SUP SB 708 - marijuana legalization.pdf
Uploaded by: Caroom, Philip
Position: FAV

SUPPORT SB 708 – MARIJUANA LEGALIZATION

MARYLAND ALLIANCE FOR JUSTICE REFORM
Working to end unnecessary incarceration and build strong, safe communities

To: Chair Will Smith and Senate Judicial Proceedings Com. members March 4, 2021
From: Phil Caroom, MAJR executive committee

Maryland Alliance for Justice Reform (MAJR - www.ma4jr.org) strongly supports SB 708 plans for legalization, safe regulation, public education, and tax revenues finding historic evidence shows this will provide substantial net benefits to public safety, public health and taxpayer savings. We also recognize that recent polls strong public support both in Md. (57%) and nationwide (67%) for such action. Particularly, when Maryland's neighboring jurisdictions (Virginia and D.C.) recently have passed similar legislation, Maryland should do so also for fiscal & law enforcement reasons.

The historic evidence: Marijuana possession wasn't always illegal in the U.S. In 1937, a federal excise tax was charged; in 1951, a federal penalty for possession of up to two years first was imposed. When federal "controlled dangerous substance"(CDS) schedules were created in 1970, marijuana was classed as Schedule I for drugs "having a high potential for abuse, no currently accepted medical use in treatment in the United States, and a lack of accepted safety for use of the drug or other substance under medical supervision." (Maryland law, of course, already has declared that classification to be wrong.) Many previous recommendations to decriminalize marijuana have been made by various governmental commissions--notably including an early one, in 1972, rejected by President Richard Nixon.

Public safety and public health benefits: As with Prohibition of alcohol in the 1920s and 1930s, criminalization of marijuana has led to proliferation crime cartels, violent crime among drug dealers, increasingly strong and toxically impure products, stigma for seeking related healthcare, much higher government costs for law enforcement and incarceration, and loss of massive potential tax revenue.

Disparate racial impact in criminal justice enforcement: Another serious problem with marijuana's criminal status involves systemic racism: While studies show that white and black Americans use the drug at similar rates, blacks are arrested, charged and incarcerated at multiple times greater rates than whites. One estimate is that 88% of all marijuana possession arrests are made against blacks. The resultant economic and social costs to families and communities are unacceptable and should be eliminated.

Taxpayer savings and revenue benefits available for public education and other needs: Marijuana decriminalization still would leave enforcement problems and negative impacts on families and communities. Decriminalization and regulation, as has long been done with alcohol sales, is the answer. In Massachusetts—a state comparable in size to Maryland, first year tax revenues on legal marijuana sales reached nearly $400 million. Huge savings also would be used by reduction of current governmental law enforcement and incarceration costs. Such revenue is sorely needed in Maryland and could be used for crime prevention and education.

Other states' examples: Eleven U.S. states have legalized marijuana use recreationally and 33 have legalized medical marijuana use. Some estimate that the cascade of legalization could reach 40 U.S. states in the coming year. Notably, Maryland's neighbor Virginia already has decriminalized up to one ounce of marijuana, eff. 7/1/20, subject to a $25 fine and no incarceration; complete legalization legislation is under consideration.

Ample evidence-based studies have compared the legal systems established in U.S. states that have legalized marijuana, identifying best practices to regulate product safety, minimize juvenile use, anticipate traffic and health concerns, and maximize tax revenues. Maryland's legislative leaders have conducted a multi-year study of other U.S. states' experience with marijuana legalization and SB 708 constitute the well thought-out result. MAJR, again, strongly urges support for this long overdue public policy change.

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PLEASE NOTE:

1) *A digital version of this written testimony is available at https://www.ma4jr.org/marijuana/* with hyperlinks to all factual statements, surveys and studies referenced herein.
2) *Phil Caroom files this testimony for MAJR and not for the Md. Judiciary.*

SB708_Feldman_SFM_SIX_AdultUseCannabis_Crosstabs (

Uploaded by: Feldman, Brian

Position: FAV

Source: January 25-February 3, 2021 Maryland 2021 Session Poll TargetSmart

Q. 27 E. Legalize and tax the sale of adult use of cannabis.

Party Affiliation

	Total	Democrat	Unaffiliated	Republican
Support Strongly	53	57	56	40
Support Somewhat	22	53	17	24
Oppose Somewhat	10	9	12	10
Oppose Strongly	11	6	12	20
Unsure	5	6	3	6
Total Support	75	80	73	64
Total Oppose	20	14	24	30
Total Support – Total Oppose	55	66	49	34

Geographic Area

	Total	Baltimore County	Montgomery Co.	Prince George's Co.
Support Strongly	53	46	50	63
Support Somewhat	22	24	17	21
Oppose Somewhat	10	12	13	10
Oppose Strongly	11	14	14	2
Unsure	5	4	7	5
Total Support	75	69	67	83
Total Oppose	20	26	26	12
Total Support – Total Oppose	55	41	41	72

			Race		Gender	
	Total	White	Black	POC	Men	Women
Support Strongly	53	53	58	56	48	57
Support Somewhat	22	23	24	21	25	20
Oppose Somewhat	10	7	11	11	11	9
Oppose Strongly	11	11	3	8	11	9
Unsure	5	6	5	5	5	6
Total Support	75	76	81	77	73	77
Total Oppose	20	18	14	18	22	18
Total Support – Total Oppose	55	58	67	59	51	59

NFranklin SB708 FAV.pdf
Uploaded by: Franklin, Neill
Position: FAV

LAW ENFORCEMENT ACTION PARTNERSHIP
ADVANCING JUSTICE AND PUBLIC SAFETY SOLUTIONS

121 Mystic Avenue, Suite 9
Medford, Massachusetts 02155
T: (781) 393.6985

Date: March 4, 2021

Re: SB 708 - Cannabis – Legalization and Regulation

Position: SUPPORT

To: The Maryland Senate Finance Committee

Distinguished Members of the Committee,

Thank you for the opportunity to testify in support of SB 708 today. Having spent my career with the Baltimore City and Maryland State Police Departments, I believe I have a responsibility to discuss the public safety impacts of the legalization and control of marijuana.

In addition to my public safety career, I am a speaker and the former Executive Director for the Law Enforcement Action Partnership (LEAP). LEAP is a nonprofit group of police, prosecutors, judges, and other criminal justice professionals who speak from firsthand experience. Our mission is to make communities safer by focusing law enforcement resources on the greatest threats to public safety and working toward healing police-community relations.

As Commander of the Bureau of Drug and Criminal Enforcement, I was dismayed to see scarce police resources spent on marijuana arrests. Every marijuana arrest took hours away from investigating homicides and attempted murders. We need our police to focus on the greatest threats to public safety -- and marijuana is not one of them.

In fact, I learned the hard way that arresting someone for selling marijuana makes things worse on the street. Every officer knows that an arrest does not stop the marijuana trade. Instead, it creates a job opening, tempting kids with an easy opportunity to make money. And it introduces young people into the justice system, where a felony charge will lock them out of employment, education, and housing opportunities. Our entire society loses every time another job opens up in the illegal marijuana trade.

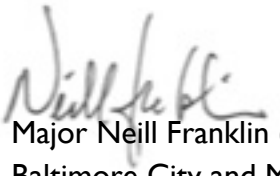
Enforcing drug laws not only wastes the time of our officers and the potential of our youth, it also destroys community trust. You already know how devastating the effects of Freddie Gray's death in police custody have been -- one of the greatest implosions in police-community relations since Rodney King. Freddie Gray had been in and out of handcuffs since age eighteen for selling drugs. We cannot place all of the blame on the officers responsible for his death -- when we ask officers to fight a war against young people who sell drugs, some officers are going to treat them as enemies rather than as children of families in the community. By putting the marijuana trade in the hands of young people, we are setting ourselves up for tragedies that lay waste to community trust.

Without community trust, police cannot protect public safety. Since the killing of Freddie Gray in April 2015, homicide rates in Baltimore have been sky-high. When people do not trust the police, our detectives cannot close cases. We must protect police-community trust as one of our most valuable public safety resources, and our War on Drugs is front and center in destroying that trust.

