City of Homer
www.cityofhomer-ak.gov

Office of the City Clerk
491 East Pioneer Avenue
Homer, Alaska 99603
clerk@cityofhomer-ak.gov
(p) 907-235-3130
(f) 907-235-3143

Memorandum
Agenda Changes/Supplemental Packet

TO: MAYOR ZAK AND HOMER CITY COUNCIL
FROM: MELISSA JACOBSEN, MMC, CITY CLERK
DATE: OCTOBER 9, 2017
SUBJECT: AGENDA CHANGES AND SUPPLEMENTAL PACKET

CONSENT AGENDA

Memorandum 17-129 from Public Works Superintendent, backup item to Ordinance 17-38.

Eric Lane Vicinity Map Page 3

PENDING BUSINESS

Memorandum 17-122 from Councilmember Aderhold Re: Approval of Submitting a Letter to the Marijuana Control Board to Oppose Smoking of Marijuana Onsite but Allowing Consumption of Marijuana to Include the Method of Vaping. Recommend approval.

Memorandum from Fire Chief Page 5

RESOLUTIONS

Resolution 17-085(S), A Resolution of the City Council of Homer, Alaska, Acknowledging the Results of the City of Homer Regular Election Held October 3, 2017 to Decide Ballot Proposition 1 “Shall the City of Homer, Alaska, be Authorized to use the Revenue from the Three Fourths Percent (3/4%) Homer Accelerated Roads and Trails Dedicated Sales Tax for the Maintenance of Local Roads and Trails?” and Elect two City Councilmembers. City Clerk/Canvass Board. Page 35


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SHELLEY AVE
SOUNDVIEW AVE
SITKA ROSE CIR
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ERO CT
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City of Homer
www.cityofhomer-ak.gov

Volunteer Fire Department
604 East Pioneer Ave
Homer, Alaska 99603
fire@cityofhomer-ak.gov
(p) 907-235-3155
(f) 907-235-3157

Memorandum

TO: Homer City Council

THROUGH: Katie Koester, City Manager

FROM: Robert Painter, Fire Chief

DATE: October 2, 2017

SUBJECT: Vaporizing of Cannabis for Consumption

Thank you for the opportunity to weigh in on the proposed memorandum to allow the consumption of cannabis by "vaping" in locations of sale. From my research it has become clear that available information on the process is severely lacking. As such, I would encourage the Council to err on the side of caution and not allow on-site consumption by either smoking, or "vaping" in order to protect the public from inadvertent second exposure to the product. While others could reasonably argue the opposite; absent clearly harmful data to support this view, vaping should be allowed; let me remind everyone how long it took the medical community to gain consensus that tobacco smoke, even second hand, was harmful and should be legislated.

Research has found that vaping of tobacco, does release harmful products back into the atmosphere. As it is unlikely that the vaping of cannabis would result in 100% absorption of the toxicants by the user, some percentage would, of course, be exhaled into the atmosphere where being used. If this were in the confines of a shop/store, where cannabis was distributed, it is only reasonable to assume that anyone in the immediate area of such use would suffer some level of exposure. Though the general public may choose to expose themselves to this second hand source, emergency response personnel have no such choice if called to a location where cannabis is being used. I have attached some of the literature I was able to glean from available sources for your review.

No smoke, no fire: What the initial literature suggests regarding vapourized cannabis and respiratory risk

Mallory Loflin MA, Mitch Earleywine PhD

As more municipalities relax restrictions on access to cannabis, questions about the plant's potential for respiratory effects become more common. Given current limitations in developing an inhalant alternative for delivering cannabis medication, smoked marijuana remains the most readily accessible form of cannabis among medicinal users (1). An important question that remains is how to improve safety for the respiratory system in individuals who choose to use cannabis medicinally. Although frequent comparisons with tobacco emphasize that the smoke from cannabis has more carcinogens and respiratory irritants, the absence of nicotine likely mitigates the impact of some of these compounds (2). Evidence suggesting a link between cannabis and lung cancer is equivocal (2-4), but other concerns remain important. Frequent smokers of cannabis often report respiratory problems. Many users experience symptoms of bronchitis including coughing, wheezing and tightness in the chest (5,6). Informed health care professionals may consider making recommendations to their medicinal cannabis patients for vapourization of the plant, particularly for those who want the rapid relief that oral administration fails to provide. It is not our intention to encourage inappropriate use of the plant, but to increase safety for those who choose to use it. Vapourization of cannabis is likely less harmful than smoking. Nevertheless, researchers have yet to gather some of the most necessary data regarding the topic. There have been no published randomized clinical trials investigating vapourization with long-term follow-up; therefore, drawing firm conclusions about the impact of the technique is difficult. Preliminary findings do support the idea that vapourization is an improvement over smoking.

PULMONARY IMPACT OF CANNABIS

The plant's effect on bronchial passages appears to vary with exposure; acute administration can lead to bronchodilation. Cannabis actually served as an asthma treatment in the 1800s and, perhaps, in ancient times (7). A meta-analytic review of 12 studies revealed average increases of 0.15 L to 0.25 L in forced expiratory volume in 1 s (FEV_1), as well as improved peak flows and airway conductance (7). No overall metric of significance was reported; however, the majority of reviewed studies found statistically significant improvements. Data regarding the role of long-term exposure is less consistent. The long-term impact of cannibis use on measures of lung function, particularly FEV_1, forced vital capacity (FVC) and their ratios, is significant in some studies but not others. A review of 14 studies emphasized vast variation in the quality of the research and found little impact of use on relevant measures of lung function, particularly when investigators applied appropriate statistical controls for cigarette smoking, age and weight (6). One 2010 study (8) found that after controlling for nicotine use and other factors, cannabis users had an FVC, total lung capacity, functional residual capacity and residual volume comparable with those who had not used it. These data did reveal cannabis-related increases in airway resistance and significant decreases in specific airway conductance adjusted for thoracic gas volume. Potential changes such as these are worthy of the attention of health professionals (3).

Further work is needed to determine whether a link exists between cannabis use and lung cancer. A review of 19 studies (4) revealed elevated exposure to tars, dysfunctions in alveolar macrophages and histological deviations in bronchial mucosa, but no elevated risk for lung cancer, particularly after controlling for tobacco use. Work subsequent to the review focused on a large sample of Swedish conscripts in a 40-year cohort study. Results suggest that heavy use (defined as >50 occasions in a lifetime in this study) had a large and statistically significant impact on lung cancer, increasing rates by a factor of two in the subsequent 40 years. Most individuals reporting marijuana use in the study sample, however, were also tobacco users (91%). In contrast, smoking >10 cigarettes a day (a cut-off chosen by the authors of the article) increased risk by a factor of five. Any attempt to try to equate cigarettes and cannabis exactly is probably a fool's errand, but these comparisons may help readers put cannabis's impact on lung cancer into perspective. Only 189 cases of lung cancer occurred in >49,000 participants; therefore, all of these results must be interpreted cautiously (9). The teen years may be a particularly important time to avoid smoking entirely given that it is a critical period in lung development when exposure to irritants may have a dramatic impact. This point does, however, support the need for some type of intervention, such as the vapourizer, if teens need medical cannabis (10).

INCREASING POTENCY TO INCREASE SAFETY

At first glance, an obvious attempt to increase the plant's safety would require higher concentrations of cannabinoids, thereby increasing the proportion of active ingredients to irritants in a single inhalation. Stronger cannabis would require smoking less, thereby decreasing exposure to byproducts of the high-heat decomposition of organic materials (pyrolytic compounds). This option relies on the assumption that higher-potency strains of cannabis do, in fact, deliver a higher ratio of cannabinoids to irritants. It also assumes that users are capable of titrating the dosages on their own. Recent evidence suggests that cannabis users will modify the amount of marijuana that they inhale depending on its active dose (11). Nevertheless, a significant proportion of medicinal users report that they prefer lower-dose forms of flower cannabis to concentrates for the very reason that effects can occur too swiftly. These participants also reported that extracts led to more tolerance (12). For these reasons, vapourized plant material may have advantages over extracts.

VAPOURIZING WHOLE-PLANT CANNABIS

Previous reviews of respiratory risk are quick to note that most research investigating cannabis has failed to control for the type of inhalation mechanism (13). The variability in mode of inhalation used across users (eg, joints, pipes, bongs, vapourizers), coupled with a lack of research differentiating users based on inhalation method, makes estimating risk associated with smoked cannabis difficult. Findings from the few studies that do attempt to isolate the respiratory risk associated specifically with vapourizers all demonstrate some level of benefit (5,14-16). Vapourizer technologies attempt to sidestep

Habits and Lifestyles Laboratory, Department of Psychology, University at Albany, State University of New York, Albany, New York, USA
Correspondence: Dr Mitch Earleywine, University at Albany, 1400 Washington Avenue, Albany, New York 12222, USA.
Telephone 518-442-4836, e-mail mearleywine@gmail.com

potential respiratory risks. Vapourizers heat the entire plant without igniting it, releasing the cannabinoids in a vapour that is relatively free from the byproducts of combustion. Most cannabis vapourizers require that users draw heated air across plant material. Other devices blow the air past the plant material independently so that the cannabinoid-rich vapour can fill a container, eliminating the user's exposure to the heat source. The majority of studies suggest that vapourizers adequately reduce risk of pulmonary symptoms (5,14-16), although complete safety may require a regulated source of plant material, rather than 'street' samples, which produce ammonia (17).

One of the first vapourizer experiments compared the emissions from multiple samples of vapourized or combusted research-grade cannabis (18).The vapour formed in the gas phase of vapourization of cannabis is composed overwhelmingly of cannabinoids with no significant pyrolytic compounds. Only trace amounts of three other compounds were found, including the terpene caryophyllene and two other substances of undetermined origin. Analysis of the smoke produced through the burned cannabis method, however, resulted in a much lower ratio of cannabinoids to overall gas space (12% of the total mass compared with 94.8%), with 111 total detectable compounds. Five of these byproducts of combustion were known polynuclear aromatic hydrocarbons, organic pollutants with known toxic and carcinogenic effects. The findings suggest that vapourization reduces the delivery of toxic byproducts associated with the use of smoked cannabis. A subsequent experiment addressed exhaled carbon monoxide (CO) (14). The researchers found a statistically significant difference between the increase in CO exhaled following smoking cannabis versus vapourization. The amount of exhaled CO showed little to no increase following vapourization compared with large increases following smoking, which would be expected for inhalation of a combustion product. These findings give further evidence that vapourization reduces exposure to gaseous combustion toxins.

