.12%	42.97%	6
North Carolina	Partners Behavioral Health Management	6.64%	4.84%	9.05%	4	32.02%	27.33%	37.10%	5
North Carolina	Sandhills Center 1	6.19%	4.29%	8.65%	3	33.09%	27.69%	38.97%	5
North Carolina	Sandhills Center 2	7.27%	5.31%	9.89%	4	26.80%	22.33%	31.78%	4
North Carolina	Smoky Mountain Center 1	6.81%	4.86%	9.47%	4	32.58%	27.29%	38.35%	5
North Carolina	Smoky Mountain Center 2	6.43%	4.49%	9.12%	4	30.86%	25.81%	36.41%	5
North Carolina	Tridium Healthcare Resources 1	6.69%	4.80%	9.24%	4	30.03%	25.17%	35.38%	5
North Carolina	Tridium Healthcare Resources 2	7.68%	5.51%	10.60%	4	28.55%	23.67%	33.99%	4
North Dakota	North Dakota	5.58%	4.72%	6.50%		27.72%	25.43%	30.13%	
North Dakota	Badlands and West Central	4.93%	3.75%	6.45%	2	29.25%	25.65%	33.12%	4
North Dakota	Lake Region	4.14%	2.85%	5.99%	1	35.32%	30.27%	40.72%	6
North Dakota	North Central	5.67%	4.16%	7.69%	3	27.92%	23.83%	32.41%	4
North Dakota	Northeast	7.27%	5.56%	9.44%	4	25.84%	21.92%	30.19%	4
North Dakota	Northwest	5.81%	3.98%	8.39%	3	26.48%	21.77%	31.79%	4
North Dakota	South Central	4.67%	3.24%	6.70%	1	31.14%	26.21%	36.54%	5
North Dakota	Southeast	5.91%	4.65%	7.49%	3	24.68%	21.38%	28.31%	3
Ohio	Ohio	7.37%	6.74%	8.05%		25.14%	23.84%	26.48%	
Ohio	Board 12	7.26%	5.44%	9.67%	4	24.51%	20.42%	29.11%	3
Ohio	Board 25 (Franklin)	10.61%	8.76%	12.81%	5	20.46%	17.79%	23.42%	2
Ohio	Board 31 (Hamilton)	8.37%	6.62%	10.53%	5	20.46%	17.38%	23.93%	2
Ohio	Board 48 (Lucas)	8.12%	6.12%	10.69%	4	25.29%	21.55%	29.44%	3
Ohio	Board 57 (Montgomery)	7.20%	5.47%	9.42%	4	24.82%	21.21%	28.83%	3
Ohio	Board 77 (Summit)	8.81%	6.79%	11.35%	5	22.88%	19.27%	26.95%	3
Ohio	Board 9 (Butler)	7.20%	5.43%	9.49%	4	21.71%	18.04%	25.89%	2
Ohio	Boards 18 and 47	7.10%	5.87%	8.57%	4	26.55%	23.74%	29.56%	4
Ohio	Boards 2, 46, 55, and 68	6.30%	4.65%	8.49%	4	29.03%	24.90%	33.54%	4
Ohio	Boards 20, 32, 54, and 69	5.70%	4.22%	7.66%	3	28.08%	24.15%	32.38%	4
Ohio	Boards 21, 39, 51, 70, and 80	5.49%	4.18%	7.19%	3	26.58%	22.96%	30.55%	4
Ohio	Boards 22, 74, and 87	6.48%	4.83%	8.84%	4	22.69%	19.11%	26.72%	3
Ohio	Boards 23 and 45	6.95%	5.28%	9.08%	4	25.86%	22.07%	30.06%	4
Ohio	Boards 27, 71, and 73	7.34%	5.47%	9.77%	4	28.48%	24.46%	32.86%	4
Ohio	Boards 28, 43, and 67	6.75%	5.26%	8.63%	4	23.40%	19.77%	27.46%	3
Ohio	Boards 3, 52, and 85	6.06%	4.53%	8.07%	3	27.00%	22.98%	31.42%	4
Ohio	Boards 4 and 78	7.29%	5.35%	9.86%	4	27.15%	22.96%	31.79%	4
Ohio	Boards 5 and 60	8.83%	6.84%	11.34%	5	23.42%	19.79%	27.49%	3
Ohio	Boards 50 and 76	6.62%	5.12%	8.52%	4	29.65%	25.76%	33.86%	4
Ohio	Boards 7, 15, 41, 79, and 84	5.67%	4.23%	7.57%	3	30.01%	25.91%	34.45%	5
Ohio	Boards 8, 13, and 83	5.57%	4.18%	7.37%	3	25.30%	21.62%	29.37%	3
Oklahoma	Oklahoma	6.09%	5.08%	7.27%		29.19%	26.75%	31.75%	
Oklahoma	Central	6.50%	4.82%	8.71%	4	24.80%	20.78%	29.31%	3
Oklahoma	East Central	5.16%	3.67%	7.21%	2	30.55%	26.04%	35.46%	5
Oklahoma	Northeast	5.42%	3.94%	7.41%	3	29.17%	24.78%	33.97%	4
Oklahoma	Northwest and Southwest	6.07%	4.39%	8.34%	3	29.43%	24.75%	34.59%	4
Oklahoma	Oklahoma County	7.02%	5.29%	9.26%	4	29.92%	25.84%	34.33%	4
Oklahoma	Southeast	4.32%	3.04%	6.10%	1	33.15%	28.72%	37.90%	5
Oklahoma	Tulsa County	7.32%	5.43%	9.79%	4	27.23%	23.14%	31.75%	4

