Medical Marijuana : Fact or Fiction

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Memorial Sloan Kettering Cancer Center

Financial Disclosures

- None

Background

- Dried leaves, flowers, stems, and seeds from the *Cannabis sativa* or *Cannabis indica*
- Used since 400 AD *
- Western medicine ~ 1800s
  - Successful experimentation with animals
  - catalepsy, rabies, cholera, tetanus, infantile convulsions, delirium tremens
- Introduction of hypodermic needles and opiates
  - Decline in use late 19th century
  - OTC cannabis available until 1941
- 1924 declared narcotic, federally restricted and controlled
- 1956 – 1st offense 2 – 4 years of prison time marijuana
- 1970 s / 80s – AIDS and Chemotherapy
  - nausea relief
- Availability
  - Smoking
  - Vaping
  - Edible
    - Candy, cookies, infused honey and tea
  - Topical

1/6/2020 – Washington Post

Morning Mix

'It's a lot happening all at once': Illinois shops run out of marijuana just six days after start of legalization

AP – May 2024


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Daily marijuana use outpaces daily drinking in the US, a new study says

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Delaware Reports Strong Start to Recreational Marijuana Sales

Department of Safety and Homeland Security | **Kent County** | **New Castle County** | **Sussex County** | **The Office of the Marijuana Commissioner** | Date Posted: Wednesday, August 6, 2025

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Financial Landscape

The Worldwide Cannabis Industry is Projected to Reach $90.4 Billion by 2026

February 18, 2021 07:43 ET | Source: Research and Markets

Dublin, Feb. 18, 2021 (GLOBE NEWSWIRE) -- The "Global Cannabis Market by Application (Medical, Recreational), Product Type (Flowers, Concentrates), Compound (THC-dominant, CBD-dominant, Balanced THC & CBD), and Region (North America, South America, Europe, RoW) - Forecast to 2026" report has been added to **ResearchAndMarkets.com's** offering.

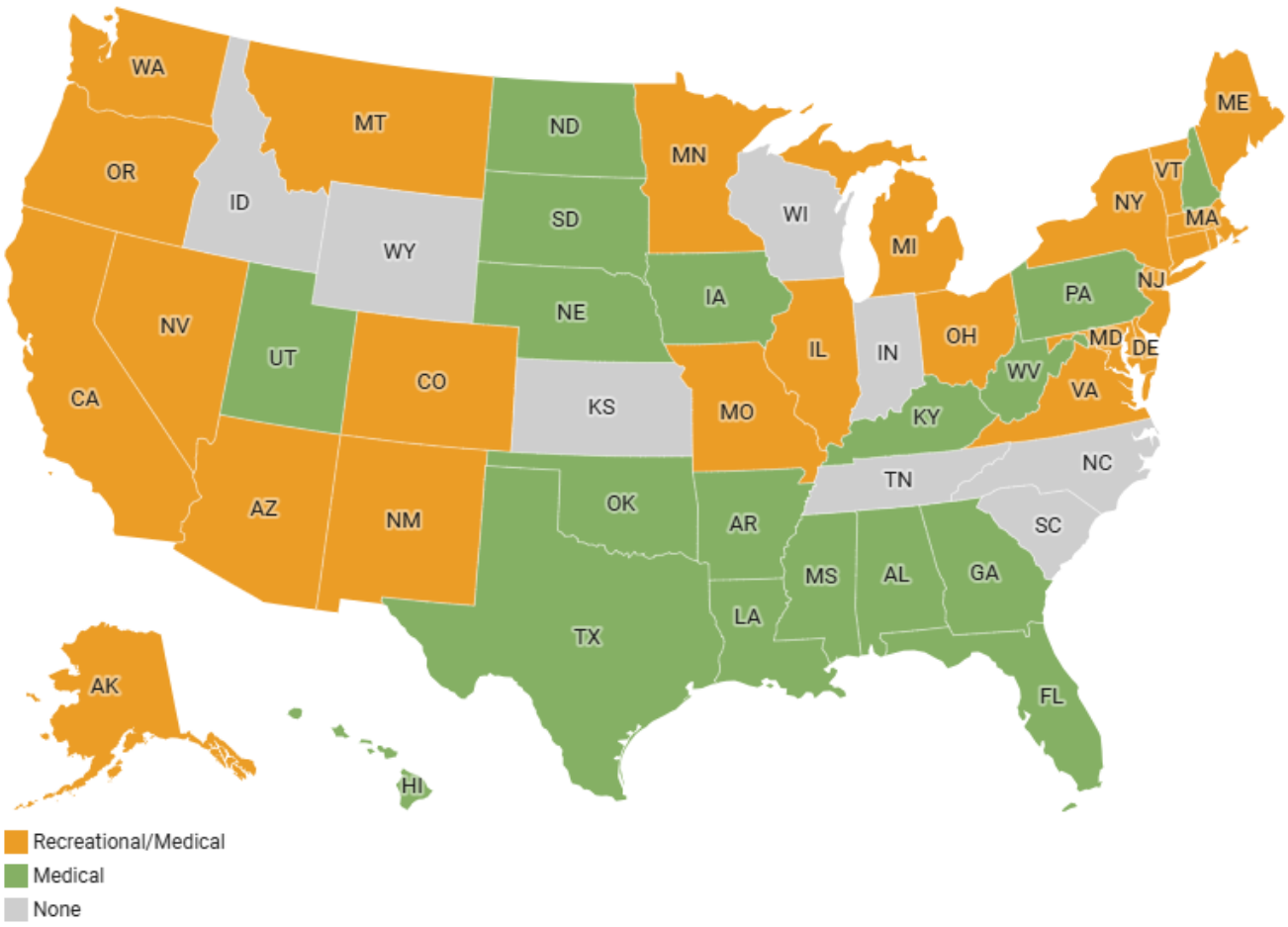
The global cannabis market is estimated to be valued at USD 20.5 billion in 2020 and is projected to reach USD 90.4 billion by 2026, recording a CAGR of 28%, in terms of value.