These results are consistent with self-report research, which suggests that users experience less respiratory irritation when using a vapourizer compared with a classic burning technique (5). After controlling for other known risk factors, using a vapourizer was associated with fewer reported respiratory symptoms overall relative to other burning techniques. Moreover, the study found a noteworthy interaction between amount of cannabis used and choosing to use a vapourizer on reported symptoms. The protective effect of the vapourizer on respiratory symptoms was greatest among those who used cannabis the most. These findings are particularly notable for medicinal users, who typically use more cannabis in both density and frequency than other types of users (1). Regular users appear to have strong intuitions about the potential for less respiratory irritation with the vapourizer. They report reduced emissions and perceived health benefits as two of the most prominent reasons for preferring vapourizers to smoked cannabis (19). Randomized clinical trials, in which users switch to the vapourizer, could bolster these data. One pre-post trial of regular users who reported at least two symptoms of bronchitis found that switching to the vapourizer for one month improved self-reported respiratory symptoms by a statistically significant 73% and FVC by a statistically significant 4.8% (0.22 L), with a trend toward significant improvement in FEV_1 of 0.38 L (11.8%) (16). Suggestions to patients to consider choosing vapourization over burning methods appear to be worthwhile.

UNDERGROUND MARKET RISKS

Despite evidence supporting increased respiratory safety when switching to a vapourizer, some risks related to the underground market are noteworthy. Aside from the obvious legal sanctions in some municipalities, research confirms the presence of toxins in 'street' samples of cannabis that even a vapourizer cannot eliminate. Ion-flow tube mass spectrometry revealed toxins, including ammonia, in smoke and vapour from confiscated 'street' samples relative to cannabis obtained from the National Institute on Drug Abuse (17). Although the smoked samples released significantly more ammonia than those that were vapourized, the 'street' cannabis vapour contained approximately 70 parts per million (ppm) of ammonia, compared with 6 ppm for vapourized National Institute on Drug Abuse samples. The findings have important implications for those assisting in vapourization of cannabis in health care and hospital settings given the known toxicity of ammonia exposure (20). Although a regulated market could help sidestep these problems, health care professionals working where patients can only obtain cannabis from the underground market should be aware of this potential risk.

SUMMARY

As marijuana laws change, questions about the plant's impact on respiratory function will undoubtedly increase. The human lung did not evolve to inhale the byproducts of combustion efficiently. Smoking marijuana does not harm lung function as dramatically as smoking tobacco does. Links between smoking marijuana and actual lung cancer are weak and difficult to replicate. Nevertheless, the habit clearly increases symptoms of respiratory irritation such as tightness in the chest, wheezing and coughing. It also has the potential to alter lung function when dose and frequency of use are high. Using stronger cannabis extracts has the potential to limit exposure to irritants, but data regarding this phenomenon are lacking. Many medical marijuana users prefer to use the entire plant. It appears to alter subjective state less dramatically as well as show lower potential for creating tolerance. Edible preparations are an obvious choice that would certainly not add byproducts of combustion to the lung, but these lack the rapid onset and easy titration of dosage available with inhaled products. Thus, the cannabis vapourizer appears to be an ideal harm-reduction approach to safer use.

The vapourizer runs heated air across the plant without igniting it, releasing the cannabinoids in a vapour free from the byproducts of combustion. Some types rely on the user's own inhalation to draw the hot air past the plant material, potentially exposing the lungs to more heat. Other devices blow air into an isolated bag, separating the heating element from the user and avoiding heat exposure. Laboratory work shows that cannabis vapour is composed almost exclusively of cannabinoids with virtually no pyrolitic compounds. The vapourizer raises cannabinoid levels in humans but does not raise exhaled CO levels. One pre-post design clinical trial showed that users with respiratory irritation improved symptoms and lung function after switching to a vapourizer. In short, vapourizers show promise for cannabis users who want to avoid pulmonary problems and prefer a more rapid onset than edibles provide.

DISCLOSURES: The authors have no financial disclosures or conflicts of interest to declare.

REFERENCES

1. Reinarman C, Nunberg H, Lanthier F, Heddleston T. Who are medical marijuana patients? Population characteristics from nine California assessment clinics. J Psychoactive Drugs 2011;43:128-35.
2. Melamede R. Cannabis and tobacco smoke are not equally carcinogenic. Harm Reduct J 2005;2:21 <www.biomedcentral.com/content/pdf/1477-7517-2-21.pdf> (Accessed July 1, 2014).
3. Pletcher MJ, Vittinghoff E, Kalhan R. Low levels of marijuana smoking do not have a negative effect on pulmonary function. JCOM 2012:19.
4. Mehra R, Moore BA, Crothers K, Tetrault J, Fiellin DA. The association between marijuana smoking and lung cancer: A systematic review. Arch Intern Med 2006;166:1359-67.
5. Earleywine M, Barnwell SS. Decreased respiratory symptoms in cannabis users who vaporize. Harm Reduct J 2007;4:11-4. <www.biomedcentral.com/content/pdf/1477-7517-4-11.pdf> (Accessed July 1, 2014)
6. Tetrault JM, Crothers K, Moore BA, Mehra R, Concato J, Fiellin DA. Effects of marijuana smoking on pulmonary function and respiratory complications: A systematic review. Arch Intern Med 2007;167:221-8.
7. Aggarwal SK, Carter GT, Sullivan MD, ZumBrunnen C, Morrill R, Mayer JD. Medicinal use of cannabis in the United States:

Historical perspectives, current trends, and future directions. J Opioid Manag 2009;5:153-68.
8. Hancox RJ, Poulton R, Ely M, et al. Effects of cannabis on lung function: A population-based cohort study. Eur Respir J 2010;35:42-7.
9. Callaghan RC, Allebeck P, Sidorchuk A. Marijuana use and risk of lung cancer: A 40-year cohort study. Cancer Causes Control 2013;24:1811-20.
10. Wiencke JK, Kelsey KT. Teen smoking, field cancerization, and a "critical period" hypothesis for lung cancer susceptibility. Environ Health Perspect 2002;110:555-8.
11. Van der Pol P, Liebregts N, Brunt T, et al. Cross-sectional and prospective relation of cannabis potency, dosing and smoking behavior with cannabis dependence: An ecological study. Addiction 2014, doi:10.1111/add.12508. (Epub ahead of print).
12. Loflin MJ, Ealeywine M. A new method of cannabis ingestion: The dangers of dabs? Addict Behaviors 2014;39:1430-3.
13. Gates P, Jaffe A, Copeland J. Cannabis smoking and respiratory health: Consideration of the literature. Respirology 2004;19:655-62.
14. Abrams DI, Vizoso HP, Shade SB, Jay C, Kelly ME, Benowitz NL. Vaporization as a smokeless cannabis delivery system: A pilot study. Clin Pharmacol Ther 2007;82:572-8.
15. Doblin R. The MAPS/California NORML marijuana waterpipe/ vaporizer study. Newsletter of the Multidisciplinary Association for Psychedelic Studies 1994;5:19-22.
16. Van Dam NT, Earleywine M. Pulmonary function in cannabis users: Support for a clinical trial of the vaporizer. Int J Drug Policy 2010;21:511-3.
17. Bloor RN, Wang TS, Spanel P, Smith D. Ammonia release from heated 'street' cannabis leaf and its potential toxic effects on cannabis users. Addiction 2008;103:1671-7.
18. Gieringer D, Laurent J, Goodrich S. Cannabis vaporizer combines efficient delivery of THC with effective suppression of pyrolytic compounds. J Cannabis Ther 2004;4:7-27.
19. Malouff JM, Rooke SE, Copeland J. Experiences of marijuana-vaporizer users. Substance Abuse 2014;35:127-8.
20. Felipo V, Butterworth RF. Neurobiology of ammonia. Prog Neurobiol 2002;67:259-79.

Traversing the triangulum: the intersection of tobacco, legalised marijuana and electronic vaporisers in Denver, Colorado

Emily Anne McDonald,[1] Lucy Popova,[2] Pamela M Ling[3]

[1]Department of Anthropology, City University of New York, John Jay College, New York, New York, USA
[2]Center for Tobacco Control Research and Education, University of California, San Francisco, San Francisco, California, USA
[3]Division of General Internal Medicine, Department of Medicine, Center for Tobacco Control Research and Education, University of California, San Francisco, San Francisco, California, USA

Correspondence to
Professor Emily Anne McDonald, Department of Anthropology, City University of New York, John Jay College, New York, NY 10019, USA; emcdonald@jjay.cuny.edu

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ABSTRACT

Objective To explore the intersection of tobacco, legalised marijuana and electronic vaporiser use among young adults in the 'natural laboratory' of Colorado, the first state with legalised retail marijuana.

Methods We conducted semistructured interviews with 32 young adults (18–26 years old) in Denver, Colorado, in 2015 to understand the beliefs and practices related to the use of tobacco, marijuana and vaporisers.

Results We found ambiguity about whether the phrase 'to smoke' refers to the use of tobacco or marijuana products. Smoking marijuana blunts (emptied cigarillo or tobacco wrap filled with marijuana) was common, but few interpreted this as tobacco use. Marijuana vaporisers were used to circumvent public consumption laws (eg, while at work or when driving). Young adults considered secondhand tobacco smoke dangerous, but perceived secondhand marijuana smoke as benign.

Discussion Using tobacco products as a delivery method for marijuana (eg, blunts) might be increasing and normalising tobacco use among young adults. Surveillance should explicitly ask about use of tobacco products for marijuana. Marijuana vaporisers, often indistinguishable from nicotine vaporisers, may be used to circumvent public consumption laws; communities concerned about use of marijuana in public spaces should include vaporisers (for nicotine or marijuana) in smoke-free regulations. Tobacco, marijuana and electronic vaporisers should be studied together, rather than separately. This approach is essential in informing research and policy as more US states and countries worldwide move to legalise marijuana.

INTRODUCTION

The legal landscape around marijuana in the USA is changing rapidly. Currently, medical marijuana is legal in 25 states and Washington DC, with retail ('recreational') marijuana legalised in four states and Washington DC. On 1 January 2014, Colorado became the first state to legally sell retail marijuana to people 21 years or older. Shifting regulations have been accompanied by technological innovations, including electronic vaporisers for tobacco and marijuana. These developments are likely to transform use of these substances, especially among young adults.

Nationally, young adults have the highest rates of current (past 30 days) marijuana use, with 18.9% aged 18–25 years using in 2013, compared to 7.1% aged 12–17 years and 5.5% aged ≥26 years.[1] According to 2014 data, almost 30% of young adults in Colorado reported current marijuana use.[2] Young adults also have the highest current rates of tobacco smoking (37%).[3] More young adults have ever tried e-cigarettes (21.6%) compared to other age groups.[4] Rates of dual and poly use are also high: in 2013, among US young adults who smoked cigarettes in the past 30 days (16% of the sample), 47% were current marijuana users.[5]

Given high rates of co-use of tobacco and marijuana among young adults,[6–9] as well as transformations in the realm of policy and technology, tobacco, marijuana and vaporisers are most effectively studied in relationship to one another.[10] Referred to as 'the triangulum' (Latin for triangle), this approach reflects interest in the intersection of tobacco, marijuana and electronic vaporiser use, with implications for surveillance (eg, evaluating tobacco and marijuana use, product taxonomies), policy (eg, smoke-free policies related to marijuana and e-cigarettes)[11 12] and treatment (eg, effects of dual use on cessation).[13] Several quantitative studies examined some aspects of the triangulum, including co-use of combustible tobacco and marijuana,[14] perceptions of comparative harm of tobacco and marijuana,[15] prevalence of vaporiser use among marijuana users[16 17] and reasons for use of marijuana vaporisers.[17 18] Two qualitative studies examined the intersection of tobacco and marijuana by interviewing youth in Scotland.[13 19] The data in the studies, however, were collected over a decade ago and do not reflect changing legal and normative environments around marijuana or the proliferation of vaporising devices. Several quantitative studies have addressed marijuana vaporisers use by adults, including Lee *et al*[17] and Etter,[18] but neither was designed to explore in depth why users choose to vaporise marijuana, or the social or policy contexts shaping vaporiser use. To the best of our knowledge, this is the first in-depth, qualitative investigation of the triangulum in the 'natural laboratory' of Colorado. We interviewed young adults in Colorado to understand how they use, perceive and ascribe meaning to various tobacco, marijuana and vaporiser products.