I am proud to see my legislators supporting SB 708, which would put us on the right path by legalizing and regulating marijuana. This bill would stop the cycle of tempting young people to sell marijuana and then introducing them into the justice system, because it would move the marijuana trade from street corners and school parking lots to regulated dispensaries.

We are at a critical time for our state and nation. We need to do more to gain back the trust of the communities we took an oath to protect and serve. I believe that SB 708 is an important step forward to restore trust and improve public safety.

Thank you for the opportunity to share my experience in support of this bill.



Major Neill Franklin (Ret.)
Baltimore City and Maryland State Police Departments
Speaker and Executive Board Member, Law Enforcement Action Partnership

SB708 - MoCo - (GA2021) Support.pdf
Uploaded by: Frey, Leslie
Position: FAV

OFFICE OF THE COUNTY EXECUTIVE

Marc Elrich
County Executive

March 4, 2021

TO: The Honorable Delores Kelley
Chair, Finance Committee

The Honorable Guy Guzzone
Chair, Budget & Taxation Committee

FROM: Marc Elrich
County Executive

RE: SB 708, Cannabis - Legalization and Regulation, Support

Senate Bill 708 would enable adult Marylanders to use and possess a limited amount of cannabis for personal, non-medical use. The bill includes important provisions to automatically expunge any records of possession of cannabis incurred before October 1, 2022 that would have otherwise been permitted under Senate Bill 708 if it had been enacted at the time of the charges, and to allow any person incarcerated for possession, cultivating, processing or sale of cannabis to apply for resentencing. The bill also provides for the Cannabis Education and Training Fund, the Community Reinvestment and Repair Fund, and the Social Equity Start-Up Fund, which are meaningful tools that will enable individuals and communities previously adversely impacted by the criminalization of cannabis to participate in the legal cannabis economy.

In addition to creating a new industry within the state and paths to participate in it for many Marylanders who have historically been harmed by the criminalization of cannabis, Senate Bill 708 also enables the State and local jurisdictions to generate revenue from sales and use taxes and excise taxes. At a time when the economic future of the State and local governments is uncertain and the needs of our citizens are arguably greater than ever before, a revenue stream with potential to have a significant impact on our ability to serve Marylanders should not be ignored. The need for increased revenue across the State is great and this bill is a meaningful way to help meet the need.

The Montgomery County Executive supports Senate Bill 708 and respectfully urges the Committee to issue a favorable report.

cc: Members of the Finance Committee
Members of the Budget & Taxation Committee

SB708 FAV Baltimore Harm Reduction Coalition.pdf
Uploaded by: Gudlavalleti, Rajani
Position: FAV

March 4, 2021

The Honorable Delores Kelley
Miller Senate Office Building, 3 East
Annapolis, Maryland 21401

SB 708 - Cannabis – Legalization and Regulation - FAVORABLE

Dear Chair Kelley and Senate Finance Committee members,

Baltimore Harm Reduction Coalition (BHRC) is an advocacy organization that mobilizes community members for the health, dignity, and safety of people targeted by the war on drugs and anti- sex worker policies. As a certified Overdose Response Program, Naloxone distributor, and syringe service program, we have provided essential health care services across the state for years. To supplement the life-saving services provided by us and dozens of harm reduction programs across the state, BHRC supports SB 708 - Cannabis – Legalization and Regulation.

BHRC supports SB708 and broader efforts to gain community reparation from over a century of harm. Over 145 years of criminalizing people - mostly Black people - who use drugs has devastated communities across the country. Maryland must prioritize the health, dignity, and safety of its residents, including systemic community healing after decades of over-policing and mass incarceration due to the war on drugs. The relationship between substance use, housing instability, incarceration, survival behavior, and racism are deeply intertwined. It is our Black community members who are most often subjected to this cycle of homelessness and incarceration, making up the majority of both homeless and incarcerated individuals in Maryland.

Adding to this incredible injustice and experiences of marginalization is the increasingly deadly overdose epidemic. During the first nine months of 2020, as the deadly COVID-19 pandemic flooded the U.S. and Maryland, drug and alcohol related intoxication deaths in Maryland reached a staggering 2,025 fatalities. Compared to the same period in 2019, overdose fatalities increased by over 35% among Black Marylanders.[1]

In the midst of multiple intersecting public health crises, Marylanders deserve the modicum of relief that this bill provides by reducing policing, surveillance, and incarceration for cannabis possession. It is the least we can do to begin a path towards repair for unjust laws and community devastation -- waged in part by mass criminalization and the war on drugs. **We ask that the Senate Finance Committee give SB708 a favorable report.**

For more information about the Baltimore Harm Reduction Coalition or our position, please contact our Director of Mobilization, Rajani Gudlavalleti at Rajani@BaltimoreHarmReduction.org.

[1]Maryland Department of Health (Jan 2020). Unintentional Drug- and Alcohol-Related Intoxication Deaths* in Maryland Data update through 3rd quarter 2020.

MOST_SUPPORT_SB708.FINAL.pdf
Uploaded by: Mitchell, Ellie
Position: FAV

MOST NETWORK
Leaders in Youth Development

March 4, 2021

SB 708–Cannabis Legalization & Regulation- SUPPORT

Dear Chair Guzzone, Vice-Chair Rosapepe, and Members of the Budget & Taxation Committee,

The Maryland Out of School Time Network (MOST) is a statewide organization dedicated to closing opportunity gaps by expanding both the quantity and quality of afterschool and summer learning opportunities for school-aged young people. MOST is one of the fifty statewide networks supported by the Charles Stewart Mott Foundation and serves as Maryland's affiliate to the National Afterschool Association.

We strongly support the provisions outlined in SB708 as a necessary measure to protect our state's learning communities. The bill, if passed, would support an increase in resources available to build capacity of youth development organizations to serve more young people, providing the opportunities they need to thrive and succeed and avoid the school to prison pipeline.

It is well known that the criminal justice system disproportionately penalizes communities of color when it comes to drug prevention and enforcement. Even after the Maryland General Assembly decriminalized marijuana across the state in 2014, black residents still made up more than 90% of those arrested for marijuana possession despite nearly equal rates of marijuana consumption among black and white communities. Though it was a welcome improvement, the 2014 law failed to adequately address the effects that drug prevention policies have had on racial equity in our state. The proposed legislation would go a long way towards remedying these pernicious remnants of the war on drugs by abolishing the excessive punishments frequently given out for this non-violent crime.

A marijuana possession charge has devastating socioeconomic consequences for all offenders, but this is especially true with regards to young people. As many of our residents know all too well, the long arm of **the criminal justice system has the potential to follow offenders long after they've served their sentence**. A criminal record makes it harder to receive student financial aid and find a job. A criminal record limits housing options, reinforcing the detrimental effects of generational poverty. In this way, the drug policies enforced by our criminal justice system have undoubtedly entrenched the so-called school-to-prison pipeline both in our own state and around the country. **We must not allow the criminal justice system to be more damaging to a young person's development than the drug which brought them to court in the first place.**

Luckily, there are more constructive alternatives to drug use prevention. Education has long been an essential component of these initiatives, and **afterschool programming is uniquely capable of providing an effective bulwark against drug use and other risky behaviors**. Data collected by the FBI shows that national juvenile delinquency rates are highest from 2-6pm on school days. While didactic drug education programs remove students from the classroom and produce mixed results when it comes to drug prevention, afterschool programs provide at-risk students with structure and fulfillment during these critical hours. They engage students by catering to the things they love most while fostering a sense of self-efficacy and community among our young people. **Athletics, science, and the arts should be at the center of our drug prevention policy, not punishment and coercion.**

Maryland Out of School Time Network
1500 Union Ave / Suite 2300
Baltimore MD 21211 / 410 374-7692
www.mostnetwork.org

Our challenge lies in providing our communities with the resources they need to support these initiatives. At the moment, Maryland faces a significant shortfall in its afterschool programming, with our state ranking in the bottom ten when it comes to access to afterschool programs. From 2014 to 2020 the percentage of young people who would attend an afterschool program if one were available to them rose from 36 to 48% (that's 389,983 kids). As we have demonstrated, our failure to meet this demand does not merely amount to lost professional development opportunities for our students, it also deprives our most vulnerable young people of the structure they need to endure social challenges. For this reason, we strongly support the creation of a fund which specifically addresses the need for afterschool programming and youth development initiatives.