The market is primarily driven by factors such as growing medical applications of cannabis and increasing legalization of cannabis and rise in social acceptance of marijuana. North America accounted for the largest market share in the cannabis market owing to the increasing legalization of cannabis for both medical and recreational purposes across the region. However, one of the restraining factors in the growth of cannabis market is complex regulatory structure to produce and use cannabis.

By application, the recreational segment is projected to grow at the highest CAGR during the forecast period

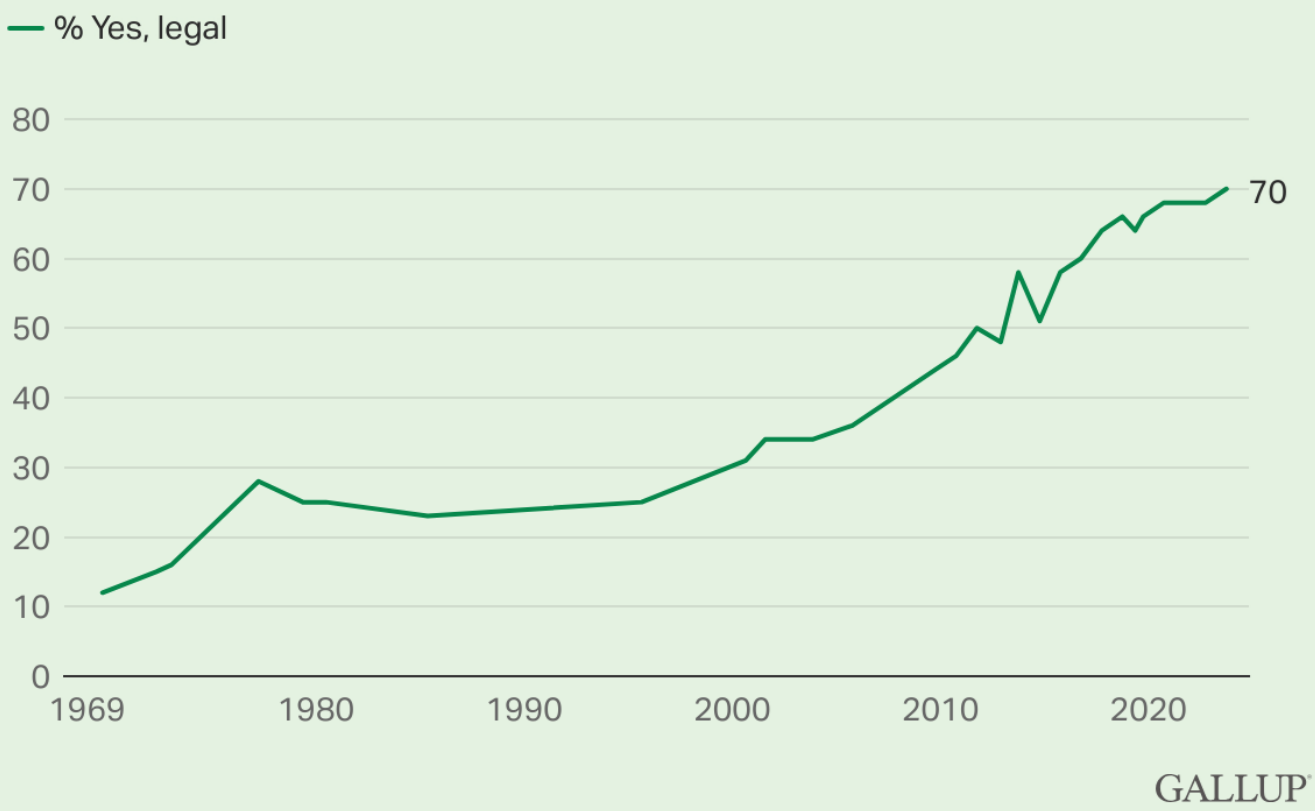
Based on application, the recreational segment is expected to be the fastest-growing during the forecast period. This segment is rapidly growing as it is highly demanded and consumed by the consumers. Also, high demand for recreational cannabis can translate into larger market if it gets legalized

Current US Landscape



The Green Wave: Americans' Support for Marijuana, 1969-2023

Do you think the use of marijuana should be legal, or not?



Patients and Families

- High interest amongst patients and families
- High percentage of patients are already using it to treat chronic pain and other symptoms
- Disconnect between physician, patient, and dispensary.
- Should be treated as any other treatment/intervention and monitored regularly

Degenhardt L,. Experience of adjunctive cannabis use for chronic non-cancer pain: findings from the Pain and Opioids IN Treatment (POINT) study. Drug Alcohol Depend. 2015 Feb 1;147:144-50. doi: 10.1016/j.drugalcdep.2014.11.031. Epub 2014 Dec 10. PMID: 25533893.

The Human Endocannabinoid System

CBD, CBN and THC fit like a lock and key into existing human receptors. These receptors are part of the endocannabinoid system which impact physiological processes affecting pain modulation, memory, and appetite plus anti-inflammatory effects and other immune system responses. The endocannabinoid system comprises two types of receptors, CB1 and CB2, which serve distinct functions in human health and well-being.

THC
Tetrahydrocannabinol

CBD
Cannabidiol

CBN
Cannabinol

CB1 receptors are primarily found in the brain and central nervous system, and to a lesser extent in other tissues.