METHODS

Collaboration

As part of the State and Community Tobacco Control (SCTC) research initiative (http://www.sctcresearch.org), this project was developed in strategic partnership with Denver Public Health and Jefferson County Public Health departments in Colorado. Beginning in early 2014, we worked with local agencies to identify research questions that would advance policy solutions and practice. These questions were further refined iteratively

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throughout the data collection period. Local agencies provided staff to recruit participants, assisted with interviewing, provided space for interviews and engaged key stakeholders in reviewing early findings.

Study recruitment

Participants were recruited using flyers placed in marijuana dispensaries, vape shops, cafes, stores and on bulletin boards at community colleges in the Denver Metro area. Online recruitment was conducted through Craigslist and posting on Facebook. Inclusion criteria included being 18–26 years old and current use (past month) of at least one of the three products (marijuana, tobacco or electronic vaporisers). Prospective participants were screened and enrolled in the study via telephone by trained research staff. We attempted to interview all 32 enrolled participants twice, in order to allow conversations to develop more deeply. Twenty-four completed both interviews. Participants were compensated $35 for the first interview and $65 for the second. Each participant gave written consent. All study protocols were approved by the Committee on Human Research at the University of California, San Francisco.

Data collection

Semistructured interviews were conducted between January and August 2015 by six trained interviewers (three PhDs, one MD and two MPHs), following a standard interview guide. Interviews were conducted individually (one participant with one or more interviewers) in public places (coffee shops, libraries) or in meeting rooms in local health departments. Before each interview, participants completed brief questionnaires with demographic information and past tobacco and marijuana use history. Discussion topics included definitions of smoking, experiences with tobacco, e-cigarettes, marijuana, marijuana vaporisers and other products, perceived benefits and risks of products and experiences with marijuana legalisation in Denver. Interviews lasted between 60 and 90 min, and were audio recorded.

Data analysis

Audio recordings were professionally transcribed. Data were coded using Dedoose software. Researchers McDonald and Popova independently blind-coded a subset of transcripts, which were then compared to develop coding guidelines. Researchers created code definitions and developed a consistent coding scheme to ensure that codes were applied consistently. The larger set of transcripts was divided and coded independently. Themes were generated iteratively during review of coded transcripts. Memos summarising each theme with illustrative quotes were reviewed by authors and discussed iteratively to reach consensus and theme saturation. Pseudonyms are used for all participants quoted in this article and no real names have been used.

RESULTS

Sample characteristics

Participants were 32 young adults with a mean age of 23 (SD=2.36) years; 43.8% were women, 34% were Hispanic, 31% non-Hispanic white, 19% non-Hispanic black and 13% more than one race, non-Hispanic. The majority (19 participants or 59%) were not currently enrolled in or attending school, five participants were in community college, four in high school, two in a 4-year college or university, one in a technical or trade school and one in a professional (law or medical) school.

Ninety-one per cent of participants had ever smoked a tobacco cigarette; 56% smoked 100 cigarettes or more; 97% ever smoked marijuana and 44% were daily marijuana smokers. Table 1 shows rates of use of each product as collected in our intake questionnaire. Three-quarters (75%) of participants reported dual use of tobacco and marijuana in the past 30 days, while 19% reported only marijuana use and 6% only tobacco use in the past 30 days. Sixty-nine per cent of participants had used all three products—combustible tobacco, marijuana and vaporisers (for nicotine or marijuana)—in the past 30 days.

Themes

Participants highlighted fluidity between use of tobacco, marijuana and vaporisers. Reflecting this fluidity, the terms 'smoke' and to be a 'smoker' were used to describe either tobacco or marijuana use in ways that left unclear which substance was referred to. While dual and poly use was our primary focus, some participants also reported co-use through merging products, including use of tobacco wraps (blunts) or little cigars/cigarillos to smoke marijuana and the use of tobacco cigarettes to 'extend' the effects of marijuana. Vaporising devices were used to consume either nicotine or marijuana concentrates, with such devices nearly indistinguishable in appearance. Participants remarked upon the increasing popularity of 'vaping', expanded interest in vaporisers for nicotine and marijuana products and the convenience of vaporisers for use in public spaces.

In some contexts, participants clearly distinguished between tobacco, marijuana and vaping, as they did when discussing the risks of secondhand smoke. Participants viewed secondhand tobacco smoke as potentially dangerous, often limiting or prohibiting use of combustible tobacco in homes or cars. Marijuana secondhand smoke, in sharp contrast, was widely considered safer and more pleasant smelling than tobacco smoke, with few participants restricting combustible marijuana indoors.

Do you smoke?

Our question 'Do you smoke?' was frequently met with the question: 'smoke *what*?' The term 'smoking' was used interchangeably to refer to the use of marijuana or tobacco, with this ambiguity only uncovered through conversation: when a researcher asked 'Ethan', 22, 'In terms of your social circle in Colorado, do many people smoke?' 'Ethan' responded, '[e]veryone that I work with under the age of 30 smokes. I have five roommates and they all smoke. Just about everyone I know in Denver smokes. I have one friend that doesn't, just because he gets panic attacks'. When the researcher asked whether these friends were regular or occasional smokers, 'Ethan' responded, 'Much more regular marijuana smokers...[pause] are we still talking about tobacco smoking? When I hear "smoking" now, I associate it more with marijuana than tobacco smoking'. 'Ethan' clarified that among his friends, only five were regular tobacco smokers, whereas the majority smoke marijuana. In Colorado, he elaborated, the term 'smoke' primarily indicates use of marijuana, but added, 'If I go back to Texas, and somebody says, "I'm going to go for a smoke," I know [they mean] cigarettes—tobacco'.

When asked if he ever smoked while drinking, 'Owen', 20, commented, 'Yeah... if I have one drink I'll probably be smoking before, you know?' When the researcher asked him to clarify whether he meant smoking marijuana or tobacco, he responded, 'Marijuana. I don't really smoke tobacco products like that. The only reason why I put 20 times [of tobacco use per month on the questionnaire] is because [of] Swisher Sweets

Table 1 Participants' use of tobacco and marijuana products (N=32)

Product	Ever use (%)	Past 30 days (%)	Daily user (%)	Days used in past 30, median (IQR)
Tobacco cigarettes 	90.6	43.8	15.6	0 (0–10)
Little cigars or cigarillos 	78.1	43.8	9.4	0.5 (0–9.3)
Electronic cigarettes 	78.1	46.9	9.4	0.5 (0–10)
Hookah 	81.3	34.4	3.1	0 (0–1)
Moist snuff 	25.0	0	0	0 (0–0)
Snus 	18.8	0	0	0 (0–0)
Smoked marijuana 	96.9	93.8	43.8	28 (15–30)
Marijuana vaporisers 	90.6	81.3	6.3	2 (1–10)
Marijuana edibles 	93.8	68.8	3.1	1 (0–3.8)

[cigarillos]. I'd have to get a Swisher Sweet to roll up the marijuana, you know?'. He added that he would not smoke cigarillos 'straight', but only as a wrap for marijuana.

Blunts: bringing together marijuana and tobacco

Participants frequently discussed smoking marijuana using blunts (the emptied shell of a tobacco cigarillo or a tobacco wrap filled with marijuana). However, many of these participants did not report using blunts as a form of tobacco use.

Some participants seemed unsure whether to categorise the use of blunt wraps or cigarillos for marijuana as a form of tobacco use. 'Daniela', 22, states, 'I've never smoked a cigar… the blunt wrap, I don't know if it should even be considered [tobacco] just because it's its own [product]… it's just a paper… it's not like you can get addicted to blunt wraps'.

Other participants recognised the effects of nicotine in blunt wraps when compared to other methods of consuming marijuana. 'Nia', 19, commented she could 'feel' the nicotine in blunt wraps and elected to use 'papers' rather than blunt wraps, 'because the papers don't have any nicotine'.

Traditional surveys may fail to record tobacco wrap use. When asked about his response of using tobacco products on 3 of the past 30 days, 'Andre', 22, clarified:

> Interviewer: You're smoking a tobacco product three days out of the month?
>
> 'Andre': Yeah.
>
> Interviewer: How often are you using wraps for marijuana, tobacco wraps?
>
> 'Andre': Oh, tobacco wraps? Definitely every day. Definitely every day.
>
> Interviewer: Okay. How many times per day are you using blunt wraps?
>
> 'Andre': I'd say three, four blunts a day maybe.
>
> Interviewer: Walk me through the timing of those during your day.

'Andre': Let's start with 8:00 and I'll usually finish that whole blunt. That would be one gone. And then by noon or 1:00 at least. After lunch usually, that's when I have my second one. And then depending how tired I am, after my day is done, it's my winding down. Sometimes it takes one, sometimes it takes two. So, that's what I mean...three or four.

One reason participants used cigarillos to consume marijuana was enjoyment of flavours. 'Andre' commented that while he had smoked joints (marijuana rolled in paper), he preferred blunt wrap flavours:

I love wraps way more. It might be the tobacco, but there's something about smoking weed in the wraps that's different from blunt papers to me. When you inhale it, you get that flavor sometimes of whatever flavor wrap you choose...I just love fruit flavors...they put out new flavors all the time too. I tried a chicken and waffle wrap flavor the other day. It tasted like syrup mainly, but that's what I'm saying. I didn't know they could do stuff like that so I'm like, 'I've got to try it!' It's just kind of fun to me. I do it with my brothers and we'll just chill—we'll have a good time.

Another reason participants reported choosing blunts over other forms of marijuana consumption was the social nature of sharing with partners or friends. 'April', 24, commented she often smokes blunts with her boyfriend, sharing up to four a day. When she is not sharing with him, she prefers to use her personal vaporiser while at work, or, if by herself, smoke marijuana in a glass pipe. She reflected, 'blunts are kind of more social...I'd rather smoke blunts in a social setting rather than hitting a pipe and passing it...That's just how it's always been with me and my friends. If we're all together, a blunt will last longer and it's easier [to] just pass...you keep it continuously lit and continuously circling'.