(continued)

State	Substate region	Marijuana use in the past month			Perceived great risk of harm from smoking marijuana once a month				
		Small area estimate	95% CI (lower)	95% CI (upper)	Substate area group	Small area estimate	95% CI (lower)	95% CI (upper)	Substate area group
Oregon	Oregon	12.19%	10.69%	13.67%		18.29%	16.28%	20.52%	
Oregon	Region 1 (Multnomah)	13.32%	10.57%	16.64%	7	15.81%	12.95%	19.17%	1
Oregon	Region 2	12.56%	10.02%	15.82%	8	18.77%	15.65%	22.34%	2
Oregon	Region 3	12.03%	9.83%	14.64%	6	18.69%	15.83%	21.93%	2
Oregon	Region 4	11.70%	8.83%	15.58%	6	18.27%	14.75%	22.40%	2
Oregon	Region 5 (Central)	10.85%	7.65%	14.64%	5	19.76%	15.66%	24.63%	2
Oregon	Region 6 (Eastern)	10.23%	7.22%	14.28%	5	21.24%	17.00%	26.19%	2
Pennsylvania	Pennsylvania	8.84%	8.24%	7.49%		28.10%	26.72%	29.52%	
Pennsylvania	Region 1 (Allegheny)	7.91%	6.43%	9.70%	4	24.86%	21.86%	28.13%	3
Pennsylvania	Region 36 (Philadelphia)	10.44%	8.66%	12.53%	5	27.54%	24.44%	30.87%	4
Pennsylvania	Regions 10, 15, 27, 32, 43, and 44	5.57%	4.19%	7.37%	3	31.45%	27.26%	35.97%	5
Pennsylvania	Regions 17 and 21	6.20%	4.67%	8.19%	4	28.58%	24.51%	33.04%	4
Pennsylvania	Regions 19, 26, 28, and 42	5.50%	4.48%	6.75%	3	29.17%	26.20%	32.33%	4
Pennsylvania	Regions 22, 38, 40, 41, and 45	4.27%	3.23%	5.64%	1	30.57%	26.66%	34.78%	5
Pennsylvania	Regions 29 and 34	7.41%	5.63%	9.70%	4	27.65%	23.72%	31.97%	4
Pennsylvania	Regions 3, 8, 9, and 51	8.82%	5.42%	8.55%	4	29.31%	25.46%	33.44%	4
Pennsylvania	Regions 30 and 50	6.44%	4.91%	8.36%	4	32.14%	28.11%	36.45%	5
Pennsylvania	Regions 4, 11, 37, and 49	8.34%	4.95%	8.10%	4	31.58%	27.90%	35.50%	5
Pennsylvania	Regions 5, 18, 23, 24, and 46	5.30%	4.08%	6.87%	3	32.36%	28.56%	36.39%	5
Pennsylvania	Regions 6, 12, 16, 31, 35, 45, and 47	8.96%	5.57%	8.68%	4	28.96%	25.34%	32.68%	4
Pennsylvania	Regions 7, 13, 20, and 33	6.70%	5.58%	8.02%	4	23.81%	21.23%	26.60%	3
Rhode Island	Rhode Island	13.47%	11.84%	15.18%		21.18%	18.90%	23.62%	
Rhode Island	Bristol and Newport	14.45%	11.07%	18.63%	7	19.32%	15.61%	23.67%	2
Rhode Island	Kent	14.23%	11.15%	17.98%	7	19.69%	15.97%	23.83%	2