CB1

CBD does not directly "fit" CB1 or CB2 receptors but has powerful indirect effects still being studied.

CB2

CB2 receptors are mostly in the perepheral organs especially cells associated with the immune system.

Receptors are found on cell surfaces

source: www.the-human-solution.org

www.rusticoils.com/cannabinoid-receptors

Pharmacokinetics

- Onset
  - PR – 15 min
  - Inh – 22 min
  - SL – 30 min
  - PO – 1 – 2 HR
  - TD – 2 HR
- 97 % protein bound
- Liver metabolism
  - Majority CY P450
- ½ life = 20 – 30 HR up to 1 – 2 weeks with chronic use

Common therapeutic applications of cannabinoids	Newer, less common therapeutic applications of cannabinoids
Glaucoma	PTSD
Inflammation, immunity, and tumor suppression	Symptoms associated with dementia and Alzheimer disease
Cancer and AIDS-associated nausea and vomiting control and appetite stimulation	Fibromyalgia
Neuropathic pain control	Anxiety and depression
Irritable bowel disease	Opioid addiction
Spasticity and seizure control	ADD/ADHD
Sleep disturbances	Parkinson disease
Headache	Tourette syndrome

Table 1. Common and Less Common Therapeutic Applications of Cannabinoids[2-4,15]

Abbreviations: ADD/ADHD, attention-deficit disorder/attention-deficit/hyperactivity disorder; PTSD, posttraumatic stress disorder.

Contraindications

- Psychotic illness
- Active unstable heart disease
- Allergy
- Pregnancy or breast feeding

Management of the Perioperative Patient Using Cannabis or Cannabinoids

- Evidence-based recommendations based on extensive literature review and experience of a 12-member expert panel of clinicians and researchers
- Panel consisted of anesthesiologists, chronic pain physicians, and a patient advocate and used a modified Delphi method
- Nine questions and 21 recommendations, all with 100% consensus

USPSTF methodology for grading evidence and recommendations used (A, B, C, D, or I)

Grade A — Universal screening for cannabinoids should be performed prior to surgery: product type, amount and frequency, time and route of last consumption.

Grade A — We recommend that the frequent, heavy cannabis user be counseled on the potentially negative effects on postoperative pain control. Low-dose, medically supervised use likely has a lower risk of negative effects.

Grade A — We recommend postponing elective surgery in patients who have altered mental status or impairment of decision-making capacity due to acute cannabis intoxication.

Grade A — Pregnant patients should be educated about the risks of maternal cannabis use on the fetus/neonate.

Grade B — Cannabis use during pregnancy and immediate postpartum period should be discouraged.

Grade B — Patients should be counseled on the potential risks of continued perioperative cannabinoids.

Grade C — We recommend utilizing multimodal analgesia incorporating regional analgesia if appropriate and using opioids as rescue medication.

Grade C — Postoperatively, patients who consume cannabis frequently should be monitored for cannabis withdrawal symptoms.

Grade C — We recommend delaying elective surgery for a minimum of 2 hours after cannabis smoking because of increased perioperative risk of acute MI.

(There is a lack of published data with other routes of administration.)

Grade C — Consideration should be given to adjusting induction and maintenance doses of anesthetic agents based on clinical presentation and timing of the last consumption of cannabis in surgical and procedural patients.

Grade C — A cannabinoid agonist such as dronabinol* at a low dose is the best choice to treat severe cannabis withdrawal symptoms postoperatively.

* Off-label use in the United States

Grade D — Universal toxicology screening is not currently indicated based on insufficient evidence.

Grade I — We cannot recommend for or against the routine tapering of cannabis and cannabinoids in the perioperative period.

Shah S, Schwenk ES, Sondekoppam RV, Clarke H, Zakowski M, Rzasa-Lynn RS, Yeung B, Nicholson K, Schwartz G, Hooten MW, Wallace M, Viscusi ER, Narouze S. ASRA Pain Medicine Consensus Guidelines on the management of the perioperative patient on cannabis and cannabinoids. *Reg Anesth Pain Med* 2022; https://doi.org/10.1136/rapm-2022-104013

Artwork by Jim Snively.

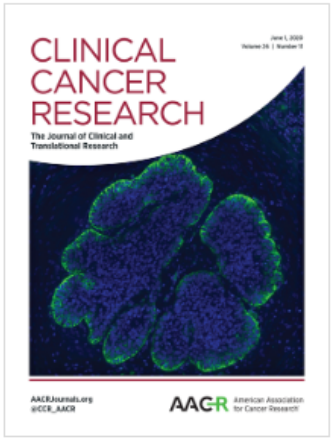
Regional Anesthesia & Pain Medicine

Side effects

- CNS
  - Euphoria
  - Anti-anxiety
  - Dysphoria
  - Pupillary changes
- CV effects
  - Increased risk of CV and cerebrovascular events
    - Endothelial and myocardial damage
    - Oxidative stress
- Respiratory Effects
  - Hyperactive airway (animal model)
  - Inflammation (animal model)
- Other Systemic Effect
  - Dry eyes
  - Blurred visions
  - Difficulty voiding
  - Slows gastric emptying (30 – 120 minutes)
  - Impaired Judgement
  - Slowed Reaction times

CLINICAL CANCER RESEARCH

Volume 26, Issue 11
1 June 2020



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Materials and Methods

TRANSLATIONAL CANCER MECHANISMS AND THERAPY | JUNE 01 2020

Cannabinoids Promote Progression of HPV-Positive Head and Neck Squamous Cell Carcinoma via p38 MAPK Activation