Participants also reported using cigarettes, particularly menthols, to extend the high from marijuana, or for mixing marijuana with comparatively inexpensive tobacco. As 'Andre' states:

I know a lot people who need cigarettes and weed...they smoke a blunt and then they're high...they say cigarettes keep their high going. They'll have like two cartons of cigarettes...weed is way more expensive...so they'll try to have plenty of cigarettes and just a little bit of weed...that's a cheaper way to keep a buzz going. I've even seen people with a little bit of weed...break down the cigarette, use all the tobacco. It will be more tobacco than weed, but they mix it all together... *cigaweed*. That's what they call it, *cigaweed*. [laughs].

Electronic vaporisers for nicotine and marijuana

Adding complexity to this 'smoking' landscape, participants questioned whether or not electronic cigarettes should be considered tobacco products, and reflected on the use of electronic vaporisers for marijuana.

'Victor', 24, used to smoke marijuana blunts using Dutch Masters cigar wraps when living in Florida. But since moving to Colorado, he has switched to vaporising concentrates, primarily cannabis wax in a portable vaporising pen. As he explains, he barely smokes 'real weed' anymore, because 'flower' does not get him high. He tries not to smoke much while at his job in construction, 'if anything I'll take a little hit (from a vape pen), just to line up the head, and just keep going'.

Participants also reflected on using marijuana vaporisers in locations where marijuana use is illegal due to public consumption laws. For example, 'Rashawn', 24, indicated that vaporisers can be used while driving. He explained, 'I do drive when I'm high...marijuana is not necessarily something that makes you impaired'. When asked if he worried about the legality of driving under the influence, he explained, '...I try and be a little safe since I know what [the police are] looking for. I use a vaporizer if I'm driving because they're basically odorless...and it's a lot better than smoke because if they do smell marijuana in your car, I guess they're allowed to search it or check you for anything'.

Another reason for using marijuana vaporisers was the ability to smoke while at work. 'April' commented, 'If I'm traveling and I don't really want to be smoking a bowl in the middle of wherever, then I like the marijuana version of [an e-cigarette]. If I'm at a job where I'm okay smoking, then on break I'll go out to the parking lot or whatever and maybe smoke a vaporizer'.

The lack of potent smell was associated not only with evading public consumption laws but also with managing social stigma. 'Danielle', 25, commented:

I guess it's more—especially the vape pens—more subtle... This one girl at school...she always gives me this death stare. It's like, 'I can't believe you're smoking pot.' So yeah, I'm trying to vaporize just for that. There's still a little bit of a stigma there. I mean, everyone [in Colorado] smokes...at the same time, I feel it's polite to keep it under wraps sometimes.

Participants commented that some personal vaporisers could be used for marijuana concentrates or for nicotine solutions. When asked to clarify whether she was referring to using a vaporiser for nicotine or marijuana, 'Angela', 18, commented 'You can do both on the pen that I have...You can go up to the [marijuana] dispensary and get it filled up for 30 bucks. Or you can go to the gas station and get nicotine for 5 bucks'.

Some participants reported that the legalised marijuana market has encouraged the proliferation of electronic devices and expanded interest in electronic vaporisers more broadly. 'Molly', 25, commented, 'I think because marijuana has been so present in Colorado, all these different smoking devices are very common. You just see everyone walking around with electronic cigarettes or with vape pens...it's just the culture here'.

Some exclusive nicotine users felt troubled by the inability to distinguish between vaporisers used for marijuana and nicotine. 'Samuel', 21, commented, 'A lot of vape shops take a negative stance towards the electronic vaporization of marijuana because then people tend to associate you with [marijuana] no matter what. When you're walking down the street and you're vaping, a lot of people straight up just assume it's marijuana'. He continued, '...if I ever get pulled over while driving...the cop comes up, and he's, like, 'well, what's all this? Is this just an electronic cigarette or is there tetrahydrocannabinol (THC) in it?' Because there's no public knowledge of this; you wouldn't know unless you were vaping'.

Smoke is smoke? Young adults assess harm of secondhand tobacco and secondhand marijuana smoke

Participants consistently viewed secondhand tobacco smoke negatively, commenting that it 'smells bad' and is harmful for bystanders. Secondhand marijuana smoke, however, was identified as having a 'pleasant aroma' that quickly dissipated. Participants sometimes mentioned that there may be harmful effects of secondhand marijuana smoke ('smoke is smoke'), but marijuana smoke was generally considered less dangerous.

Participants often differentiated between cigarettes and marijuana in maintaining smoke-free spaces. 'Scott', 26, remarked that marijuana and alcohol were similar in that 'you can't drink on the streets, you can't smoke on the streets. You have to go to a private place'. Yet, he noted, there are no public cannabis bars,

requiring young adults to create their own use rules in private (and sometimes public) spaces. Here, the distinction between cigarettes and cannabis comes into relief. As 'Scott' remarked:

> As far as secondhand cigarette smoke goes, I'm glad that you can't smoke cigarettes in a bar because I personally don't like the smell. I think it leaves a really gross stench. And I don't let people smoke [cigarettes] in my apartment...[or] in my car...I'm not concerned about the health effects of secondhand smoke because it just never concerned me. But for me, it's just I don't like the smell.

When asked to compare the smell of cigarette smoke to cannabis smoke, 'Scott' explained:

> I enjoy the smell of cannabis. And I think a lot of people [do]. Ever since I was younger, I love the smell of it. It was just intoxicating. And the smell doesn't linger as much.

Smoke tobacco outside, smoke marijuana inside

While many young adults established household rules prohibiting tobacco smoke indoors, they were far more lenient about indoor use of marijuana or e-cigarettes.

'Danielle' maintained strict rules prohibiting the use of cigarettes in her home, but had no such prohibitions against smoking marijuana. When asked if she lets friends smoke inside her home, she explained:

> No, no, no. I mean, we smoke *weed*. Yeah, that's for sure. But not smoke tobacco. I don't see why not [smoke marijuana] unless the smell is too bad. We can open a window. But no cigarettes in the house for sure...cigarettes smell worse. They're no fun for secondhand smokers. It's worse for you as a secondhand smoker than it is as a first-hand smoker.

'Danielle' mentioned that while growing up in Southern California, she saw many educational antitobacco messages, which she described as 'these horror stories of how tobacco destroyed lives and families and stuff'. Most saliently, she recalled the story of a man whose smoking affected his kids and pets. As she remembered thinking, '"*Not the dog!*" So, I won't have [tobacco smoke] around my cats or dog. You're going to kill them. That's why I don't like that in the house'. When asked if secondhand marijuana smoke would affect her pets, she explained, 'Oh, I mean, it definitely affects them, but...it's not bad for them...there's marijuana in pet medicine...there's so many medicinal properties'.

When asked about rules regarding smoking in his multiunit housing complex, 'Xavier', 24, mentioned that 'technically' he was in a non-smoking building. He explained that cigarette smoke negatively affects furniture and walls, and that tenants '*technically* would have to go outside'. When asked if these rules also applied to marijuana, he responded, 'I don't know. I think it might say cigarettes specifically. I know the picture [on the sign] is cigarettes. But, it could just say a general "no smoking," with a cigarette and the non-smoking [symbol]. I couldn't tell you. I just assumed it was cigarettes, I guess'. He continued, 'marijuana smoke disappears a lot quicker...just the smell and the aroma. I don't think it's as harmful. Not only to you, but to the surrounding area. That's just my personal opinion on marijuana smoke'.

Another reason participants chose to smoke marijuana inside is that doing so had protected them from police surveillance during the years marijuana was illegal. 'Teresa', 21, explained that when she started smoking marijuana at the age of 13, her mother told her 'just smoke the weed in the house. Don't go outside. Just go in the bathroom. Lock yourself in there. Don't let nobody see you. Don't do it out on the street'.

Finally, some participants elected to smoke marijuana indoors because they did not have access to private, outdoor spaces (such as a backyard), or lived in multiunit housing where outdoor space was shared. When young adults did have access to private, outdoor spaces, they reported being more likely to smoke outside. 'Daniela' stated that, '[m]ost of my friends are not super-duper potheads. They don't want their house smelling like marijuana or anything like that, so they do go outside... they have a little patio—their backyard'.

DISCUSSION

The emerging issues uncovered in this qualitative study highlight the need to reconsider the traditional silo-based approach to tobacco control and marijuana research. It is particularly important to consider the triangulum of tobacco, marijuana and vaporisers, and we believe this is the first study to address this intersection in the context of legalised marijuana.

We found widespread ambiguity about whether 'to smoke' referred to the use of tobacco or marijuana products. While not unique to Colorado, this linguistic equivalence between tobacco and marijuana use may signal increasing normalisation of marijuana. Researchers should be aware of this ambiguity in designing precisely worded research instruments. Additionally, antitobacco messaging that focus on 'smoke' or 'smoker' identity may be diluted in this context, as combustible marijuana moves towards legality and widespread availability.

Participants reported the use of tobacco products as part of the consumption of marijuana. This points to several key issues. Tobacco products are used as a delivery method for marijuana (eg, blunts) because of convenience and/or to facilitate sharing, even when tobacco products are not explicitly desired. Therefore, tobacco consumption may increase and become normalised even in the absence of the desire to use tobacco. Second, as noted previously,[20 21] participants reported using traditional tobacco cigarettes to extend the 'high' of marijuana consumption, particularly because of tobacco's comparatively lower cost. Third, participants did not uniformly agree whether the use of tobacco products for consuming marijuana 'counted' as using tobacco. This may lead to a significant under-reporting of current tobacco use. For example, the participant who reported using tobacco products 3 days of the last 30 on the questionnaire revealed during his interview that he used tobacco wrappers for marijuana 30 days out the past 30 (3–4 per day). It was not until specifically asked about his method of marijuana consumption that it became evident he was a daily tobacco user. Tobacco researchers should be aware that tobacco products used to consume marijuana may not be reported as tobacco use, and should specifically ask about the use of blunt wraps and cigarillos for marijuana consumption. While this issue has been raised before,[14] with at least one nationally representative survey (National Survey on Drug Use and Health (NSDUH)) asking about cigarillos for marijuana consumption,[22] it has not been widely adopted and will become increasingly critical as marijuana is more widely legalised.

Participants reported the appeal of electronic vaporisers for nicotine and marijuana. Some participants used the same vaporiser for both products (switching cartridges between marijuana concentrates and nicotine solutions), while others reported owning devices for each. Although past studies showed that vaping was less common than smoking marijuana among a convenience sample of adults,[16] given the rapid growth of the marijuana vaporiser industry[23 24] and the growing popularity of

electronic vaporisers, especially in states with legalised medical marijuana,[16] it is essential to study perceptions and practices related to electronic vaporisers for marijuana.

Reduced odour was frequently mentioned in the appeal of marijuana vaporisers, cited as advantageous when consuming marijuana in public spaces (currently illegal under Colorado's public consumption laws). Those wishing to vaporise marijuana in public may benefit from the broader normalisation of nicotine vaporising (legal in many, though not all, outdoor, public spaces), as the similar appearance of the devices may make it difficult for the passers-by or law enforcement to identify which product is being consumed. This was experienced negatively by some participants who exclusively vaporise nicotine, as they felt falsely identified as marijuana users.