Rhode Island	Providence	12.77%	10.93%	14.87%	6	21.00%	20.20%	26.06%	3
Rhode Island	Washington	14.85%	11.81%	18.50%	7	16.35%	13.10%	20.22%	1
South Carolina	South Carolina	7.02%	5.97%	8.24%		31.38%	28.96%	33.85%	
South Carolina	Region 1	6.98%	5.38%	9.01%	4	31.88%	28.13%	35.87%	5
South Carolina	Region 2	7.10%	5.53%	9.08%	4	29.28%	25.48%	33.36%	4
South Carolina	Region 3	6.99%	5.24%	9.27%	4	30.58%	26.38%	35.13%	5
South Carolina	Region 4	7.01%	5.48%	8.93%	4	33.16%	29.36%	37.19%	5
South Dakota	South Dakota	5.14%	4.28%	6.16%		28.24%	25.95%	30.66%	
South Dakota	Region 1	5.46%	4.08%	7.26%	3	26.74%	23.14%	30.67%	4
South Dakota	Region 2	5.29%	3.63%	7.65%	3	30.89%	26.20%	36.00%	5
South Dakota	Region 3	4.79%	3.63%	6.29%	2	29.85%	26.05%	33.94%	4
South Dakota	Region 4	5.41%	3.95%	7.35%	3	28.11%	23.71%	32.97%	4
South Dakota	Region 5	4.97%	3.79%	6.49%	2	27.42%	24.08%	31.03%	4
Tennessee	Tennessee	6.29%	4.40%	8.35%		32.71%	30.24%	35.27%	
Tennessee	Region 1	4.75%	3.32%	6.76%	1	33.50%	28.27%	39.17%	5
Tennessee	Region 2	4.76%	3.49%	6.46%	2	31.86%	27.73%	36.29%	5
Tennessee	Region 3	4.77%	3.49%	6.48%	2	33.31%	28.85%	38.09%	5
Tennessee	Region 4 (Davidson)	6.00%	4.33%	8.25%	3	30.00%	25.41%	35.02%	5
Tennessee	Region 5	6.12%	4.61%	8.09%	3	31.74%	27.65%	35.91%	5
Tennessee	Region 6	4.69%	3.36%	6.51%	1	36.83%	31.86%	42.10%	6
Tennessee	Region 7 (Shelby)	5.36%	3.91%	7.29%	3	33.42%	28.85%	38.32%	5
Texas	Texas	8.62%	8.13%	6.16%		35.56%	34.26%	36.88%	
Texas	Region 1	6.08%	4.64%	7.93%	3	33.96%	30.04%	38.11%	6
Texas	Region 10	4.23%	3.25%	5.49%	1	44.77%	40.59%	49.02%	7
Texas	Region 11	3.93%	3.18%	4.87%	1	47.71%	44.56%	50.88%	7
Texas	Region 2	6.40%	4.70%	8.67%	4	35.15%	30.32%	40.30%	6
Texas	Region 3	5.67%	4.90%	6.55%	3	33.19%	31.18%	35.26%	5
Texas	Region 4	5.17%	3.88%	6.84%	2	37.02%	32.97%	41.27%	6
Texas	Region 5	5.98%	4.51%	7.89%	3	37.17%	32.54%	42.06%	6
Texas	Region 6	5.15%	4.35%	6.09%	2	34.40%	32.01%	36.87%	6
Texas	Region 7	7.44%	6.25%	8.83%	4	29.46%	26.92%	32.14%	4
Texas	Region 8	5.93%	4.78%	7.34%	3	38.26%	35.07%	41.57%	7
Texas	Region 9	6.06%	4.50%	8.17%	3	37.32%	32.74%	42.14%	6

(continued)