Ellie Mitchell
Director, Maryland Out of School Time Network
emitchell@mostnetwork.org
410-370-7498

Vireo_Health_Testimony_on_SB_708_-_Cannabis_-_Lega
Uploaded by: Pounds, Eddie
Position: FAV

Vireo

Senate Finance Committee
Miller Senate Office Building, 3 East Wing
11 Bladen St., Annapolis, MD 21401 - 1991

March 4, 2021

Testimony: SB 708 - Cannabis - Legalization and Regulation
Position: Favorable

Dear Chair Kelley and Members of the Finance Committee:

Thank you for your time and consideration on SB 708 - Cannabis - Legalization and Regulation. My name is Dr. Kyle Kingsley and I serve as the CEO of Vireo Health and its subsidiary, MaryMed, LLC, a vertically integrated operator licensed in Maryland. Vireo Health is a physician-founded, science-focused company dedicated to providing best-in-class cannabis-based products and unrivaled patient care. We are licensed to cultivate and produce cannabis products in 8 states including Maryland. Our team is comprised of physicians, scientists, engineers, and horticulturists that bring a broad spectrum of experience in best manufacturing practices and evidence-based medicine. We currently operate a 110,000 square foot cultivation facility in Massey, MD, with expansion underway to bring the total canopy to 180,000 square feet, a 22,500 square foot processing and manufacturing facility in Hurlock, MD and a Green Goods™ retail dispensary in Frederick, MD. The majority of our 64 Maryland employees are members of the United Food and Commercial Workers Union, Local 27.

We appreciate the sponsor's efforts to pass a comprehensive legalization and regulation bill that considers both the war on drug's disparate effects on minority and low-income communities, as well as the practical business issues that will arise in a newly legalized adult use marketplace. Vireo Health remains steadfast in our support of proposed cannabis reform legislation that helps ensure cannabis laws are inclusive and equitable. Our comments are based on this shared vision, as well as our experience operating in other states.

It is especially helpful that the legislation creates the Office of Social Equity within the Commission. The Office of Social Equity would be responsible for promoting and encouraging participation within the regulated cannabis industry by people from communities that have been disproportionately harmed by cannabis prohibition and enforcement. Through the proposed

Social Equity Start-Up Fund, and its Cannabis Education and Training Fund, we believe there is an opportunity to create an incubator program accessible to minority business applicants that can learn directly from experts in the industry. We certainly welcome any opportunity to help create the incubator program and facilitate its operations and efforts. *As such, we suggest an amendment that would include an incubator program within the Office of Social Equity.*

Combined with our mutual goal of increasing access to the cannabis industry to those that have been disproportionately harmed by prohibition, we know that Vireo Health and other cannabis companies can help Marylanders on both social and fiscal levels. We truly look forward to our partnership and our efforts together. Should you have any questions, or requests for more information, please feel free to contact us.

For these reasons, we respectfully urge the committee to vote favorably on SB 708.

Sincerely,

Kyle Kingsley, MD

CEO of Vireo Health, Inc. and MaryMed LLC

2021 MDMDA SB 708 FIN SWA.pdf
Uploaded by: Bagwell, Ashlie
Position: FWA

TESTIMONY ON BEHALF OF THE MARYLAND MEDICAL DISPENSARY ASSOCIATION

Senate Bill 708—Cannabis-Legalization and Regulation
SUPPORT with AMENDMENTS
Senate Finance Committee
March 4, 2021

The Maryland Medical Dispensary Association (MDMDA) was established in May, 2017 in order to promote the common interests and goals of the Medical Cannabis Dispensaries in Maryland. MDMDA advocates for laws, regulations and public policies that foster a healthy, professional and secure medical cannabis industry in the State. MDMDA works on the State and local level to advance the interests of licensed dispensaries as well as to provide a forum for the exchange of information in the Medical Cannabis Industry.

The MDMDA strongly supports the goal of Senate Bill 708. In addition to establishing a framework for adult-use cannabis legalization, this legislation includes some much-needed and long-overdue criminal justice reforms. We appreciate the proposal Senator Feldman has put forward, and respectfully request consideration of the following issues:

- We appreciate the lower tax rate proposed in Senate Bill 707 as opposed to the one proposed in House Bill 32. This means more people will be incentivized to transition into the legal market, thereby shrinking the illicit market. More people participating in the legal market will result in higher tax revenue for the state, rather than a higher tax rate. Consumers are sensitive to the price of products. Tax levels should be set to keep the final price of product competitive to what is available in the illicit market and with the tax rates of nearby jurisdictions and jurisdictions likely to legalize soon in mind, such as VA, NJ, PA and DC.
- As proposed, the Alcohol and Tobacco Commission would regulate the adult use market while the Maryland Medical Cannabis Commission would remain the regulating body of the medical program. While we take no position on who the ultimate regulator is, we would request that there be ONE regulator for both the adult use and medical markets. There are duplicate costs associated with maintaining two separate regulatory bodies. In addition, it is important that regulations are the same for medical and adult use programs, except for a small number of areas, since the products are substantially similar. Over the years, regulations have been adopted that address a myriad of important issues, like advertising, packaging, edibles etc. It does not make sense to recreate the wheel with regard to these regulations. Further, duplicate regulations could cause serious compliance issues for dual licensees, as it could be impossible to follow both if the regulations have contradictory requirements.

- We strongly believe that any adult use program fee structure should mirror the medical market fee structure, where fees are based on the amount of revenue generated by each type of license. This would mean that growers would have the highest fee, followed by processors and then dispensaries. While the initial renewal fee (on page 61, lines 2-16) is set up that way in Senate Bill 708, the social equity fee (on page 60, lines 5-19) is not. We would request the social equity fee be changed to reflect this fee structure.
- On page 65, line 26 through page 67, line 4, Senate Bill 708 prescribes a very specific scoring system for dispensary/retail applications while suggesting something less specific for the other license categories. We would request that all license categories be treated similarly, which means including a similar, specific scoring system in the bill for cultivators and processors or changing what is currently in the bill for dispensaries to match the less prescriptive language for cultivators and processors.
- We would request that ownership caps in an adult use market be similar to what exists in the medical market, which is one grower license per license holder, one processor license per license holder and four dispensaries per license holder. We believe that an ownership cap structure like this one prevents widespread consolidation and protects small businesses. In addition, we would respectfully request inclusion of ownership and control language similar to what appears in COMAR for the medical program, which prevents entities from skirting ownership caps.
- As we consider the different legalization proposals being contemplated this year, we believe the license cap proposed in Senate Bill 708, which is 47 additional dispensary licenses, is more realistic and enough, at least initially, to serve the population in both the medical and adult use markets. Current dispensaries have the capacity to service a large number of consumers and allocating one more dispensary per legislative district will protect the smaller dispensary licensees. In addition, we would urge the committee to consider ways to more evenly spread dispensary locations throughout the state so as to avoid the clustering of dispensaries in some geographic areas of the state. This would better ensure that small, unaffiliated dispensaries are more successful.
- We would request the creation of a low-tier cultivation license for unaffiliated medical dispensaries transitioning into the adult use market. Small cultivation licenses for dispensaries unaffiliated with a grower will create product and pricing stability. In addition, it will help to ensure more equitable distribution of flower across the market. Low tier cultivation licenses are an important step to ensure in an adult use market that dispensaries are able to withstand any short and long-term product shortages and any price instability.

We greatly appreciate the opportunity to provide comments on this important issue. We look forward to continuing to work with Senator Feldman as well as the members of the Senate Finance Committee as you deliberate further on this this legislation.

SB 708 Testimony 3.1.2021.pdf
Uploaded by: Berman, Gina
Position: FWA

RITUAL
DISPENSARY

March 1, 2021

Chairwoman Kelley and Members of the Maryland Senate Finance Committee,

I am writing today in support of SB 708.

I am an owner of a Medical Cannabis Dispensary in Anne Arundel County. I have read the proposed bill and I have a few comments:

1. Section 23-301 (A)(3)(III) states "Include procedures for suspending a dual license for a medical cannabis business that has failed to maintain reasonable prices and product availability for qualifying patients during the period of expedited licensing."