Communities concerned about the use of marijuana in public spaces should consider including all vaporisers (for nicotine or marijuana) in smoke-free regulations to prevent this confusion. Additionally, there is a concern that growing popularity of vaping, for tobacco and marijuana, might renormalise smoking.[25]

Participants clearly differentiated between secondhand tobacco and secondhand marijuana smoke. Many were quick to cite the dangers of tobacco, including secondhand smoke, and enforced rules determining where combustible tobacco could and could not be used in their own spaces. In contrast, marijuana smoke was largely regarded as benign, neutral or even pleasant. Few participants expressed concern about secondhand marijuana smoke, or limited where combustible marijuana could be used. This was, in part, due to the subjective experiences of marijuana smoke being much 'milder' than tobacco smoke, and dissipating more quickly. Participants also reported that aerosol produced by vaporisers ('vapour'), whether nicotine or marijuana, smelled less strongly than combustible smoke, and generally allowed its use indoors.

This is in contrast to a study in Georgia that found 83% of surveyed college students adopted smoke-free policies for marijuana and 86% for tobacco in their homes.[26] State policies around legal marijuana might affect young adults' personal smoke-free rules. Our participants reported that smoking combustible marijuana indoors was often the only viable option available. Colorado law prohibits the use of marijuana in public places (including public outdoor spaces adjacent to homes). Since many of our participants lived in lower income, multiunit housing, they did not often have private outdoor spaces where they could legally smoke marijuana. Their choice, therefore, was either to break the law and smoke marijuana in an outdoor public space, or, following the law, smoke combustible marijuana in indoor, home spaces. Furthermore, 'no smoking' signs in housing units and other spaces were sometimes unclear, with young adults unsure whether prohibitions were limited to tobacco or included marijuana.

Current research indicates that secondhand marijuana smoke contains many of the same chemicals as secondhand tobacco smoke and some in greater concentrations[27] with recent studies demonstrating that secondhand marijuana smoke has negative cardiovascular effects similar to tobacco smoke.[28 29] Non-smokers exposed to secondhand marijuana smoke had detectable levels of THC and metabolites, with levels increasing when higher potency marijuana was used.[30–33] Non-smokers exposed to cannabis smoke for 60 min in an unventilated room had detectable levels of THC in blood following the exposure, increased heart rate, mild to moderate self-reported sedative drug effects and performed worse on a cognitive test.[34] As normalisation of marijuana use continues, it is important to monitor the effects of normalisation on tobacco use, perceptions and smoke-free spaces. Smoke-free policies should cover all products, including combustible marijuana and electronic vaporisers for tobacco and marijuana. Signs and information signalling smoke-free policies should be adapted to clearly include marijuana smoke where applicable. Information about harmful effects of secondhand tobacco smoke was found to be a deterrent to smoking initiation and a motivator for cessation for youth.[35–37] Studies should explore messaging around the negative effects of secondhand marijuana smoke.

As a qualitative study, our relatively small sample provides insight into how some young adults in Colorado integrate tobacco, marijuana and vaporiser use. While these experiences may not be representative, this work begins to shed light on how these products are used and made sense of alongside one another. Further in-depth qualitative work is needed to document the complexities of perceptions of tobacco and marijuana in distinct legal contexts (including in other states and countries), and examine differences between perceptions of medical and retail marijuana in relationship to tobacco. More work is also needed to understand those who primarily vaporise nicotine, those who vaporise marijuana and those who use both.

The SCTC research initiative addresses high-priority gaps in tobacco control research through collaboration between academic researchers and local tobacco control agencies and community organisations. Legalisation of marijuana is one area that is highly salient for many state and community tobacco programmes because of its potential to affect use and perceptions of tobacco. Moreover, tobacco control experts within agencies are frequently tasked with recommending marijuana policies or educating citizens about rules of use and potential health effects.

Tobacco, marijuana and vaporisers are most effectively studied together and future research should address perceptions of comparative harm of these products; social, political and health effects of their use; and adequate measurement of use patterns, especially when products are combined. Finally, tobacco programmes and policies should take into account emerging research on the complexities of this triangulum, particularly in the context of marijuana legalisation.

What this paper adds

- In collaboration with local health agencies, we conducted the first in-depth qualitative study exploring the triangulum of tobacco, marijuana and electronic vaporisers among young adults in Colorado, the first state with legal retail marijuana.
- We found widespread ambiguity about whether 'to smoke' refers to the use of tobacco or marijuana products. Smoking marijuana blunts (the emptied shell of a tobacco cigarillo filled with marijuana) was common, but few interpreted this as tobacco use. Marijuana vaporisers were used to circumvent public consumption laws (such as when at work or while driving). Young adults considered secondhand tobacco smoke dangerous, but secondhand marijuana smoke was seen as benign and its use indoors was common.
- Tobacco, marijuana and electronic vaporisers are frequently used together and should be studied together, rather than separately, in order to inform policy.

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REFERENCES

1 Substance Abuse and Mental Health Services Administration. *2012–2013 National Survey on Drug Use and Health: model-based prevalence estimates (50 States and the District of Columbia)*. Rockville (MD): Substance Abuse and Mental Health Services Administration, U.S. Department of Health and Human Services, 2015.
2 Colorado Department of Public Health & Environment. Marijuana use in Colorado: Colorado adults, ages 18 and older, 2014. Results from the Colorado Behavioral Risk Factor Surveillance System. https://www.colorado.gov/pacific/cdphe/marijuanause
3 Substance Abuse and Mental Health Services Administration. *Results from the 2013 national survey on drug use and health: detailed tables*. Rockville (MD): Substance Abuse and Mental Health Services Administration, US Department of Health and Human Services, 2013.
4 Schoenborn CA, Gindi RM. Electronic cigarette use among adults: United States, 2014. NCHS Data Brief 217, 2015:1–8. http://www.cdc.gov/nchs/products/databriefs/db217.htm
5 Cohn A, Villanti A, Richardson A, *et al*. The association between alcohol, marijuana use, and new and emerging tobacco products in a young adult population. *Addict Behav* 2015;48:79–88.
6 Schauer GL, Berg CJ, Kegler MC, *et al*. Differences in tobacco product use among past month adult marijuana users and nonusers: findings from the 2003–2012 National Survey on Drug Use and Health. *Nicotine Tob Res* 2016;18:281–8.
7 Ramo DE, Delucchi KL, Hall SM, *et al*. Marijuana and tobacco co-use in young adults: patterns and thoughts about use. *J Stud Alcohol Drugs* 2013;74:301.
8 Ramo DE, Liu H, Prochaska JJ. Tobacco and marijuana use among adolescents and young adults: a systematic review of their co-use. *Clin Psychol Rev* 2012;32:105–21.
9 Morean ME, Kong G, Camenga DR, *et al*. High school students' use of electronic cigarettes to vaporize cannabis. *Pediatrics* 2015;136:611–16.
10 Tobacco-Related Disease Research Program. The triangulum: tobacco, marijuana, and e-cigarettes, 2016. http://trdrp.yes4yes.com/events/webinar_form.php?code=ecigarettes2016
11 Maida V. Vaping rules still need tweaking. *Toronto Star*, 15 Mar 2016.
12 Ontario finally gets it right on medical weed: editorial. *Toronto Star*, 10 Mar 2016.
13 Amos A, Wiltshire S, Bostock Y, *et al*. 'You can't go without a fag…you need it for your hash'—a qualitative exploration of smoking, cannabis and young people. *Addiction* 2004;99:77–81.
14 Delnevo CD, Bover-Manderski MT, Hrywna M. Cigar, marijuana, and blunt use among US adolescents: are we accurately estimating the prevalence of cigar smoking among youth? *Prev Med* 2011;52:475.
15 Berg CJ, Stratton E, Schauer GL, *et al*. Perceived harm, addictiveness, and social acceptability of tobacco products and marijuana among young adults: marijuana, hookah, and electronic cigarettes win. *Subst Use Misuse* 2015;50:79–89.
16 Borodovsky JT, Crosier BS, Lee DC, *et al*. Smoking, vaping, eating: is legalization impacting the way people use cannabis? *Int J Drug Policy* Published Online First: 2 Mar 2016. doi:10.1016/j.drugpo.2016.02.022
17 Lee DC, Crosier BS, Borodovsky JT, *et al*. Online survey characterizing vaporizer use among cannabis users. *Drug Alcohol Depend* 2016;159:227–33.
18 Etter JF. Electronic cigarettes and cannabis: an exploratory study. *Eur Addict Res* 2015;21:124–30.
19 Highet G. The role of cannabis in supporting young people's cigarette smoking: a qualitative exploration. *Health Educ Res* 2004;19:635–43.
20 Callahan Research Associates. A summary of focus group research among young Black people on mentholated cigarettes, Feb 1972. https://www.industrydocumentslibrary.ucsf.edu/tobacco/docs/#id=shhj0016
21 Brown and Williamson Tobacco. Young adult smoker life styles and attitudes, 1974. https://www.industrydocumentslibrary.ucsf.edu/tobacco/docs/#id=mjfj0045
22 Cohn A, Johnson A, Ehlke S, *et al*. Characterizing substance use and mental health profiles of cigar, blunt, and non-blunt marijuana users from The National Survey of Drug Use and Health. *Drug Alcohol Depend* 2016;160:105–11.
23 Schroyer J. Industry snapshot: vaporizers. Data, trends and challenges, 2015. https://mjbizmagazine.com/industry-snapshot-vaporizers/
24 Mincer J. The US vaporizer market is booming, 2015. http://www.businessinsider.com/r-in-rise-of-us-vape-shops-owners-eye-new-marijuana-market-2015-7
25 Budney AJ, Sargent JD, Lee DC. Vaping cannabis (marijuana): parallel concerns to e-cigs? *Addiction* 2015;110:1699–704.
26 Padilla M, Berg CJ, Schauer GL, *et al*. Allowing cigarette or marijuana smoking in the home and car: prevalence and correlates in a young adult sample. *Health Educ Res* 2015;30:179–91.
27 Moir D, Rickert WS, Levasseur G, *et al*. A comparison of mainstream and sidestream marijuana and tobacco cigarette smoke produced under two machine smoking conditions. *Chem Res Toxicol* 2008;21:494–502.
28 Wang X, Derakhshandeh R, Liu J, *et al*. One minute of marijuana secondhand smoke exposure substantially impairs vascular endothelial function. *J Am Heart Assoc* 2016;5:e003858.
29 Wang X, Derakhshandeh R, Narayan S, *et al*. Brief exposure to marijuana secondhand smoke impairs vascular endothelial function. *Circulation* 2014;130 (Suppl 2):A19538.
30 Cone EJ, Bigelow GE, Herrmann ES, *et al*. Non-smoker exposure to secondhand cannabis smoke. I. Urine screening and confirmation results. *J Anal Toxicol* 2015;39:1–12.
31 Niedbala RS, Kardos KW, Fritch DF, *et al*. Passive cannabis smoke exposure and oral fluid testing. II. Two studies of extreme cannabis smoke exposure in a motor vehicle. *J Anal Toxicol* 2005;29:607–15.
32 Röhrich J, Schimmel I, Zörntlein S, *et al*. Concentrations of Δ9-tetrahydrocannabinol and 11-nor-9-carboxytetrahydrocannabinol in blood and urine after passive exposure to cannabis smoke in a coffee shop. *J Anal Toxicol* 2010;34:196–203.
33 Cone EJ, Bigelow GE, Herrmann ES, *et al*. Nonsmoker exposure to secondhand cannabis smoke. III. Oral fluid and blood drug concentrations and corresponding subjective effects. *J Anal Toxicol* 2015;39:497–509.
34 Herrmann ES, Cone EJ, Mitchell JM, *et al*. Non-smoker exposure to secondhand cannabis smoke II: effect of room ventilation on the physiological, subjective, and behavioral/cognitive effects. *Drug Alcohol Depend* 2015;151:194–202.
35 Glantz SA, Jamieson P. Attitudes toward secondhand smoke, smoking, and quitting among young people. *Pediatrics* 2000;106:E82.
36 Romer D, Jamieson P. The role of perceived risk in starting and stopping smoking. In: Slovic P, ed. *Smoking: risk, perception, and policy*. Thousand Oaks (CA): Sage, 2001:65–80.
37 Song AV, Glantz SA, Halpern-Felsher BL. Perceptions of second-hand smoke risks predict future adolescent smoking initiation. *J Adolesc Health* 2009;45:618–25.