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		Small area estimate	95% CI (lower)	95% CI (upper)	Substate area group	Small area estimate	95% CI (lower)	95% CI (upper)	Substate area group
Utah	Utah	5.36%	4.53%	6.41%		32.76%	30.45%	35.15%	
Utah	Beaver River, Northeastern, Summit, Tooele, and Wasatch	4.49%	3.26%	6.16%	1	32.53%	28.13%	37.27%	5
Utah	Central, Four Corners, San Juan, and Southwest	4.89%	3.45%	6.89%	2	34.65%	29.88%	39.76%	6
Utah	Davis County	4.72%	3.38%	6.56%	1	30.47%	25.98%	35.37%	5
Utah	Salt Lake County	6.61%	5.25%	8.29%	4	32.06%	28.88%	35.41%	5
Utah	Utah County	4.39%	3.24%	5.92%	1	34.53%	30.48%	38.82%	6
Utah	Weber, Morgan	4.89%	3.43%	6.93%	2	32.58%	27.70%	37.85%	5
Vermont	Vermont	13.01%	11.46%	14.73%		18.70%	17.56%	22.03%	
Vermont	Champlain Valley	13.87%	11.82%	16.20%	7	18.37%	15.70%	21.38%	2
Vermont	Rural Northeast	12.88%	10.03%	15.91%	6	20.18%	18.67%	24.22%	2
Vermont	Rural Southeast	13.01%	10.21%	16.44%	7	18.30%	15.09%	22.02%	2
Vermont	Rural Southwest	11.31%	8.66%	14.65%	6	24.22%	20.26%	28.65%	3
Virginia	Virginia	6.40%	5.45%	7.50%		25.44%	23.15%	27.88%	
Virginia	Region 1	7.80%	5.97%	10.12%	4	26.31%	22.43%	30.59%	4
Virginia	Region 2	5.04%	3.81%	6.63%	2	26.81%	23.20%	30.32%	4
Virginia	Region 3	6.83%	5.25%	8.84%	4	25.73%	22.78%	31.09%	4
Virginia	Region 4	6.15%	4.64%	8.11%	3	24.00%	20.17%	28.30%	3
Virginia	Region 5	6.99%	5.42%	8.96%	4	23.50%	20.09%	27.29%	3
Washington	Washington	12.74%	11.29%	14.40%		18.79%	16.80%	20.81%	
Washington	Region 1	10.53%	8.45%	13.04%	5	21.90%	18.78%	25.38%	3
Washington	Region 2	14.31%	12.29%	16.58%	7	17.48%	15.17%	20.05%	1
Washington	Region 3	12.01%	10.06%	14.28%	6	18.55%	16.17%	21.20%	2
West Virginia	West Virginia	5.76%	4.84%	6.84%		33.51%	31.09%	36.01%	
West Virginia	Region I	4.99%	3.37%	7.04%	2	32.27%	27.06%	37.96%	5
West Virginia	Region II	5.89%	4.28%	8.04%	3	31.07%	26.61%	35.91%	5
West Virginia	Region III	4.45%	3.03%	6.48%	1	35.95%	30.52%	41.76%	6
West Virginia	Region IV	7.17%	5.61%	9.11%	4	31.03%	27.15%	35.18%	5
West Virginia	Region V	5.77%	4.40%	7.52%	3	33.78%	30.05%	37.73%	6
West Virginia	Region VI	4.90%	3.68%	6.73%	2	37.26%	33.11%	41.61%	6
Wisconsin	Wisconsin	6.63%	5.62%	7.79%		25.32%	22.85%	27.85%	
Wisconsin	Midwest	7.69%	5.78%	10.16%	4	24.63%	20.60%	29.16%	3
Wisconsin	Northeastern	5.53%	4.15%	7.32%	3	24.82%	21.14%	28.91%	3
Wisconsin	Northern	5.12%	3.63%	7.18%	2	24.43%	20.08%	29.38%	3
Wisconsin	Southeastern	6.45%	4.86%	8.51%	4	28.05%	24.05%	32.43%	4
Wisconsin	Southern	7.49%	5.72%	9.73%	4	23.22%	19.45%	27.48%	3
Wisconsin	Western	7.12%	5.36%	9.39%	4	26.40%	22.22%	31.18%	4
Wyoming	Wyoming	6.20%	5.26%	7.43%		27.53%	25.34%	29.83%	
Wyoming	Judicial District 1 (Laramie)	6.58%	4.84%	8.85%	4	27.21%	23.36%	31.43%	4
Wyoming	Judicial District 2	8.84%	6.69%	11.59%	5	22.69%	19.01%	26.84%	3
Wyoming	Judicial District 3	5.06%	3.68%	6.03%	2	31.40%	27.34%	35.76%	5
Wyoming	Judicial District 4	6.14%	4.26%	8.78%	3	25.66%	21.12%	30.80%	4
Wyoming	Judicial District 5	5.13%	3.59%	7.28%	2	30.46%	25.44%	35.99%	5
Wyoming	Judicial District 6	5.07%	3.65%	7.01%	2	27.97%	23.82%	32.54%	4
Wyoming	Judicial District 7 (Natrona)	6.01%	4.37%	8.20%	3	23.68%	19.82%	28.03%	3
Wyoming	Judicial District 8	5.29%	3.71%	7.48%	3	31.81%	27.00%	37.04%	5
Wyoming	Judicial District 9	7.88%	5.64%	10.89%	4	27.50%	23.20%	32.26%	4