   As Dispensary-only licenses, we have no control over the product supply and pricing – those are determined by the processors and cultivators. Therefore, the responsibility should be placed on those businesses who determine pricing and availability to meet standards set in this legislation.

2. Allowing small cultivation licenses for Dispensary-only licenses would go a long way to help with the product availability issues expressed in #1, above. It would also allow us to have a small number of strains that consumers can depend on at our establishment.

3. The tax section 12.5-101 is unclear as to where the tax is imposed.

4. The excise tax increase being decided now for up to 7 years in the future might hamstring the program – the decision as to whether to raise taxes and by how much would be better decided closer to the time of the tax increase. The amount of tax increase should be dependent on how the program is doing and how that tax increase would impact diversion to the illicit market. There is no way to know this in 2021. If prices have not settled by 2025, a lower tax might be more prudent. I would recommend wording that, for example, would reflect that the tax rate would be reassessed starting April 1, 2025 and could go up to 15% depending on the supply of product, current pricing versus the illicit market and potential for diversion of current legal consumers to the illicit market. I would recommend the same for the proposed tax increase in 2027.

Thank you for your time and consideration,

Gina Mecagni Berman, MD
Clinical Director and Founder, Ritual Dispensary
gina@ritualdispensary.com

CANMD SB 708 FWA March4.pdf
Uploaded by: Bryce, Joe
Position: FWA

SENATE BILL 708 – FAVORABLE WITH AMENDMENTS

Cannabis - Legalization and Regulation

The Maryland Wholesale Medical Cannabis Trade Association (CANMD), an organization representing the majority of medical cannabis grower and processor licensees in Maryland, submits this statement in general support of Senate Bill 708, with some suggested changes. We applaud Senator Feldman for taking a leadership role on this issue, and particularly appreciate his focus on social justice and social equity in the proposal.

CANMD members have been, and remain, dedicated to creating and supporting a medical cannabis program in the State that provides a safe, affordable, accessible product for Maryland patients. While CANMD has not advocated for an adult use program in Maryland, our members believe that if the State makes the decision to move forward with such a program we have a valuable perspective on what has worked in Maryland's medical program and across the country, and that as well-regulated existing entities medical licensees should be included in any adult use program.

Our comments generally relate to the structure, regulation, and implementation of an adult use market. CANMD members fully embrace the criminal justice, social justice and social equity components of Senate Bill 708, but others in the advocacy and justice system communities are better equipped to lend expertise to those provisions. The comments below instead address programmatic issues.

Overall, Senate Bill 708 presents a sound framework for an adult use market, if that is the policy direction Maryland pursues. The proposal addresses social justice issues, promotes diversity and inclusion in the industry, and contemplates a well-regulated system that includes existing medical operators with sound records of regulatory compliance and the production of safe products. We look forward to working with Senator Feldman and the Committee on the conceptual issues that we identify here.

Regulatory Structure. As drafted, Senate Bill 708 places regulatory responsibility for the adult use program with the Alcohol and Tobacco Commission (ATC) while the Maryland Medical Cannabis Commission (MMCC) retains regulatory responsibility for the medical program. If enacted, this approach would contradict the approach taken in every other State that has adopted an adult use program while maintaining an existing medical program – one regulator should have responsibility for both programs. CANMD has no position on the particular entity that will be the regulator. However, there are several considerations that should be observed when making that decision.

First, Maryland should take advantage of the experienced personnel at the current MMCC, who have developed significant expertise in regulating the medical market. Staff is very knowledgeable and strict, but fair, and Maryland should take advantage of that experience. Second, the regulating entity's Commissioners/Board members should reflect the new mission of the entity – the qualifications of the current membership of the ATC and/or MMCC would have to be amended to meet that need. Finally,

the regulating entity should be a truly independent entity that can promulgate its own regulations and act swiftly and decisively when necessary to perform its duties.

Regulatory Provisions. As a related matter, Maryland's medical program is governed by a comprehensive set of regulations that have been developed over time by the MMCC based on best practices across the country (COMAR Title 10, Subsection 62.01-36). Senate Bill 708 dedicates several pages to topics that a new regulator must address through regulations – all of these programmatic issues are already incorporated in the current regulations, including security, seed-to-sale tracking, testing, diversion, labeling, advertising, child-proof packaging, transportation, crop protection, marketing to children, and many others. As a general matter, the regulations for the adult use program should reflect the current medical regulations unless there is a significant reason to differentiate – which should be the exception.

Existing medical cannabis grower, processor, dispensary and independent testing laboratory licensees. Senate Bill 708 reflects the practice in other States that allows medical cannabis licensees to participate in the adult use market. To participate, a medical licensee must have a solid regulatory record and commit to continuing to serve the medical market that remains after adult use is implemented. This approach benefits the State and consumers. The State benefits from having a set of businesses that have experience following State laws and policies on security, diversion, and the development of a safe product, to assist in the immediate production of taxable adult use products. Consumers benefit from knowing they are purchasing from established entities with a record of safety.

Appropriately and innovatively, Senate Bill 708 requires a payment from these medical licensees to a Social Equity Fund that can help provide much needed technical assistance and starting capital for new social equity applicants. This structure helps relieve a significant hurdle for small and minority businesses that may have difficulty acquiring capital to navigate the application process, secure property, and establish their new business. CANMD looks forward to working with the sponsor and the Committee to set an appropriate level of, and schedule for, these payments, an issue that is impacted by the current tax status of existing medical businesses at the federal and state level, as discussed below.

Licensing issues, including number, size, multiple ownership and license transfer. As drafted, Senate Bill 708 creates a system for 40 new grower licenses in addition to the 22 authorized medical licensees, unlimited processor licenses in addition to the 28 authorized medical licensees, and 47 dispensary licenses. The bill contradicts the current medical cannabis statutes with conflicting restrictions on ownership interest in multiple licenses, procedures for license transfer, different standards for employees, and limits on the size of cultivation operations. CANMD recognizes that some of these provisions are designed to enhance diversity in the program, which we support, and the bill clearly needs to provide for more "Tier 1" licenses to help further that objective. However, CANMD notes that all these provisions must be looked at comprehensively to ensure that the desired result is achieved.

For example, authorizing a large or unlimited number of new licenses may enhance participation opportunities. Alternatively, it may make it more difficult to establish and improve the odds of success of a social equity licensee. Similarly, size limitations may protect some entities from competition, but may inhibit growth of social equity businesses; allowing multiple ownership interests may allow some social equity applicants to expand their business opportunities, but also may concentrate ownership in larger non-diverse entities. There is not necessarily a simple answer to these issues, but it is necessary to work through them to achieve the result that is being sought. In addition to the above

considerations, it is important to view the number of licenses from the perspective of the regulator that will be responsible for ensuring compliance, maintaining a supply of safe product, and preventing product diversion.

Maintenance of a medical program. Senate Bill 708 generally requires that dual licensees (existing medical licensees) continue to serve medical patients "without increasing prices or reducing product availability" (page 50, lines 12-15). CANMD agrees that the medical program needs to be preserved and patients need to be served. However, the vague standard in the bill is difficult to interpret and likely impossible to meet. This is particularly true given the experience in other States that the existing medical program loses enrollment, often by large amounts, when an adult use system is put in place. Other States have used more measurable standards to regulate the supply to the medical market, and more precise standards should be put in place here.

As noted, the reduction of the patient count in a State that moves to adult use varies, but inevitably it declines. It is important, therefore, to ensure medical licensees can be converted to dual licensees, as Senate Bill 708 contemplates. Some of the potential restrictions on size, however, cause concern if medical licensees are capped as dual licensees. If that occurs, the dual licensee would be able to produce for the adult use market only the amount of product equal to the reduction in demand in the medical market. This is inefficient and is a particular impediment to the launching of the adult use market given the constraint on supply.

Finally, the bill should explicitly allow for the sale of certain medically oriented products (higher dosage, different delivery methods) in the medical market even if they are not permitted in the adult use market.

Taxation of medical and adult use cannabis businesses (280E). The cultivation, production and dispensing of cannabis – medical or adult use – are considered illegal business activities in the eyes of the federal government. These businesses are still required to pay federal and State taxes, however. Because of the illegal nature of the business, cannabis-related businesses are not allowed to deduct ordinary and necessary business expenses (because of Section 280E of the Internal Revenue Code), which include expenses associated with distribution, sales, administration, management, promotion, advertisement, overhead, and support. This also impacts Maryland taxes.