HEALTH

What Are the Negative Effects of Cannabis Smoking and Secondhand Smoke?

JEREMIAH WILHELM

We've all learned about the dangers of smoke inhalation since we were young, whether it's from a house fire or a cigarette. However, as an avid cannabis enthusiast and occasional secondhand smoke creator, I felt compelled to seek out scientif

on smoke inhalation's negative health effects, especially with cannabis popularity on the rise and smoke inhalation ingrained as the traditional means of enjoying cannabis.

RELATED STORY

6 Ways to Enjoy Cannabis Without Having to Smoke It

As I found out, cannabis smoke is not only harder on the circulatory system than tobacco, but while "[t]here is widespread belief that, unlike tobacco smoke, marijuana smoke is benign" (Springer 2016),studies on circulatory health show that its smoke – and secondhand smoke – may be harmful.

What are the Effects of Secondhand Cannabis Smoke?

In a recent study conducted at the University of California, San Francisco, scienti measured the effects of secondhand cannabis smoke on rats by observing "flow mediated dilation" of arteries (i.e. how wide or narrow arteries became). Basically,

when blood flow is briefly blocked and then unblocked, blood vessels must enlarge in order to let the backed-up blood supply flow through. (Think of the machines at pharmacies that cinches around a person's arm to check blood pressure.)

According to Dr. Matthew L. Springer, whose cadre of scientists conducted the study, this "flow-mediated dilation" (FMD) is "a real-time effect that works better in healthy vessels than in diseased vessels, and is better in young people with no cardiovascular risk factors."

RELATED STORY

Cannabis and Its Impact on High Blood Pressure

To study the effects of secondhand cannabis smoke, researchers used rats that were individually sedated in order to obtain consistent measurements and minimize harm. They then temporarily blocked blood flow in a large artery and measured FMD after the block was removed. This was done both before and after exposing the rats to secondhand cannabis smoke. These experiments were designed to test whether FMD would be impaired by smoke exposure, i.e. whether blood vessels would show a diminished ability to expand after being blocked. Dr. Springer explained, "It's been known since the 1990s that [tobacco] smokers have impaired FMD, and that people who report a lot of exposure to secondhand smoke have poor FMD even if they are not being exposed to smoke during the test."

The results clearly showed that rats exposed to secondhand cannabis smoke displayed impaired FMD—their blood vessels did not dilate as well compared to control subjects exposed to smoke-free air. In fact, after just one minute of secondhand smoke exposure, FMD did not recover to normal levels even when measured 90 minutes later. This effect was not surprising to the researchers given the long list of toxic substances contained in smoke. "Burning of any plant material results in many toxic chemicals, including volatile organic compounds and noxious gases like acrole carbon monoxide, and formaldehyde," Springer told us.

Does Cannabinoid Content Affect Cannabis Smoke Side Effects?

Next, the researchers wanted to know whether THC or other cannabinoids contributed to the blood vessel impairment they observed. To do this, they used cannabis that did not contain any cannabinoids (THC, CBD, etc.). When rats were exposed to secondhand smoke lacking cannabinoids, they observed the same deficits in FMD, indicating that THC and other cannabinoids do not contribute to impairment in FMD caused by smoke exposure.

"We showed that impairments occurred even when THC was absent and when rolling paper was absent," Springer said. "In fact, we also confirmed that there were no pesticides used for the growth of this marijuana, and that there were no seeds or stems." Thus, they ruled out that the impairment was caused by the major psychoactive component of cannabis (THC) or other cannabinoids which may have therapeutic utility (e.g. CBD).

Does Vaporization of Cannabis Smoke Have the Same Effect

Dr. Springer explained the implications of this study's results: "It is worthwhile to emphasize that these results do not necessarily indicate an anti-drug message, as we have shown that the problem is not caused by marijuana the drug, but by marijuana the smoke. We just hope that the results can influence people to think about how they are taking cannabis/THC/CBD etc. and to make informed decisions about what they are exposing themselves and their family, neighbors, and friends to in the process." Given the negative health effects of smoke exposure, cannabis consumers may want to consider combustion-free delivery methods, including vaporization.

RELATED STORY

How Does Cannabis Vaping Technology Work?

To put a finer point on the subject, we asked Dr. Springer if vaporizing cannabis was a healthier method of consumption. "It is a reasonable supposition," he answere
"However, we don't know this for certain, and more chemicals than just THC ar

present in the vapor from these devices. A very sensible reaction to our demonstration is to suggest that people use non-smoke-generating ways to consume THC."

Vaporization, oral ingestion, and topical use are less harmful consumption methods than smoke inhalation. And while a joint amongst friends is still a symbol of togetherness, we can vape our cannabis and eat it, too, without endangering either our health or the health of bystanders who are the real casualties of secondhand smoke.

Smoking in a Legalized Cannabis World

Secondhand smoke and its health concerns extend well beyond the cannabis consumer. For instance, many adult cannabis enthusiasts are prohibited from consuming in their homes or private residence, making them more likely to indulge in public and therefore increasing the likelihood that non-cannabis consumers will come in contact with smoke. This is especially frustrating in states with legal cannabis but no venues designated for local consumption.

Where Can I Smoke Legally in a Legal State?

Dr. Springer notes, "I feel that public exposure to secondhand smoke should be avoided whether it is from tobacco or marijuana. Smoke-free policies that determine where smoking is prohibited should be written broadly enough to include marijuana. Educationally, people who live with other people, especially parents of young children, need to know that smoking marijuana around the kids may be just as bad for their cardiovascular health as smoking tobacco cigarettes. I think this is a no-brainer when it comes to recreational use."

With new cannabis research guidelines approved by the DEA, studies like this one can influence the future of cannabis consumption. As an industry, we should seek to understand all aspects of how this plant can affect personal and public health.

CANNABINOIDS | RESEARCH | SCIENCE | SMOKING

Jeremiah Wilhelm
Jeremiah is the Strain Researcher at Leafly.

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The Different Ways to Smoke and Consume Cannabis

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National Institute on Drug Abuse

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Marijuana

What is marijuana?

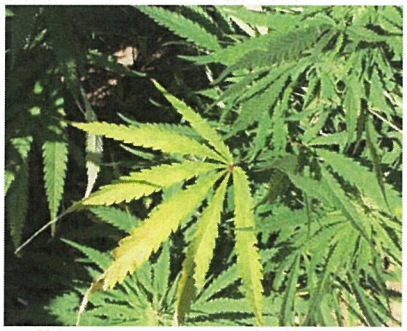

Photo by NIDA

Marijuana refers to the dried leaves, flowers, stems, and seeds from the *Cannabis sativa* or *Cannabis indica* plant. The plant contains the mind-altering chemical THC and other similar compounds. Extracts can also be made from the cannabis plant (see "Marijuana Extracts," see page 2").

Marijuana is the most commonly used illicit drug in the United States.[1] Its use is widespread among young people. In 2015, more than 11 million young adults ages 18 to 25 used marijuana in the past year.[1] According to the Monitoring the Future survey, rates of marijuana use among middle and high school students have dropped or leveled off in the past few years after several years of increase. However, the number of young people who believe regular marijuana use is risky is decreasing.[2]

Legalization of marijuana for medical use or adult recreational use in a growing number of states may affect these views. Read more about marijuana as medicine in our *DrugFacts: Marijuana as Medicine.*

How do people use marijuana?

People smoke marijuana in hand-rolled cigarettes (*joints*) or in pipes or water pipes (*bongs*). They also smoke it in *blunts*—emptied cigars that have been partly or completely refilled with marijuana. To avoid inhaling smoke, some people are using vaporizers. These devices pull the active ingredients (including THC) from the marijuana and collect their vapor in a storage unit. A person then inhales the vapor, not the smoke. Some vaporizers use a liquid marijuana extract.

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People can mix marijuana in food (*edibles*), such as brownies, cookies, or candy, or brew it as a tea. A newly popular method of use is smoking or eating different forms of THC-rich resins (see "Marijuana Extracts," see page 2).

Marijuana Extracts

Smoking THC-rich resins extracted from the marijuana plant is on the rise. People call this practice *dabbing*. These extracts come in various forms, such as:

- *hash oil* or *honey oil*—a gooey liquid
- *wax* or *budder*—a soft solid with a texture like lip balm
- *shatter*—a hard, amber-colored solid

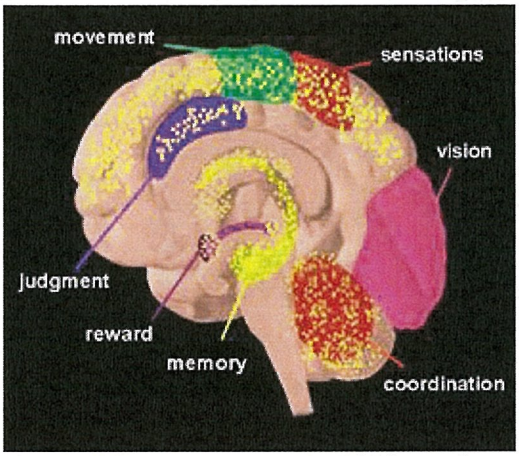
These extracts can deliver extremely large amounts of THC to the body, and their use has sent some people to the emergency room. Another danger is in preparing these extracts, which usually involves butane (lighter fluid). A number of people have caused fires and explosions and have been seriously burned from using butane to make extracts at home.[3,4]

How does marijuana affect the brain?

Marijuana has both short-and long-term effects on the brain.

Short-Term Effects

When a person smokes marijuana, THC quickly passes from the lungs into the bloodstream. The blood carries the chemical to the brain and other organs throughout the body. The body absorbs THC more slowly when the person eats or drinks it. In that case, they generally feel the effects after 30 minutes to 1 hour.