CI = confidence interval; LA SPA = Los Angeles Service Planning Area.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Surveys on Drug Use and Health (NSDUHs), 2012 to 2014.

ENDNOTES

1. Center for Behavioral Health Statistics and Quality. (2015). *Behavioral health trends in the United States: Results from the 2014 National Survey on Drug Use and Health* (HHS Publication No. SMA 15-4927, NSDUH Series H-50). Retrieved from <http://www.samhsa.gov/data/sites/default/files/NSDUH-FRR1-2014/NSDUH-FRR1-2014.pdf>
2. Center for Behavioral Health Statistics and Quality. (2015). *Risk and protective factors and initiation of substance use: Results from the 2014 National Survey on Drug Use and Health*. Retrieved from <http://www.samhsa.gov/data/sites/default/files/NSDUH-DR-FRR4-2014rev/NSDUH-DR-FRR4-2014.pdf>
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8. Research on the inverse relationship between perceptions of harm and use has focused on adolescents. For more information, see Miech, R. A., Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2015). *Monitoring the Future national survey results on drug use, 1975-2014: Volume 1, secondary school students*. Ann Arbor, MI: Institute for Social Research, University of Michigan. The results of this study may not generalize to the population of people aged 12 or older.
9. Substance use and mental health officials from each of the 50 states and the District of Columbia typically define these substate areas to correspond to areas reported in their applications for the Substance Abuse Prevention and Treatment Block Grant (SABG) administered by SAMHSA. The SABG program provides financial and technical assistance to the 50 states, the District of Columbia, and other jurisdictions to support substance abuse prevention and treatment programs and to promote public health. States use NSDUH substate estimates for a variety of purposes, including strategic planning and program development, production of epidemiological profiles for briefing state legislatures and informing the public, allocation of funds to areas based on the need for services, and other uses.
10. In this report, substate estimates are discussed in terms of their observed rankings because they provide useful context. However, a substate region having a highest or lowest estimate does not imply that the substate region's estimate is significantly higher or lower than the estimate of the next highest or lowest substate region. Similarly, the seven categories were not selected to represent statistical differences across categories or to correspond to proximity to a target public health threshold for a particular measure. For example, the division of substate regions into seven categories does not indicate that substate regions in the same category are statistically similar to each other. Furthermore, the size of the intervals (i.e., the difference between the upper and lower limits of each category) that define the map boundaries is not necessarily uniform across each category. When comparing two substate region percentages, the method of overlapping confidence intervals is more conservative (i.e., it rejects the null hypothesis of no difference less often) than the standard method based on Z statistics when the null hypothesis is true. Even if confidence intervals for two substate regions overlap, the two estimates may be declared significantly different by the test based on Z statistics. Hence, the method of overlapping confidence intervals is not recommended to test the difference of two substate region estimates. A detailed description of the method of overlapping confidence intervals and its comparison with the standard methods for testing of a hypothesis is given in the following articles: (a) Schenker, N., & Gentleman, J. F. (2001). On judging the significance of differences by examining the overlap between confidence intervals. *American Statistician*, 55(3), 182-186. (b) Payton, M. E., Greenstone, M. H., & Schenker, N. (2003). Overlapping confidence intervals or standard error intervals: What do they mean in terms of statistical significance? *Journal of Insect Science*, 3, 34.
11. Estimates presented in this report are derived from a hierarchical Bayes model-based small area estimation procedure in which NSDUH data at the substate level are combined with local area county and census block group/tract-level data from the area to provide more precise estimates of substance use and mental health outcomes. With 3 years of combined NSDUH data, the sample sizes in the 362 substate regions ranged from 100 people to approximately 3,500 people.
12. The West has 13 states: AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA, and WY. The South has 16 states plus the District of Columbia: AL, AR, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, and WV. The Northeast has 9 states: CT, MA, ME, NH, NJ, NY, PA, RI, and VT. The Midwest has 12 states: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, and WI.
13. This substate region is named Region 11 by the Texas Department of State Health Services and consists of the following 19 counties in the southernmost part of Texas: Aransas, Bee, Brooks, Cameron, Duval, Hidalgo, Jim Hogg, Jim Wells, Kenedy, Kleberg, Live Oak, McMullen, Nueces, Refugio, San Patricio, Starr, Webb, Willacy, and Zapata.
14. More information about SPAs in Los Angeles County can be found at <http://publichealth.lacounty.gov/chs/SPAMain/ServicePlanningAreas.htm>.