Chao Liu; Sayed H. Sadat; Koji Ebisumoto; Akihiro Sakai; Bharat A. Panuganti; Shuling Ren; Yusuke Goto; Sunny Haft; Takahito Fukusumi; Mizuo Ando; Yuki Saito; Theresa Guo; Pablo Tamayo; Huwate Yeerna; William Kim; Jacqueline Hubbard; Andrew B. Sharabi; J. Silvio Gutkind; Joseph A. Califano

+ Author & Article Information

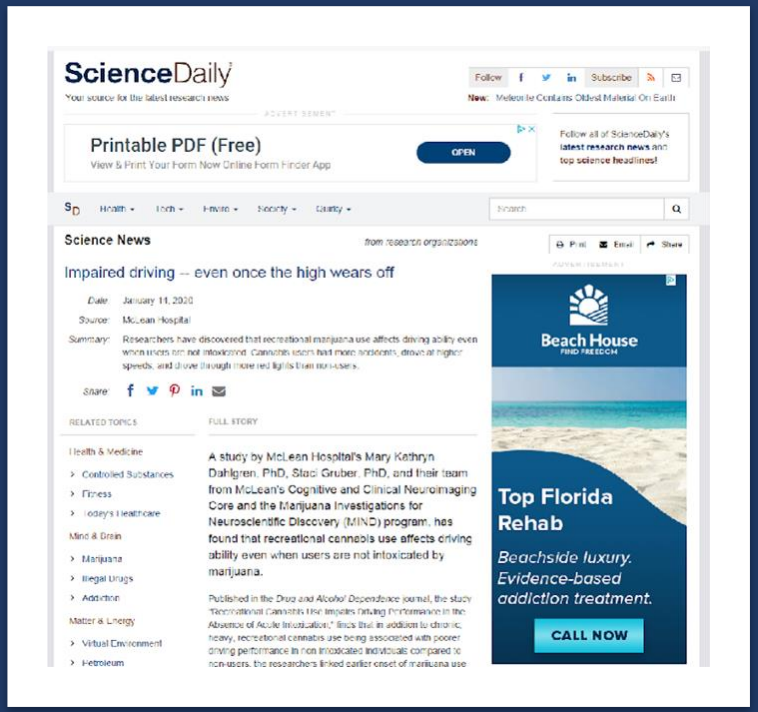
Clin Cancer Res (2020) 26 (11): 2693–2703.
https://doi.org/10.1158/1078-0432.CCR-18-3301 **Article history**

Split-Screen **Views** **PDF** **Share** **Tools** **Versions**

Abstract

Purpose:

Human papillomavirus (HPV)-related head and neck squamous cell carcinoma (HNSCC) is associated with daily marijuana use and is also increasing in parallel with increased marijuana use in the United States. Our study is designed to define the interaction between cannabinoids and HPV-positive HNSCC.



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Impaired driving -- even once the high wears off

Date: January 14, 2020

Source: McLean Hospital

Summary: Researchers have discovered that recreational marijuana use affects driving ability even when users are not intoxicated. Cannabis users had more accidents, drove at higher speeds, and drove through more red lights than non-users.

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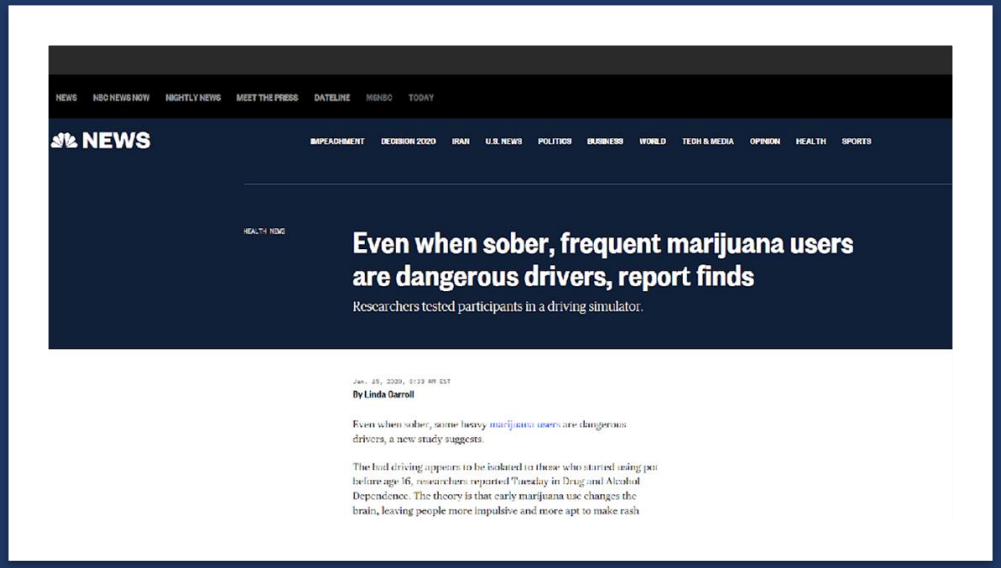
FULL STORY

A study by McLean Hospital's Mary Kathryn Dahlgren, PhD, Staci Gruber, PhD, and their team from McLean's Cognitive and Clinical Neuroimaging Core and the Marijuana Investigations for Neuroscientific Discovery (MIND) program, has found that recreational cannabis use affects driving ability even when users are not intoxicated by marijuana.