Application of 280E results in cannabis business owners being subjected to an effective tax rate as high as 90%. While there is a need to fix this at the federal level, Maryland can lessen the impact on Maryland business owners by allowing for the deduction of these expenses. This has been a major challenge for medical cannabis licensees in Maryland and should be fixed immediately. Failing to fix it will continue to have a disproportionate impact on those conducting a business activity that is permitted under Maryland law. This extraordinarily high effective tax rate also poses a challenge for medical businesses in making required payments into the Social Equity Fund as Senate Bill 708 requires.

Senate Bill 708 has language to address the State impact of 280E on page 82; it is worth noting that it is drafted differently than stand-alone bills that have been introduced this year and in prior Sessions (House Bill 271 and Senate Bill 900 are this year's bills).

Taxation of adult use cannabis. As noted above, as there will continue to be a medical market of some size in Maryland, Senate Bill 708 maintains the current tax exemption for medical products. The bill

states that whatever tax rate the State chooses, the tax should only be levied at the point of sale to the consumer. This structure helps avoid an unnecessary and undue burden to maintain separate inventories of medical and adult use products, which in almost all situations are identical products. The bill also appropriately prohibits the regulatory body from requiring such an inventory system.

The bill sets the initial tax rate imposed by the State at a relatively low level and phases up to higher levels as the market matures. This is helpful in trying to attract people to the legal market and keep them away from the illicit market.

Other issues. Many other details remain to be worked out. For example, it is unclear when dual licensees can begin to sell products in an adult use market. The bill contemplates licenses being awarded by mid-May 2022, but the required regulations are not submitted until October 1, 2022. Further, the bill is not clear on how dual licensees are permitted to open additional dispensaries – dual or adult use – as contemplated under current law. Additionally, based on the experience in the medical cannabis program, the bill likely cedes too much control over the program and facilities to local governments and sets various dates for Commission action that may be unrealistic.

In summary, if Maryland decides to adopt an adult use system, CANMD would like to lend the experience of our members in the medical market to help structure the program and make it successful. We also share the perspective that an adult use program must promote inclusion, address prior injustices, and ensure social equity. We appreciate Senator Feldman's efforts to make this possible.

Testimony SB 708 Cannabis.pdf
Uploaded by: Burton, Evelyn
Position: FWA

SARDAA
Maryland Chapter

Schizophrenia and Related Disorders Alliance of America
www.sardaa.org | *Shattering Stigma – Destroying Discrimination*

Testimony for SB 708, Cannabis - Legalization and Regulation, Senate Finance Committee
Date: March 4, 2021
From: Schizophrenia and Related Disorders Alliance of America (SARDAA),
Maryland Chapter, Evelyn Burton, Advocacy Chair
Position: SUPPORT with Amendments

The Maryland chapter of the Schizophrenia and Related Disorders Alliance of America (SARDAA) supports SB 708 because for those who choose to use cannabis, it will provide a standardized product and reduce the risk of adulteration with more harmful drugs.

However, we remain very concerned about the effects of cannabis use by those with schizophrenia and those with a genetic vulnerability to psychotic illnesses.

SB 708 requires the development of a scientifically accurate safety information label, handout, or both. It also requires that the safety label and/or handout advise of any adverse effects unique to younger adults, including effects related to the developing mind. However, we do not believe this provides adequate protection for those with schizophrenia or genetic vulnerabilities to psychotic illnesses.

According to the American Psychological Association, significant brain development occurs not just during the adolescent years but through the age of 24.[1] Schizophrenia is a developmental neurological brain condition that most frequently becomes evident between adolescence and 30 years of age.[2] In the July 2020 Marijuana Research Report of the National Institute of drug abuse,[3] it states "Recent research ... has found that people who use marijuana and carry a specific variant of the AKT1 gene, ... are at increased risk of developing psychosis. ... One study found that the risk of psychosis among those with this variant was seven times higher for those who used marijuana daily compared with those who used it infrequently or used none at all." In addition, the report found "Marijuana use has also been shown to worsen the course of illness in patients who already have schizophrenia."
.

Therefore, we request the following AMENDMENTS to SB 708:

1. Require that BOTH a label AND a handout be developed and that the label and the handout be provided with each cannabis product.
2. Require that warnings about the risk of worsening schizophrenia and the risk of psychosis in those with genetic vulnerabilities be required on the labeling and in the handout.
3. In Section 23-301(C)(3)(I)2 (page 57, line 14): Change "mind" to "brain."
4. If it cannot be determined that a consumer is at least 21 years of age, the retailer must require that Government-issued proof of age be shown before selling any cannabis product.

We believe it is essential for those with schizophrenia or at a high for psychosis be clearly warned that cannabis use poses increased and very serious risks for them. Our amendments would alert them to those risks. They would help protect those with schizophrenia from a worsening course of illness and help prevent early psychosis from developing in those with genetic risk of schizophrenia.

Thank you for your consideration of these amendments.

[1] https://www.apa.org/monitor/julaug04/brain#:~:text=The%20research%20also%20shows%20that,when%20making%20decisions%2C%20he%20said

[2] https://www.nimh.nih.gov/health/statistics/schizophrenia.shtml#part_156807

[3] https://www.drugabuse.gov/download/1380/marijuana-research-report.pdf?v=d9e67cbd412ae5f340206c1a0d9c2bfd

DC-W_SB708_FAV.pdf
Uploaded by: Carlin-Weber, Daniel
Position: FWA

Daniel J. Carlin-Weber
SB708 – FAV
Finance, Budget and Taxation Committees
3/4/2021

I am a firearms instructor and advocate of responsible firearms handling and ownership. Currently, I am certified by the Maryland State Police as a Qualified Handgun Instructor and regularly teach the course necessary to receive the Handgun Qualification License (HQL). I'm also a Utah Concealed Firearm Permit Instructor, and NRA Range Safety Officer and Basic Pistol Instructor. Since 2016, I have instructed Marylanders from all walks of life on how to safely operate firearms and the responsibilities that come with their usage. I come before you today to ask a favorable report of Senate Bill 708 with amendments.

Quite simply, I am supportive of any legislation that peels back criminal penalties and legalizes consumption and usage of substances that people choose to use on their own. As you will likely read and hear from a number of advocates on this bill, cannabis in particular is regularly used as a pretense to wrongfully initiate arrests or detainment by police, especially and disproportionately against people of color. This legislation recognizes the reality that cannabis usage, despite its illegalities, is pervasive by Marylanders of all walks and that the ship on stemming its usage has long sailed. Other states like Massachusetts, Colorado, New York, and many others have legalized cannabis use for personal purposes and our neighboring Virginia is close to doing the same.

As stated in my introduction, I am a firearms instructor, and no, I did not sign up to testify on the wrong bill. There are caveats when discussing the intersections of cannabis (or any illegally used drug) and guns. I have reluctantly had to turn students away because they have disclosed that

they consume or that they have a medical cannabis card. Why? Drug consumption is still recognized as illegal under federal law and nothing the state can do will change that fact. SB708 seems to propose in § 23-604 (g) and (h) that one's use of cannabis does not affect their ability to acquire or possess firearms or be issued a firearms license or carry permit under Maryland law. Someone who consumes, regardless of their needs or whether they're using for medicinal purposes, is strictly prohibited under federal law from possessing firearms or ammunition **completely**. See 18 U.S. Code § 922(d)(3). https://www.law.cornell.edu/uscode/text/18/922. Even merely having a medical cannabis card also constitutes as a prohibitor. Advocacy organization Maryland Shall Issue covers the legal issues surrounding cannabis and guns in thorough detail in testimony on previously submitted legislation before this body over medical cannabis. *2020 MDGA – Information Only Testimony on SB179 and HB73*. Maryland Shall Issue. https://bit.ly/3b8wdRo.

This is a painful reality and I *despise* this prohibitor, but having the state turn a blind eye to federal law in this regard could leave gun owners and potential owners with a false sense of security and liable to be prosecuted for using cannabis and having guns. When someone does a federal National Instant Background Check System (NICS) background check, (as this legislature requires of most firearms transactions now), a user of cannabis cannot legally pass it. They either have to disclose that they do use and admit that they are a prohibited person – which will fail them – or they ***have to lie***, thus breaking federal law. It stinks, but it is the current reality.