SUGGESTED CITATION

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SUMMARY

Background: Attitudes about the risks associated with substance use are often closely related to their use. As states have been at the center of efforts to monitor marijuana use, examining the percentages of people using marijuana and attitudes about the risks associated with using marijuana provides needed policy information. **Method:** Combined 2012 to 2014 National Surveys on Drug Use and Health (NSDUHs) state (including the District of Columbia) estimates of past month marijuana use and perceptions of great risk of harm from smoking marijuana once a month among people aged 12 or older were analyzed in 362 substate regions. Because of revisions to substate boundaries, the 2012 to 2014 estimates are not compared with estimates from prior years. **Results:** Findings in this report suggest that there is a significant negative relationship between marijuana use and perceived great risk of use at the substate level across the United States. For example, substate regions with higher percentages of marijuana use were more likely to have lower percentages of the population who think there is great risk in using marijuana, whereas substate regions with lower percentages of marijuana use tend to have higher percentages of the population who think there is great risk in using marijuana. **Conclusion:** Highlighting the percentage of people using marijuana and attitudes toward use in each state and substate area may help to raise awareness about the consequences of marijuana use and to improve prevention efforts.

Keywords: marijuana, National Survey on Drug Use and Health, NSDUH, risk, state, substate

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KEYWORDS

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virgin Islands, Virginia, Washington, West Virginia, Wisconsin, Wyoming, Short Report, Population Data, 2012, 2013, 2014, Researchers, Marijuana, All US States Only, County Type, Risk & Protective Factors

The Substance Abuse and Mental Health Services Administration (SAMHSA) is the agency within the U.S. Department of Health and Human Services that leads public health efforts to advance the behavioral health of the nation. SAMHSA's mission is to reduce the impact of substance abuse and mental illness on America's communities.

The National Survey on Drug Use and Health (NSDUH) is an annual survey sponsored by the Substance Abuse and Mental Health Services Administration (SAMHSA). The data used in this report are based on information obtained from people aged 12 to 17 (68,309 in 2012, 67,838 in 2013, and 67,901 in 2014). The Survey collects data by administering questionnaires to a representative sample of the population through face-to-face interviews at their place of residence.

The CBHSQ Report is prepared by The Center for Behavioral Health Statistics and Quality (CBHSQ), SAMHSA, and by RTI International in Research Triangle Park, North Carolina. (RTI International is a trade name of Research Triangle Institute.)

Information on the most recent NSDUH is available in the following publication:

Center for Behavior Health Statistics and Quality. (2015). Behavioral health trends in the United States: Results from the 2014 National Survey on Drug Use and Health (HHS Publication No. SMA 15-4927, NSDUH Series H-50). Retrieved from <http://samhsa.gov/data/>

Also available online: <http://www.samhsa.gov/data/population-data-nsduh>



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RESULTS FROM THE 2015 NATIONAL SURVEY ON DRUG USE AND HEALTH: DETAILED TABLES

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