Published in the *Drug and Alcohol Dependence* journal, the study "Recreational Cannabis Use Impairs Driving Performance in the Absence of Acute Intoxication," finds that in addition to chronic, heavy, recreational cannabis use being associated with poorer driving performance in non intoxicated individuals compared to non-users, the researchers linked earlier onset of marijuana use



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HEALTH NOW

Even when sober, frequent marijuana users are dangerous drivers, report finds

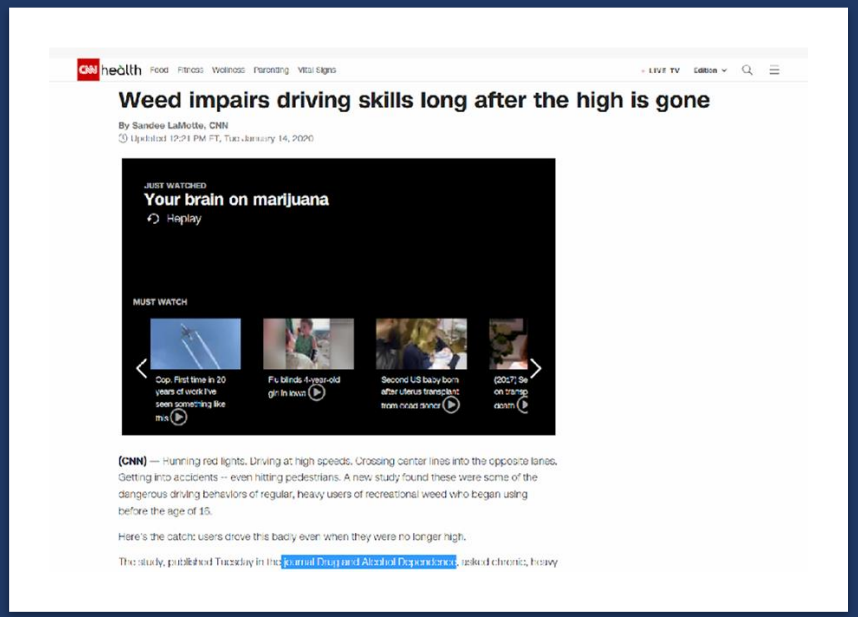
Researchers tested participants in a driving simulator.

Jan. 15, 2020, 9:23 AM EST

By Linda Carroll

Even when sober, some heavy marijuana users are dangerous drivers, a new study suggests.

The bad driving appears to be isolated to those who started using pot before age 16, researchers reported Tuesday in Drug and Alcohol Dependence. The theory is that early marijuana use changes the brain, leaving people more impulsive and more apt to make rash



CNN health Food Fitness Wellness Parenting Vital Signs LIVE TV Edition

Weed impairs driving skills long after the high is gone

By Sandee LaMotte, CNN

Updated 12:21 PM ET, Tue January 14, 2020

JUST WATCHED

Your brain on marijuana

Replay

MUST WATCH

Cop: First time in 20 years of work I've seen something like this

Ft. Hood 4-year-old girl in town

Second US baby born after uterus transplant from dead donor

(2017) Se on transp death

(CNN) — Running red lights. Driving at high speeds. Crossing center lines into the opposite lanes. Getting into accidents -- even hitting pedestrians. A new study found these were some of the dangerous driving behaviors of regular, heavy users of recreational weed who began using before the age of 15.

Here's the catch: users drove this badly even when they were no longer high.

The study, published Tuesday in the Journal Drug and Alcohol Dependence, asked chronic, heavy

Drug and Alcohol Dependence 208 (2020) 107771

Contents lists available at ScienceDirect

Drug and Alcohol Dependence

journal homepage: www.elsevier.com/locate/drugalcdep

Full length article

Recreational cannabis use impairs driving performance in the absence of acute intoxication

M. Kathryn Dahlgren[a,b,c], Kelly A. Sagar[a,b,c], Rosemary T. Smith[a,b], Ashley M. Lambros[a,b], Madeline K. Kuppe[a,b], Staci A. Gruber[a,b,c,*]

[a] Cognitive and Clinical Neuroimaging Core, McLean Imaging Center, McLean Hospital, Belmont, MA, USA
[b] Marijuana Investigations for Neuroscientific Discovery (MIND) Program, McLean Imaging Center, McLean Hospital, Belmont, MA, USA
[c] Department of Psychiatry, Harvard Medical School, Boston, MA, USA

ARTICLE INFO

Keywords:
Cannabis
Marijuana
Driving
Safety
Age of onset
Executive function
Impulsivity

ABSTRACT

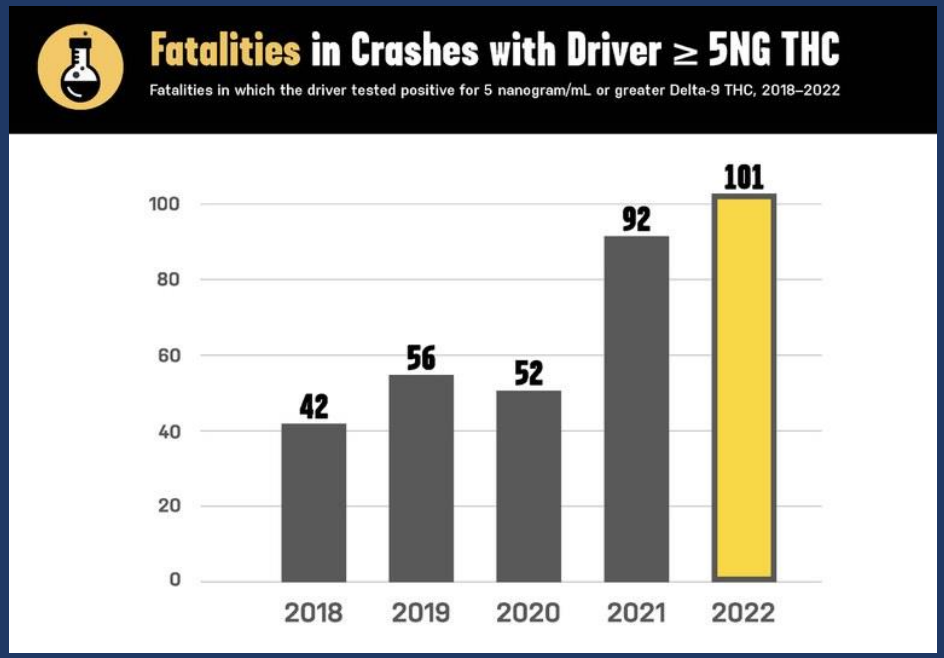
Background: Across the nation, growing numbers of individuals are exploring the use of cannabis for medical or recreational purposes, and the proportion of cannabis-positive drivers involved in fatal crashes increased from 8 percent in 2013 to 17 percent in 2014, raising concerns about the impact of cannabis use on driving. Previous studies have demonstrated that cannabis use is associated with impaired driving performance, but thus far, research has primarily focused on the effects of *acute* intoxication.