Furthermore, there are numerous references related to drug use ("Habitual user," for example) and being federally prohibited from firearms possession in Maryland's Public Safety Article and Criminal codes. Those **will** need to be updated should the State seek to protect otherwise innocent people from prosecution.

In one example, Public Safety Article § 5.117 states:

(c) A person may purchase, rent, or receive a handgun **only** if the person:

(1) (i) possesses a valid handgun qualification license issued to the person by the Secretary in accordance with this section;

(ii) possesses valid credentials from a law enforcement agency or retirement credentials from a law enforcement agency;

(iii) is an active or retired member of the armed forces of the United States or the National Guard and possesses a valid military identification card; or

(iv) is purchasing, renting, or receiving an antique, curio, or relic firearm, as defined in federal law or in determinations published by the Bureau of Alcohol, Tobacco, Firearms and Explosives; and

(2) is not otherwise prohibited from purchasing or possessing a handgun under State **or federal law.** (emphasis added)

All of this said, I do still applaud what the state is doing here with cannabis in general and perhaps this bill's provisions for firearms stand ready for whenever the federal government does finally get its act together. Responsible alcohol consumption does not eviscerate one's 2nd Amendment rights and the same usage of cannabis should not either. America's history is replete with examples of the expensive, deadly, and futile failures surrounding the prohibition of substances (and many other items…). It is refreshing to see the State working to legalize a common substance that is responsibly used by many Marylanders, but there needs to be an understanding of what is at risk if someone innocently violates these intertwined laws.

Daniel J. Carlin-Weber
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Senate Bill 708 testimony _ cartalemi.pdf
Uploaded by: Cartalemi, Carissa
Position: FWA

Hallaway LLC, dba Star Buds
5075 Belair Rd
Baltimore MD 21202

March 2, 2021

To: Senate Finance Committee – State of Maryland

RE: Senate Bill 708 -Cannabis – Legalization & Regulation

Dear Senate Finance Committee and Senator Feldman:

My name is Carissa Cartalemi, I am the Founding Treasurer of the MD Medical Dispensary Association and the Owner/Operator of Star Buds, a licensed medical cannabis dispensary. I am writing to you today to ask you to **support with amendments Senate Bill 708, which legalizes medical cannabis for adult use.**

The tax rate proposed has two problems which will result in high prices to the consumer: a tax rate that starts off too high and a progressive tax rate which assumes pricing will go down. Prices will not go down in our state because of supply limitations from the small number of growers here in Maryland.

Due to current supply constraints and the supply shortage we know is coming with Adult Use, I ask that you provide micro-grow licenses to unaffiliated dispensaries so that we may ensure some of the supply necessary for our customers.

Since the program began growers have not been able to meet the demand from our market. Ensuring a fair, stable tax rate and supply from a micro grow would help keep prices lower for the consumer. Therefore, I ask you today to consider both what is best for my business and the consumer and **vote to amend SB708 to include low tier cultivation licenses for unaffiliated dispensaries immediately and lower the tax rate as well as ensure the tax rate in stable over time (not progressive).**

Thank you for your time on this matter. If you would like to discuss this with me further, I can be reached at carissa@starbuds.us or 914-589-6566.

Sincerely,

Carissa Cartalemi
924 Stubblefield Lane
Baltimore, MD 21202

SB 708 adult use final.pdf
Uploaded by: Davis, Robert
Position: FWA

Date: 2-12-2021

Regarding: Senate Bill 708 – Testimony of Robert Davis R.Ph

Owner hi Tide dispensary/OC botanicals LLC (SD 38) Ocean City Maryland.

Good afternoon,

I would like to voice my support with amendments to Senate Bill 708.

The taxation structure proposed is a bit confusing as it discusses excise tax and or a sales tax to the final consumer? Please provide some clarity in the definition as that would be helpful. I believe it is particularly important that the tax rate be realistic and manageable. The proposed tax structure I think is reasonable but please ensure that a fair tax structure makes it to the final draft. My concerns would be a tax that would make the final price of the product too cost prohibitive, allowing black-market and the illegal cannabis market to not only survive but to thrive. Other states such as California, Oregon and Colorado have found over taxation has created a robust black-market and made it extremely difficult for legitimate regulated cannabis businesses to compete with the illicit black market.

The regulatory agency that oversees the medical cannabis program should also be the regulatory agency that oversees the adult use program. This makes complete sense as operators both on the medical cannabis side and the adult use program still have the same duties of protecting public safety and welfare and ensuring compliance with state regulations.

A micro-licensing grow program allowing dispensaries the ability to grow a small amount of their own product would be extremely beneficial for the patients within the state of Maryland by helping to supply the medical needs of our patients in each senatorial district. By being able to create and grow a small predictable supply of medical cannabis to be dispensed by that licensed dispensary will ensure patients within the state of Maryland will receive the medicine they need without severe supply chain issues arising. My business OC botanicals LLC/ hi Tide dispensary is an independently owned operation. A small micro grow will allow me to produce a small amount of medical cannabis that would directly benefit my patients in the area I serve. As the industry develops, we are seeing a tremendous number of multistate operators moving into

Maryland and these operators are buying up many dispensaries, processors and grow licenses. This type of business model, if it is left to continue unchecked will force me out of operation as I am dependent on the grows and processors selling product to my business. I am already experiencing shortages of product not being allocated to my business because multistate operators are utilizing the product, they are creating, for their own dispensaries to distribute and denying me the ability to purchase. Also, I am completely at the mercy of whatever price structure they offer as my purchase price. The intent from the beginning in the original application for the state of Maryland's medical cannabis program was to give an incentive for instate ownership thus providing jobs and wealth to the residents of Maryland state directly. We are all seeing that intent erode drastically. If I am to have hope to survive and not being forced to sell to one of these multistate operators, allowing independently owned in state dispensaries the opportunity to have a micro grow would be one of the few avenues available to correct this grave issue. Please, review this issue before it is too late, as the future will be Maryland patients money, being spent on medical cannabis, will be sent out of state to the multistate operators and ultimately will be at the detriment of the state of Maryland and all Maryland citizens.

Thanks for your time and the opportunity to present this statement.

Sincerely,

Robert H Davis R.Ph

Owner/Clinical Director

hi Tide Dispensary

TrilogyWellnessofMD.SB708AdultUseLegalization.pdf
Uploaded by: Dunst, Herman
Position: FWA

Trilogy Wellness of Maryland, LLC

9291 Baltimore National Pike, Ellicott City, MD 21042

MMMC Dispensary License #D-1800010

Testimony from Herman Dust, Trilogy Wellness President

SB 708 - Adult Use Legalization

Senators and Esteemed Colleagues:

Thank you for the opportunity to comment on the proposed Bill to establish adult-use cannabis in Maryland.

We applaud the inclusion of dual licensure that uses our existing expertise and infrastructure to fast-track the availability of product and revenue for the state. The position of Trilogy Wellness of Maryland is support with amendments.

Tax Rate:

The position of Trilogy Wellness is that the Tax proposed rate itself is fairly reasonable. A progressive tax rate that increases over time is based on market assumptions and customer assumptions that may not reflect the reality of the actual market in Maryland. It assumes that market prices decrease over time, which is not guaranteed, and we have seen the consumers are sensitive to prices in the medical market. It also assumes consumers will not choose to leave the legal market when the price to them does not decrease over time. A reasonable tax rate means more people will be incentivized to transition into the legal market, thereby shrinking the illicit market. More people participating in the legal market will result in higher tax revenue for the state, rather than a higher tax rate. In the Maryland medical market there is already competition with the DC market, which would show that market prices should not be expected to necessarily decrease over time.

One item to note-the proposed language in the tax section is also not clear - is this meant to be excise or sales tax?

Local authority:

The position of Trilogy Wellness is that including the local authority may slow down the licensing process significantly.