THC acts on numerous areas in the brain (in yellow).
Image by NIDA

THC acts on specific brain cell receptors that ordinarily react to natural THC-like chemicals. These natural chemicals play a role in normal brain development and function.

Marijuana overactivates parts of the brain that contain the highest number of these receptors. This causes the "high" that people feel. Other effects include:

- altered senses (for example, seeing brighter colors)
- altered sense of time
- changes in mood
- impaired body movement
- difficulty with thinking and problem-solving
- impaired memory
- hallucinations (when taken in high doses)
- delusions (when taken in high doses)
- psychosis (when taken in high doses)

Long-Term Effects

Marijuana also affects brain development. When people begin using marijuana as teenagers, the drug may impair thinking, memory, and learning functions and affect how the brain builds connections between the areas necessary for these functions. Researchers are still studying how long marijuana's effects last and whether some changes may be permanent.

For example, a study from New Zealand conducted in part by researchers at Duke University showed that people who started smoking marijuana heavily in their teens and had an ongoing marijuana use disorder lost an average of 8 IQ points between ages 13 and 38. The lost mental abilities didn't fully return in those who quit marijuana as adults. Those who started smoking marijuana as adults didn't show notable IQ declines.[5]

In another recent study on twins, those who used marijuana showed a significant decline in general knowledge and in verbal ability (equivalent to 4 IQ points) between the preteen years and early adulthood, but no predictable difference was found between twins when one used marijuana and the other didn't. This suggests that the IQ decline in marijuana users may be caused by something other than marijuana, such as shared familial factors (e.g., genetics, family environment).[6] NIDA's Adolescent Brain Cognitive Development (ABCD) study, a major longitudinal study, is tracking a large sample of young Americans from late childhood to early adulthood to help clarify how and to what extent marijuana and other substances, alone and in combination, affect adolescent brain development. Read more about the ABCD study on our Longitudinal Study of Adolescent Brain and Cognitive Development (ABCD Study) webpage.

A Rise in Marijuana's THC Levels

The amount of THC in marijuana has been increasing steadily over the past few decades.[7] For a person who's new to marijuana use, this may mean exposure to higher THC levels with a greater chance of a harmful reaction. Higher THC levels may explain the rise in emergency room visits involving marijuana use.

The popularity of edibles also increases the chance of harmful reactions. Edibles take longer to digest and produce a high. Therefore, people may consume more to feel the effects faster, leading to dangerous results.

Higher THC levels may also mean a greater risk for addiction if people are regularly exposing themselves to high doses.

What are the other health effects of marijuana?

Marijuana use may have a wide range of effects, both physical and mental.

Physical Effects

- **Breathing problems.** Marijuana smoke irritates the lungs, and people who smoke marijuana frequently can have the same breathing problems as those who smoke tobacco. These problems include daily cough and phlegm, more frequent lung illness, and a higher risk of lung infections. Researchers so far haven't found a higher risk for lung cancer in people who smoke marijuana.[8]

- **Increased heart rate.** Marijuana raises heart rate for up to 3 hours after smoking. This effect may increase the chance of heart attack. Older people and those with heart problems may be at higher risk.

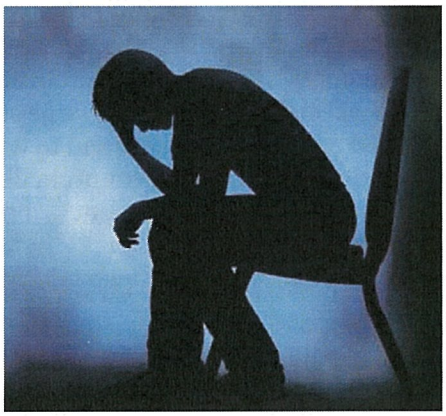
- **Problems with child development during and after pregnancy.** Marijuana use during pregnancy is linked to lower birth weight[9] and increased risk of both brain and behavioral problems in babies. If a pregnant woman uses marijuana, the drug may affect certain developing parts of the fetus's brain. Children exposed to marijuana in the womb have an increased risk of problems with attention,[10] memory, and problem-solving compared to unexposed children.[11] Some research also suggests that moderate amounts of THC are excreted into the breast milk of nursing mothers.[12] With regular use, THC can reach amounts in breast milk that could affect the baby's developing brain. More research is needed. Read our *Marijuana Research Report* for more information about marijuana and pregnancy.

Mental Effects

Long-term marijuana use has been linked to mental illness in some people, such as:

- temporary hallucinations
- temporary paranoia
- worsening symptoms in patients with *schizophrenia*—a severe mental disorder with symptoms such as hallucinations, paranoia, and disorganized thinking

Marijuana use has also been linked to other mental health problems, such as depression, anxiety, and suicidal thoughts among teens. However, study findings have been mixed.



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Are there effects of inhaling secondhand marijuana smoke?

Failing a Drug Test?

While it's possible to fail a drug test after inhaling secondhand marijuana smoke, it's unlikely. Studies show that very little THC is released in the air when a person exhales. Research findings suggest that, unless people are in an enclosed room, breathing in lots of smoke for hours at close range, they aren't likely to fail a drug test.[13,14] Even if some THC was found in the blood, it wouldn't be enough to fail a test.

Getting high from passive exposure?

Similarly, it's unlikely that secondhand marijuana smoke would give nonsmoking people in a confined space a high from passive exposure. Studies have shown that people who don't use marijuana report only mild effects of the drug from a nearby smoker, under extreme conditions (breathing in lots of marijuana smoke for hours in an enclosed room).[15]

Other Health Effects?

More research is needed to know if secondhand marijuana smoke has similar health risks as secondhand tobacco smoke. A recent study on rats suggests that secondhand marijuana smoke can do as much damage to the heart and blood vessels as secondhand tobacco smoke.[18] But researchers haven't fully explored the effect of secondhand marijuana smoke on humans. What they do know is that the toxins and tar found in marijuana smoke could affect vulnerable people, such as children or people with asthma.

How Does Marijuana Affect a Person's Life?

Compared to those who don't use marijuana, those who frequently use large amounts report the following:

- lower life satisfaction
- poorer mental health
- poorer physical health
- more relationship problems

People also report less academic and career success. For example, marijuana use is linked to a higher likelihood of dropping out of school.[16] It's also linked to more job absences, accidents, and injuries.[17]

Is marijuana a gateway drug?

Use of alcohol, tobacco, and marijuana are likely to come before use of other drugs.[19,20] Animal studies have shown that early exposure to addictive substances, including THC, may change how the brain responds to other drugs. For example, when rodents are repeatedly exposed to THC when they're young, they later show an enhanced response to other addictive substances—such as morphine or nicotine—in the areas of the brain that control reward, and they're more likely to show addiction-like behaviors.[21,22]

Although these findings support the idea of marijuana as a "gateway drug," the majority of people who use marijuana don't go on to use other "harder" drugs. It's also important to note that other factors besides biological mechanisms, such as a person's social environment, are also critical in a person's risk for drug use and addiction. Read more about marijuana as a gateway drug in our *Marijuana Research Report*.

Can a person overdose on marijuana?

An overdose occurs when a person uses enough of the drug to produce life-threatening symptoms or death. There are no reports of teens or adults dying from marijuana alone. However, some people who use marijuana can feel some very uncomfortable side effects, especially when using marijuana products with high THC levels. People have reported symptoms such as anxiety and paranoia, and in rare cases, an extreme psychotic reaction (which can include delusions and hallucinations) that can lead them to seek treatment in an emergency room.

While a psychotic reaction can occur following any method of use, emergency room responders have seen an increasing number of cases involving marijuana edibles. Some people (especially preteens and teens) who know very little about edibles don't realize that it takes longer for the body to feel marijuana's effects when eaten rather than smoked. So they consume more of the edible, trying to get high faster or thinking they haven't taken enough. In addition, some babies and toddlers have been seriously ill after ingesting marijuana or marijuana edibles left around the house.

Is marijuana addictive?

Marijuana use can lead to the development of a *substance use disorder,* a medical illness in which the person is unable to stop using even though it's causing health and social problems in their life.

Severe substance use disorders are also known as addiction. Research suggests that between 9 and 30 percent of those who use marijuana may develop some degree of marijuana use disorder.[23] People who begin using marijuana before age 18 are four to seven times more likely than adults to develop a marijuana use disorder.[24]

Many people who use marijuana long term and are trying to quit report mild withdrawal symptoms that make quitting difficult. These include:

- grouchiness
- sleeplessness
- decreased appetite
- anxiety
- cravings

What treatments are available for marijuana use disorder?

No medications are currently available to treat marijuana use disorder, but behavioral support has been shown to be effective. Examples include therapy and motivational incentives (providing rewards to patients who remain drug-free). Continuing research may lead to new medications that help ease withdrawal symptoms, block the effects of marijuana, and prevent relapse.

Points to Remember

- Marijuana refers to the dried leaves, flowers, stems, and seeds from the *Cannabis sativa* or *Cannabis indica* plant.
- The plant contains the mind-altering chemical THC and other related compounds.
- People use marijuana by smoking, eating, drinking, or inhaling it.
- Smoking and vaping THC-rich extracts from the marijuana plant (a practice called *dabbing*) is on the rise.
- THC overactivates certain brain cell receptors, resulting in effects such as:
  - altered senses
  - changes in mood
  - impaired body movement
  - difficulty with thinking and problem-solving
  - impaired memory and learning
- Marijuana use can have a wide range of health effects, including:
  - hallucinations and paranoia
  - breathing problems
  - possible harm to a fetus's brain in pregnant women
- The amount of THC in marijuana has been increasing steadily in recent decades, creating more harmful effects in some people.
- It's unlikely that a person will fail a drug test or get high from passive exposure by inhaling secondhand marijuana smoke.
- There aren't any reports of teens and adults dying from using marijuana alone, but marijuana use can cause some very uncomfortable side effects, such as anxiety and paranoia and, in rare cases, extreme psychotic reactions.
- Marijuana use can lead to a substance use disorder, which can develop into an addiction in severe cases.
- No medications are currently available to treat marijuana use disorder, but behavioral support can be effective.

Learn More

For more information about marijuana and marijuana use, visit our:

- Marijuana webpage
- *Drugged Driving DrugFacts*

Source: National Institute on Drug Abuse; National Institutes of Health; U.S. Department of Health and Human Services.

Updated August 2017

References

1. Substance Abuse Center for Behavioral Health Statistics and Quality. Results from the 2015 National Survey on Drug Use and Health: Detailed Tables. SAMHSA. https://www.samhsa.gov/data/sites/default/files/NSDUH-DetTabs-2015/NSDUH-DetTabs-2015/NSDUH-DetTabs-2015.pdf. Published September 8, 2016. Accessed January 18, 2017.

2. Johnston L, O'Malley P, Miech R, Bachman J, Schulenberg J. *Monitoring the Future National Survey Results on Drug Use: 1975-2015: Overview: Key Findings on Adolescent Drug Use.* Ann Arbor, MI: Institute for Social Research, The University of Michigan; 2015.