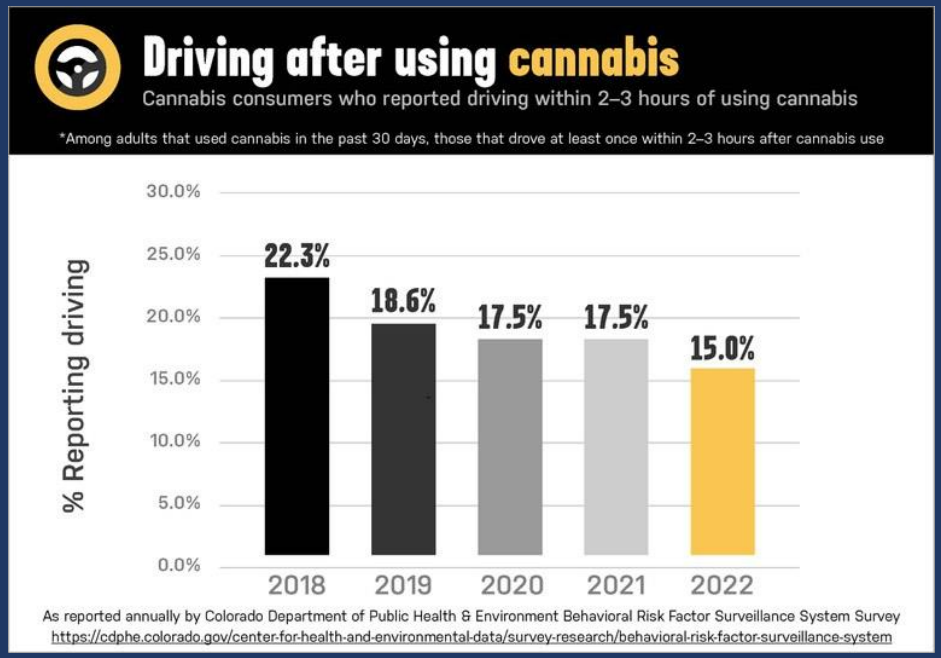
Methods: The current study assessed the potential impact of cannabis use on driving performance using a customized driving simulator in *non-intoxicated*, heavy, recreational cannabis users and healthy controls (HCs) without a history of cannabis use.

Results: Overall, cannabis users demonstrated impaired driving relative to HC participants with increased accidents, speed, and lateral movement, and reduced rule-following. Interestingly, however, when cannabis users were divided into groups based on age of onset of regular cannabis use, significant driving impairment was detected and completely localized to those with early onset (onset before age 16) relative to the late onset group (onset $\geq$16 years old). Further, covariate analyses suggest that impulsivity had a significant impact on performance differences.

Conclusions: Chronic, heavy, recreational cannabis use was associated with worse driving performance in non-intoxicated drivers, and earlier onset of use was associated with greater impairment. These results may be related to other factors associated with early exposure such as increased impulsivity.

Data from Colorado





Data for pain mgt

Cannabinoids for Medical Use

Original Investigation | Substance Use and Addiction

Year-Long Cannabis Use for Medical Symptoms and Brain Activation During Cognitive Processes

Debbie C. L. Burdinski, BS[1,2]; Alisha Kodibagkar, MSE[1,3]; Kevin Potter, PhD[2,4] ; et al

Author Affiliations | Article Information

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JAMA Netw Open
Published Online: September 18, 2024
2024;7;(9):e2434354.
doi:10.1001/jamanetworkopen.2024.34354

Key Points

Question Is there an association between year-long cannabis use for medical symptoms and brain activation during cognitive processes implicated in cannabis use?

Findings In a cohort study of adults who newly obtained medical cannabis cards for symptoms of depression, anxiety, pain, or insomnia, functional magnetic resonance imaging measures during working memory, reward, and inhibitory control tasks did not differ statistically from baseline to 1 year and were not associated with changes in cannabis use frequency.

Meaning The absence of activation differences in this study suggests that adults using cannabis for medical symptoms over 1 year may not experience significant changes within reward, working memory, or inhibitory control domains.