Regulatory body:

The position of Trilogy Wellness is that the same regulatory body should oversee both the adult use and medical program, regardless of the regulatory body chosen. Having more than one

regulatory body would add a level of complexity that is unnecessary, while increasing operating costs significantly for cannabis businesses with duel-licensure. Trilogy Wellness supports the adoption of medical regulations for the adult use market in all areas that make sense. We believe strongly in the medical efficacy of cannabis and believe that medical regulations are appropriate in some instances. As a business we are open for any lawmaker to visit us and we will be happy to discuss further and open our books for review.

Low tier cultivation licenses for unaffiliated dispensaries:

The position of Trilogy Wellness is that small cultivation licenses will create stability in product availability. Dispensaries should have a small number of strains that consumers can expect to find consistency at that facility. Additionally, allowing licensees to produce small amounts of flower product will help stabilize prices in the market and make more affordable products available to consumers and dispensaries overall. Allowing small cultivation licenses will also ensure a more equitable distribution of flower across the market.

In the case of Trilogy Wellness, our dispensary continues to experience shortages in available and consistent flower product in the medical market. Most small dispensaries that are unaffiliated with growers are unable to source enough flower for the demand or their patient and customer bases and consistency of strain availability and this is an on-going problem.

Additionally, early granting of these licenses will help us manage any potential impact to our medical patients as we implement adult-use.

Equitable treatment for all license categories:

The bill legislates how the application must appear for retailers only, but no other kinds of licenses. We would request that all license categories be treated similarly, which means including a similar, specific scoring system in the bill for cultivators and processors or changing what is currently in the bill for dispensaries to match the less prescriptive language for cultivators and processors.

Ownership caps and Geographic spread of dispensaries.

It is the position of Trilogy Wellness that the ownership caps should be similar to medical program (1-1-4) with inclusion of language currently in the medical program. The geographic spread of dispensaries is important and the proposed 47 is a reasonable number.

Additionally, we support an amendment to establish equitable treatment for existing licensees should their local jurisdiction opt out of adult-use cannabis sales. Choice of a location in another jurisdiction is needed if this should occur.

Thank you for your consideration of these amendments.

Herman Dunst, President Trilogy Wellness of Maryland

Testimony for Senate Bill 708.pdf
Uploaded by: Gray, Ezra
Position: FWA

3/2/2021

Honored Delegates,

My name is Ezra Gray, General Manager at Greenlight Therapeutics in Gambrills, MD, and I am writing this testimony in regards to Senate Bill 708. Let me start by thanking you for taking steps towards legalizing Adult Use. Adult Use has the potential to be hugely beneficial for the State of MD not only because of the tax revenue but also due to the many jobs this bill will take part in creating. However, as it is written currently there are multiple points that will prevent most of the small businesses like us from making this transition.

First, we have the tax rate. The original tax rate seems very reasonable. However, having a progressive tax structure makes assumptions about the market and its customer base that may not reflect reality in Maryland. It assumes that market prices will decrease significantly over that relatively short period of time and it also assumes that customers will not pull away from the legal market if prices do not come down as taxation goes up. Once the tax rate hits 20%, many of the small businesses will suffer and likely collapse. This serves to bolster the big businesses from out of state that have the money to take this hit, while muscling out the smaller, Maryland-based businesses.

Second, we come to ownership caps. If the cap remains as written, all small businesses in the industry will suffer. There will be nothing preventing the big businesses from consolidating licenses and muscling all of us out.

Finally, it seems to me that the medical market and adult use market should both be regulated by the same regulatory body and this entity should be governed by the state. Including local authority in the licensing process will only serve to slow down the licensing process. Putting the authority under one state-run regulatory body will allow for expedience and will cut down on the layers of possible bureaucratic delays. Licensing should be an equal opportunity venture and should not be impacted by local biases.

I cannot deny that this bill needs to pass, but without revision, the above points will serve to discourage a multitude of the small businesses from making the transition to adult use and will ensure the dominance of big business in the cannabis industry. Therefore, in conclusion I support this bill with the following revisions: Taking away the progressive tax rate; Decreasing the number of licenses each owner can be involved in; Taking licensing out of the hands of local authorities.

Thank you for your consideration,

Ezra Gray

General Manager

Greenlight Therapeutics

SB 708 testimony.pdf
Uploaded by: Lemley, Warren
Position: FWA

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WELLNESS CENTER
2001 Chapman Ave.
Rockville, MD 20852

March 1, 2021

SB 708 Cannabis - Legalization and Regulation

Before the Senate Finance Committee

POSITION: FAVORABLE WITH AMENDMENTS

Dear Chair Kelley, and Vice Chair Feldman:

My name is Warren Lemley, and I am president of Peake ReLeaf, a medical cannabis dispensary, located in Rockville, Maryland. We strongly support the legalization of cannabis for adults. Legalization will lead to the creation of thousands of jobs in Maryland; result in substantial increase in tax revenue; shutter the black market; and finally, and perhaps most importantly, bring economic benefits to communities of color which have been disproportionately impacted by the "war on drugs." SB 708 provides a reasonable framework for the legalization of cannabis; however, several key amendments would greatly improve the bill. We suggest the bill be amended to change the legislation in the following manner.

SUGGESTED CHANGES

THE TAX RATE:

We appreciate that the tax rate proposed in SB 708 is lower as opposed to the tax rate proposed in HB 32 but believe a flat tax rate is more beneficial than a progressive tax rate. A progressive tax rate is built on the understanding that prices decrease over time and we believe the medical industry showcases how decreasing wholesale costs are not a given. Consumers are very sensitive to the price of products and Maryland's tax rate should be set to ensure prices in the regulated market are competitive to what is available in the black market and comparable or preferably lower to the tax rates proposed in nearby jurisdictions moving toward legalization as well. A lower rate drives consumers away from the black market and to the regulated market and ensures Maryland is not denied much needed tax revenue.

REDUCE THE FEES:

The licensing fees are simply too high to ensure robust participation by all segments of society. We suggest the bill be amended to mirror the current fee structure in the medical cannabis market. To that end, growers should pay higher fees than processors and dispensaries. Dispensaries fees should be lowest because they are saddled with high overhead and have thin margins. Moreover, dispensaries are unable to write off typical business expenses. Therefore, unless properly addressed, many dispensaries may struggle financially. The initial renewal fee reflects this but the social equity fee does not. We request that the social equity fee reflects the same fee structure.

REDUCE OWNERSHIP CAPS:

Ownership caps should be the same as they are in the medical cannabis market which allows one grower license, one processing license and 4 dispensary licenses per license holder. Lower caps help protect smaller businesses from consolidation and create a more sustainable and equitable program. This in turns helps create more opportunities for entrepreneurs. We also encourage the language concerning ownership limits and the prevention of management contracts in the medical cannabis industry to be adopted for the adult use industry as well.

THE NUMBER OF PROPOSED DISPENSARY LICENSES:

Dispensaries are expensive to own and operate. As stated above, margins are thin and an overabundance of dispensaries in a concentrated area could lead to business failures. It is for this reason that we think that the proposed license cap for SB 708 is more beneficial for the long term success for dispensaries. Additionally we encourage the committee to consider ways to ensure that the dispensary licenses are spread more evenly geographically to avoid clustering of dispensaries in areas throughout the State.

AWARD UNAFFILIATED DISPENSARIES LOW TIER GROW LICENSES:

Unaffiliated and independent dispensaries struggle to maintain inventory, specifically flower, because vertically integrated licensees prioritize their own dispensaries. Awarding dispensaries low tier grow licenses would also provide market sustainability which should bring down Maryland's high wholesale costs which is the second highest in the nation. See https://www.pricingguide.leaflink.com/2020, I have attached the report below as well. Finally, allowing dispensaries to operate low tier grow licenses would provide more diverse products and reduce patient costs.

ONE REGULATORY BODY FOR BOTH ADULT USE AND MEDICAL PROGRAMS:
There should be one regulatory body for both the adult use and medical programs. This will make oversight more efficient and save the State significant costs.

SCORING FOR APPLICATIONS:
We request all license types be treated and scored similarly. Currently SB 708 details a very specific scoring system for dispensaries while leaving less specificity for other license types. We request that the scoring system be changed to reflect the same scoring system for growers and processors as the dispensaries or changing what is currently in the bill for dispensaries to match the less specific language for growers and processors.

We urge a Favorable with Amendments report.