3. Bell C, Slim J, Flaten HK, Lindberg G, Arek W, Monte AA. Butane Hash Oil Burns Associated with Marijuana Liberalization in Colorado. *J Med Toxicol Off J Am Coll Med Toxicol.* 2015;11(4):422-425. doi:10.1007/s13181-015-0501-0.

4. Romanowski KS, Barsun A, Kwan P, et al. Butane Hash Oil Burns: A 7-Year Perspective on a Growing Problem. *J Burn Care Res Off Publ Am Burn Assoc.* 2017;38(1):e165-e171. doi:10.1097/BCR.0000000000000334.

5. Meier MH, Caspi A, Ambler A, et al. Persistent cannabis users show neuropsychological decline from childhood to midlife. *Proc Natl Acad Sci U S A.* 2012;109(40):E2657-E2664. doi:10.1073/pnas.1206820109.

6. Jackson NJ, Isen JD, Khoddam R, et al. Impact of adolescent marijuana use on intelligence: Results from two longitudinal twin studies. *Proc Natl Acad Sci U S A.* 2016;113(5):E500-E508. doi:10.1073/pnas.1516648113.

7. Mehmedic Z, Chandra S, Slade D, et al. Potency trends of Δ9-THC and other cannabinoids in confiscated cannabis preparations from 1993 to 2008. *J Forensic Sci.* 2010;55(5):1209-1217. doi:10.1111/j.1556-4029.2010.01441.x.

8. National Academies of Sciences, Engineering, and Medicine. *The Health Effects of Cannabis and Cannabinoids: Current State of Evidence and Recommendations for Research.* Washington, DC: The National Academies Press; 2017.

9. The National Academies of Sciences, Engineering, and Medicine, Health and Medicine Division, Board on Population Health and Public Health Practice, Committee on the Health Effects of Marijuana: An Evidence Review and Research Agenda. *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research.* http://nationalacademies.org/hmd/Reports/2017/health-effects-of-cannabis-and-cannabinoids.aspx. Accessed January 19, 2017.

10. Goldschmidt L, Day NL, Richardson GA. Effects of prenatal marijuana exposure on child behavior problems at age 10. *Neurotoxicol Teratol.* 2000;22(3):325-336.

11. Richardson GA, Ryan C, Willford J, Day NL, Goldschmidt L. Prenatal alcohol and marijuana exposure: effects on neuropsychological outcomes at 10 years. *Neurotoxicol Teratol.* 2002;24(3):309-320.

12. Perez-Reyes M, Wall ME. Presence of delta9-tetrahydrocannabinol in human milk. *N Engl J Med.* 1982;307(13):819-820. doi:10.1056/NEJM198209233071311.

13. Röhrich J, Schimmel I, Zörntlein S, et al. Concentrations of delta9-tetrahydrocannabinol and 11-nor-9-carboxytetrahydrocannabinol in blood and urine after passive exposure to Cannabis smoke in a coffee shop. *J Anal Toxicol.* 2010;34(4):196-203.

14. Cone EJ, Bigelow GE, Herrmann ES, et al. Non-smoker exposure to secondhand cannabis smoke. I. Urine screening and confirmation results. *J Anal Toxicol.* 2015;39(1):1-12. doi:10.1093/jat/bku116.

15. Herrmann ES, Cone EJ, Mitchell JM, et al. Non-smoker exposure to secondhand cannabis smoke II: Effect of room ventilation on the physiological, subjective, and behavioral/cognitive effects. *Drug Alcohol Depend.* 2015;151:194-202. doi:10.1016/j.drugalcdep.2015.03.019.

16. McCaffrey DF, Pacula RL, Han B, Ellickson P. Marijuana Use and High School Dropout: The Influence of Unobservables. *Health Econ.* 2010;19(11):1281-1299. doi:10.1002/hec.1561.

17. Zwerling C, Ryan J, Orav EJ. The efficacy of preemployment drug screening for marijuana and cocaine in predicting employment outcome. *JAMA*. 1990;264(20):2639-2643.

18. Wang X, Derakhshandeh R, Liu J, et al. One Minute of Marijuana Secondhand Smoke Exposure Substantially Impairs Vascular Endothelial Function. *J Am Heart Assoc*. 2016;5(8). doi:10.1161/JAHA.116.003858.

19. Secades-Villa R, Garcia-Rodríguez O, Jin CJ, Wang S, Blanco C. Probability and predictors of the cannabis gateway effect: a national study. *Int J Drug Policy*. 2015;26(2):135-142. doi:10.1016/j.drugpo.2014.07.011.

20. Levine A, Huang Y, Drisaldi B, et al. Molecular mechanism for a gateway drug: epigenetic changes initiated by nicotine prime gene expression by cocaine. *Sci Transl Med*. 2011;3(107):107ra109. doi:10.1126/scitranslmed.3003062.

21. Panlilio LV, Zanettini C, Barnes C, Solinas M, Goldberg SR. Prior exposure to THC increases the addictive effects of nicotine in rats. *Neuropsychopharmacol Off Publ Am Coll Neuropsychopharmacol*. 2013;38(7):1198-1208. doi:10.1038/npp.2013.16.

22. Cadoni C, Pisanu A, Solinas M, Acquas E, Di Chiara G. Behavioural sensitization after repeated exposure to Delta 9-tetrahydrocannabinol and cross-sensitization with morphine. *Psychopharmacology (Berl)*. 2001;158(3):259-266. doi:10.1007/s002130100875.

23. Hasin DS, Saha TD, Kerridge BT, et al. Prevalence of Marijuana Use Disorders in the United States Between 2001-2002 and 2012-2013. *JAMA Psychiatry*. 2015;72(12):1235-1242. doi:10.1001/jamapsychiatry.2015.1858.

24. Winters KC, Lee C-YS. Likelihood of developing an alcohol and cannabis use disorder during youth: association with recent use and age. *Drug Alcohol Depend*. 2008;92(1-3):239-247. doi:10.1016/j.drugalcdep.2007.08.005.

CITY OF HOMER
HOMER, ALASKA

City Clerk/Canvass Board

RESOLUTION 17-085(S)

A RESOLUTION OF THE CITY COUNCIL OF HOMER, ALASKA, ACKNOWLEDGING THE RESULTS OF THE CITY OF HOMER REGULAR ELECTION HELD OCTOBER 3, 2017 TO DECIDE BALLOT PROPOSITION 1 "SHALL THE CITY OF HOMER, ALASKA, BE AUTHORIZED TO USE THE REVENUE FROM THE THREE FOURTHS PERCENT (3/4%) HOMER ACCELERATED ROADS AND TRAILS DEDICATED SALES TAX FOR THE MAINTENANCE OF LOCAL ROADS AND TRAILS?" AND ELECT TWO CITY COUNCILMEMBERS.

WHEREAS, In compliance with Homer City Code 4.35, the Canvass Board of the City of Homer has opened, counted, and tallied the votes on absentee ballots including special needs ballots, and question ballots found to be valid, that were cast in the City of Homer Regular Election held on October 3, 2017; and

WHEREAS, The total number of voters voting in the City Regular Election was 1736 and reflects the number of voters, not the number of votes cast or ballots counted; and

WHEREAS, In accordance with Homer City Code 4.35, the Canvass Board of the City of Homer had inspected the precinct reports, Election Central Logs and entered the the results of the absentee and questioned ballots on the Certification of Election along with the results of the precinct counts; and

WHEREAS, The results of the City Regular Election held October 3, 2017, attached as Exhibit A, is presented in the Canvass Board's Certificate of Election in accordance with the Homer City Code.

NOW, THEREFORE, BE IT RESOLVED that the City Council hereby certifies the results of the City Regular Election held October 3, 2017, as presented in the Canvass Board's Certificate of Election, attached as Exhibit A, in accordance with the Homer City Code.

BE IT FURTHER RESOLVED the result of Proposition 1 are:

PROPOSITION NO. 1

AUTHORIZE THE USE OF REVENUE FROM THE 0.75% OF THE EXISTING CITY SALES TAX DEDICATED TO THE HOMER ACCELERATED ROADS AND TRAILS (H.A.R.T.) PROGRAM TO INCLUDE MAINTENANCE OF LOCAL ROADS AND TRAILS

Shall the City of Homer, Alaska, be authorized to use the revenue from the three

fourths percent (3/4%) Homer Accelerated Roads and Trails dedicated sales tax for the maintenance of local roads and trails?

Yes - 971 No - 280

BE IT FURTHER RESOLVED that the following candidates are declared elected to office of City Councilmember, having received a number of votes greater than 35% of the total votes cast for all candidates divided by the number of seats to be filled for a three-year term of office:

COUNCILMEMBERS (TWO THREE-YEAR TERMS)

Caroline Venuti
Rachel Lord

BE IT FURTHER RESOLVED that the Canvass Board's Certificate of Election (Exhibit A) be attached permanently as part of this Resolution.

PASSED AND ADOPTED by the City Council of Homer, Alaska, this 9th day of October, 2017.

CITY OF HOMER

_____
BRYAN ZAK, MAYOR

ATTEST:

_____
MELISSA JACOBSEN, MMC, CITY CLERK

Fiscal Note: N/A

EXHIBIT A

CERTIFICATE OF ELECTION
City of Homer Regular Election October 3, 2017

We, the Election Canvass Board, duly appointed, of the City of Homer, Alaska hereby certify that the validated absentee and validated questioned ballots were opened, counted, and recorded at a legally authorized and convened meeting of the City of Homer Canvass Board, held October 3, 2017 and that the results of that count are hereon entered with the certified results of the votes counted for the precinct polling places via Accu-Vote Ballot Tabulation System and that the total results are recorded hereon.

	31-350 Homer #1	31-360 Homer #2	Absentee/ Questioned/ Special Needs	Total Regular Votes	% of Votes
CITY COUNCIL 3 Year Term					Total Votes Cast 3225 ÷ 2 seats = 1612.5 x 35% = 564 votes
Sarah Vance	183	148	97	428	27%
Kimberly M. Ketter	13	9	11	33	2%
Caroline Venuti	450	326	281	1057	66%
Anne Poso	16	15	9	40	2%
Rachel Lord	433	330	297	1070	66%
Stephen M. Mueller	100	78	64	242	15%
Dwayne G. Nustvold, JR	108	121	41	270	17%
Andrew Kita	33	28	12	70	4%
Write In	4	4	4	12	1%
Proposition 1					
Yes	541	430		971	78%
No	152	128		280	22%
Registered Voters	2631	2112			

We further certify that there were 1283 Regular voters and 401 Absentee voters, 24 Special Needs Voters, and 28 Questioned voters for a total of 1736 voters that voted in this election. Percentage of voter turnout is 37. Total registered voters for the City of Homer are 4743 as of September 3, 2017.

IN WITNESS WHEREOF, I have hereunto set my hand this 6th day of October, 2017.

Canvass Board: Jane Swain _____ Alice Krivitsky _____

Staff: Renee Krause _____ **Attest:** Melissa Jacobsen _____

Renee Krause, CMC, Deputy City Clerk I **Melissa Jacobsen, MMC, City Clerk**