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Risk vs benefit

Benefits

- Nausea/ Vomiting
  - PONV vs CINV
- Chronic Pain
- Tourette Syndrome
- Depression
- MS
- Glaucoma
- Anxiety/Depression
- Epilepsy
- Appetite Stimulation
- PTSD

Risks

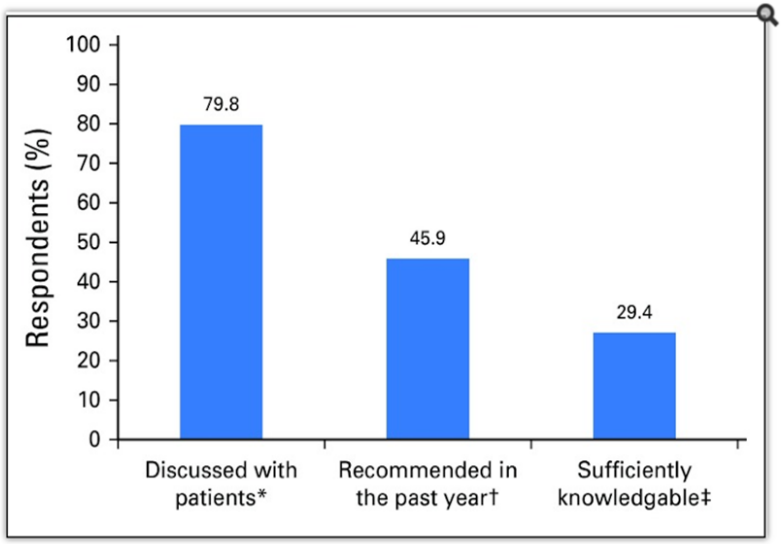
- Shivering
- EKG changes (chronic vs short term)
- Myocardial depression with concomitant cardiac medications
- Airway irritation (smoking/Vaping)
- Decrease peristalsis
  - Aspiration risk
  - Post – op complications
- Cytochrome P450 interactions
- Prothrombotic/anticoagulant (+/-)
- Variable post op pain needs
- ** variability

A word about the clinician

- 3.9 million persons nationwide are state-authorized to use Medical Marijuana
- 62 million Americans
  - 25 % of the adult population report using marijuana in the past year
- 17.7 million using it daily or near-daily

J Clin Oncol. 2018 Jul 1; 36(19): 1957–1962.
Published online 2018 May 10. doi: 10.1200/JCO.2017.76.1221

Fig 1.



Surgical guidance – MSK

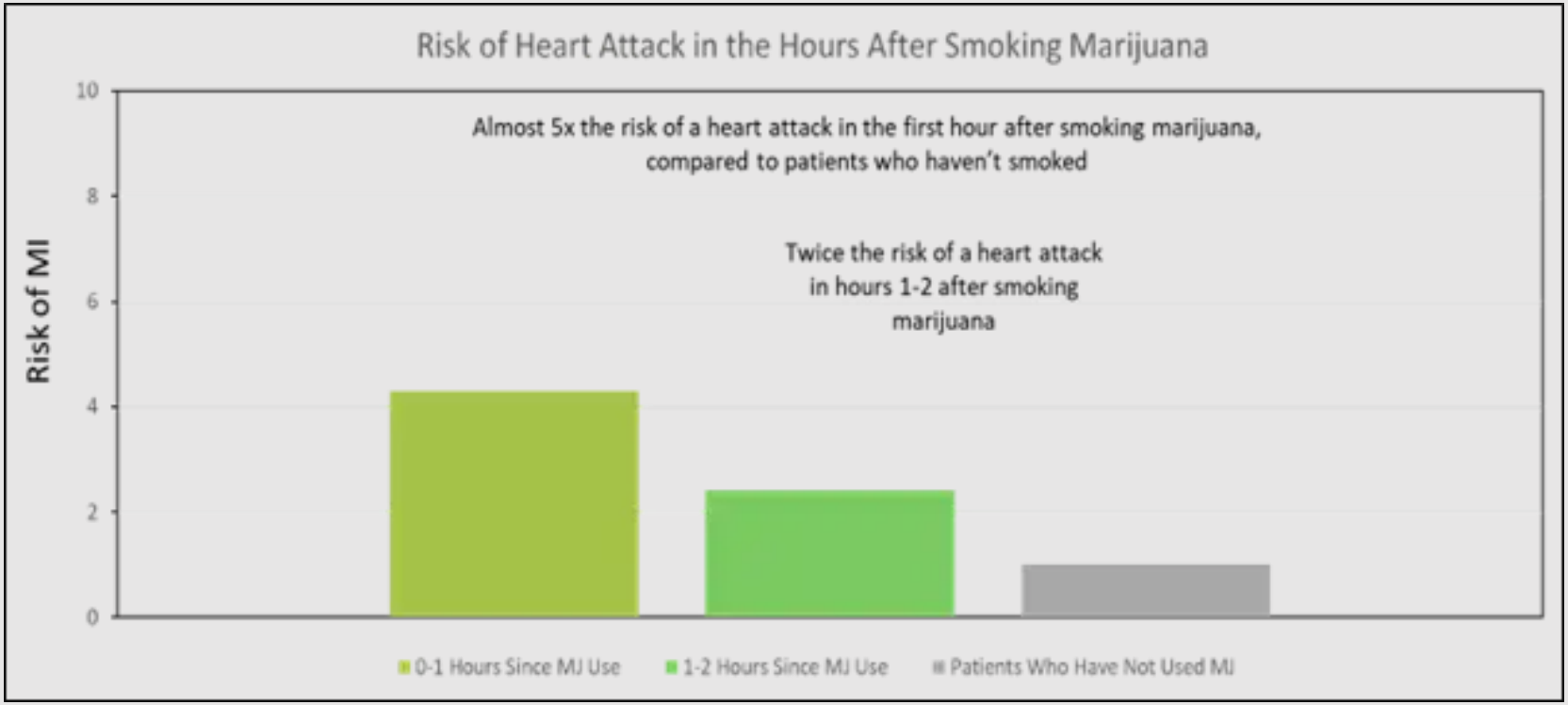
MISCELLANEOUS AGENTS

MEDICATIONS:	SURGICAL PROCEDURES	GI/ENDOSCOPY	INTERVENTIONAL RADIOLOGY
CHANTIX	HOLD DOS	CONTINUE DAY OF PROCEDURE	CONTINUE DAY OF PROCEDURE
NICOTINE PATCH	REMOVE DOS; *EXCEPT FOR PLASTICS – NO NICOTINE SUPPLEMENT X 1 WEEK PRIOR AND 6 WEEKS POST PLASTIC SURGERY*	CONTINUE DAY OF PROCEDURE	CONTINUE DAY OF PROCEDURE
Transdermal Patches (all regardless of opioids)	CONTINUE DOS if outpatient procedure CONTINUE to wear DOS but will be removed in PSC for all inpatient	CONTINUE DOS if outpatient procedure	CONTINUE DOS if outpatient procedure
NASAL SPRAYS	MAY CONTINUE DOS IF NEEDED	CONTINUE DAY OF PROCEDURE	CONTINUE DAY OF PROCEDURE
DECONGESTANTS (PHENYLEPHRINE, PSEUDOEPHEDRINE)	HOLD DOS	HOLD DOS	HOLD DOS
FLEXERIL AND OTHER MUSCLE RELAXANTS	Continue DOS	Continue DOS	Continue DOS
GUIFENISAN	HOLD DOS	HOLD DOS	HOLD DOS
CANNABIS /MEDICAL MARIJUANA/CBD Oil	AVOID 72 HOURS PRIOR TO SURGERY	AVOID 72 HOURS PRIOR TO SURGERY	AVOID 72 HOURS PRIOR TO SURGERY

System and route	Short- or long-term use	Potential anesthetic implication	Anesthetic considerations
Respiratory Route: inhalation	Short- or long-term	Bronchial irritation and reactive airway; increased airway secretions	• Give preoperative antisialagogue • Administer preoperative aerosol treatment if there is active congestion or wheezing • Consider use of a supraglottic airway over endotracheal intubation • Consider deep extubation
Cardiovascular Route: inhalation, oral, other methods	Short-term	Sympathetic effects of tachycardia and hypotension (note: tolerance to these effects occurs with long-term use)	• Avoid agents that cause tachycardia • Provide vasopressor support as needed
	Short- or long-term	Potential for sympathetic blockade and bradycardia with high doses and long-term use	• Treat symptomatic bradycardia
Gastrointestinal Route: oral	Short-term	Aspiration potential if solid food containing cannabis was ingested	• Perform rapid sequence induction • Give aspiration prophylaxis
Liver and Renal Route: inhalation, oral, other methods	Long-term	Enzyme inhibition or induction with unpredictable metabolism of anesthetic agents	• Carefully titrate enzyme-dependent anesthetic agents • Patient may require higher doses of induction agents
Neurologic Route: inhalation, oral, other methods	Short-term Long-term	Unpredictable additive or inhibitory interaction with sedatives	• Carefully titrate sedatives and anesthetic agents • Patient may require higher doses of induction agents
Cognitive Route: inhalation, oral, other methods	Short-term	Psychoactive activity	• Consider obtaining informed consent from a proxy

Table 2. Anesthetic Considerations of Cannabis Use[13,29]

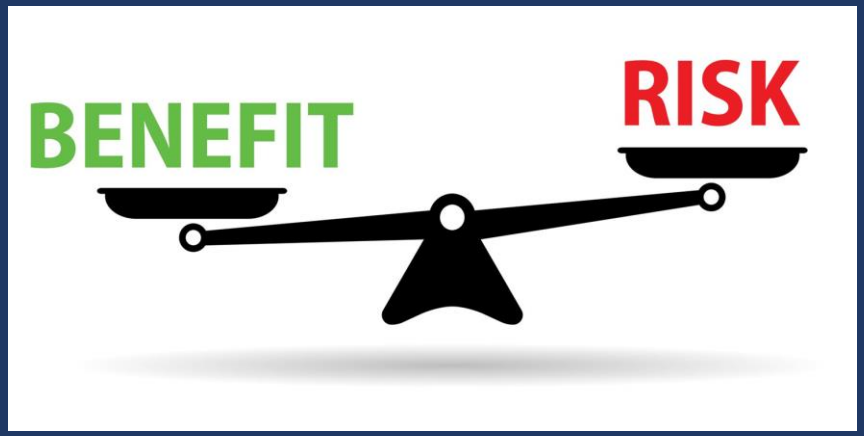
ACS – Stop 72 hours before GA



Mittelman MA, et al. Circulation. 2001;103:2805-2809.

Implications

- Increased use
- Understand type of marijuana used
  - Recreational vs medical certified
- Delay Elective surgery
  - Recreational
- Be prepared
  - manage side effects
  - complications
  - safe discharge home
- Useful but not without risk



Healthcare Workers

- Chronic vs acute use
- Fitness for duty
- Policy on use

SHRM Membership Learning Events Resources Community Shop

Table 2.

Past 30-Day Use of Cannabis and Risk of Injury

Past 30-day use of cannabis	Increased risk of injury	Odds ratio
1–9 Times	1.37	1.06–1.77
10–39 Times	1.51	1.03–2.21
40+ Times	2.47	1.64–3.71

- SHRM 2022
- Hazle et. al. (2022) Workplace Cannabis Policies

Fact VS Fiction

- Medical Marijuana cures cancer
- Medical marijuana can help with certain conditions
- Its completely safe because its natural
- Different components matter
- CBD is risk free
- Marijuana is not risk free
- Everyone can benefit from medical marijuana
- Regulation varies

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