Respectfully submitted,

Warren Lemley
President, Peake ReLeaf

The LeafLink Wholesale Cannabis Pricing Guide is a comprehensive analysis of wholesale pricing in 10 US states with legal cannabis markets. Our analysis includes average pricing across five major product categories, as well as the impact those price points have on product sales. Cannabis businesses can use the data provided here to understand how they can strategically price their products to increase sales.

ABOUT LEAFLINK

LeafLink is a tech-enabled wholesale marketplace for the cannabis industry that has revolutionized the way over 7,500 brands, distributors, and retailers across 27 North American markets manage their operations. The marketplace manages over $3 billion in annualized orders, an estimated 32% of wholesale U.S. wholesale cannabis commerce, giving us insight into the evolution of cannabis commerce and industry-wide trends.

Methodology

DATA

We analyzed over 109,000 unique SKUs on LeafLink in this guide. The study focuses on LeafLink's top five product categories by market share (Cartridges, Concentrates, Edibles & Ingestibles, Flower, and Pre-Rolls), and examines pricing for each category on both the national and state level, as well as year-over-year (YoY) changes. Over $1.2B of wholesale orders placed through LeafLink in 2020 were used to determine the impact of pricing on sales.

UNITS OF MEASURE

The units used in this year's guide are as follows:

Cartridges: 1 gram
Concentrates: 1 gram
Edibles & Ingestibles: 1 milligram
Flower: 1 pound
Pre-Rolls: 1 gram

All SKUs analyzed were listed in the above units of measure, or converted to ensure comparability across products and markets. For example, the pricing of a Flower product listed at 0.5lb was doubled to estimate its value at 1 pound. When comparing wholesale product pricing in your state, be sure to convert the product in question to the referenced units.

GEOGRAPHIES

In this guide, we included pricing data from the following US cannabis markets: Alaska, Arizona, California, Colorado, Maryland, Michigan, Nevada, Oklahoma, Oregon, and Washington. These markets were selected based on the availability of pricing data for each of our five top product categories.

INCLUDED IN EACH STATE PROFILE:

- **Most Popular Category:** Category making up the largest percentage of 2020 Gross Merchandise Value (GMV) within the state
- **Most Competitive Category:** Category with the highest number of SKUs listed on LeafLink in that state
- **Least Competitive Category:** Category with the lowest number of SKUs listed on LeafLink in that state
- **Biggest Pricing Change Since Last Year:** Category with the greatest change in average pricing since the 2019 guide
- **Wholesale Start Date:** The month of the state's first orders on LeafLink.
- **Number of Active Retailers:** Number of retailers in the state using LeafLink at the time of publication
- **Category Pricing Rank:** How the average price for a product category in one state compares to the 9 other states included in this guide
- **Pricing Score:** The average of all Category Pricing Ranks for a given state. Closer to 1 indicates higher average pricing across categories, whereas closer to 10 indicates lower average pricing

LeafLink is live in 27 markets across the United States and Canada, but all other markets were omitted from this guide due to limited historical pricing data on the platform.

MULTI-STATE ANALYSIS

Pricing Overview

Average pricing per category varies greatly across different markets. To help you judge where a specific market falls compared to the others analyzed in this guide, we assigned a Pricing Score to each state. Pricing Scores are determined by averaging all of a state's Category Pricing Ranks, 1 being the highest, 10 being the lowest. You can find these scores in the State Profiles.

PRICING SCORE BY STATE

AK	MD	MI	NV	AZ	CA	OK	CO	WA	OR
1.2	2.6	3.2	5.0	5.4	5.6	6.4	7.4	8.8	9.2

Overall, Oregon, a mature state known for product oversaturation, had the lowest Pricing Score (9.2). Alaska, a state with exceptionally high logistics and shipping costs, had the highest Pricing Score (1.2).

You can view state-specific category pricing for each state broken into average price, lower quintile, middle quintile, and upper quintile in the State Profile sections.

The following are average wholesale price points for each of our five most popular product categories across the ten markets included in this study:

CARTRIDGES	CONCENTRATES	EDIBLES	FLOWER	PRE-ROLLS
$22.78 PER G	$17.02 PER G	$0.08 PER MG	$1,940 PER LB	$7.18 PER G

PRICING RANK: MOST TO LEAST EXPENSIVE BY STATE

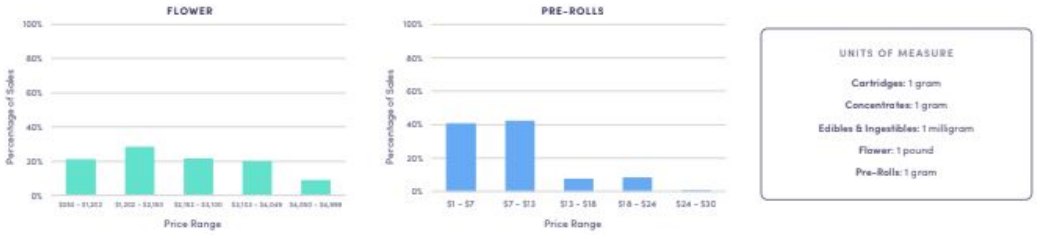
	1	2	3	4	5	6	7	8	9	10
← MORE EXPENSIVE / LESS EXPENSIVE →										
CARTRIDGES	AK	MD	MI	AZ	NV	CA	OK	CO	OR	WA
CONCENTRATES	AK	MI	MD	OK	AZ	CA	NV	CO	OR	WA
EDIBLES & INGESTIBLES	AK	MI	NV	MD	CO	WA	CA	OK	OR	WA
FLOWER	AK	MD	MI	CA	OK	NV	AZ	WA	CO	OR
PRE-ROLLS	AZ	AK	MD	NV	CA	MI	CO	OK	OR	WA

Impact of Pricing on Product Sales

MULTI-STATE ANALYSIS

In addition to average pricing, this guide examines how sales are impacted by a product's wholesale pricing. In other words, are affordable or premium priced products more popular among dispensaries? To analyze this, we looked at the total range of price points available for a given product category and divided that range into quintiles. We then looked at sales by unit and compared sales by unit for each quintile.

Overall, the impact of pricing on sales varied greatly across each category at the national level. For Concentrates and Pre-Rolls, the bottom two quintiles drove the majority of sales across each product category. For Cartridges, more than half of all products sold were priced in the second quintile. A majority of Edibles & Ingestibles products sold were priced at the middle quintile (40-60%), and very few sold were priced in the bottom or the top. Out of all categories, analyzed, Flower had the most even distribution, with no single quintile accounting for more than 30%.



For a more in depth understanding of which markets favored premium priced products or more affordable products, please see the State Profiles in the next section.

Maryland

MARYLAND PRICING OVERVIEW

Most Popular Category: Flower

Most Competitive Category: Cartridges

Least Competitive Category: Edibles & Ingestibles

Biggest Pricing Change Since Last Year: Pre-Rolls, -19% YoY

Wholesale Start Date: April 2018

Number of Active Retailers: 95

Category Pricing Rank: Consistently high pricing across most categories

PRICING SCORE: 2.6

UNITS OF MEASURE

Cartridges: 1 gram, **Concentrates:** 1 gram,
Edibles & Ingestibles: 1 milligram, **Flower:** 1 pound, **Pre-Rolls:** 1 gram

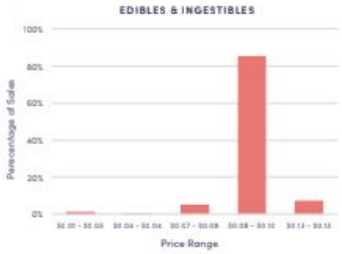
MARYLAND PRICING ANALYSIS

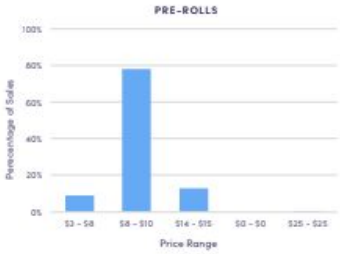
	AVERAGE PRICING	LOWER QUINTILE (20%)	MEDIAN	UPPER QUINTILE (80%)	CATEGORY PRICING RANK (1 = MOST EXPENSIVE)
CARTRIDGES	$40.43	$25.00	$46.00	$52.00	2 OF 10
CONCENTRATES	$25.01	$15.00	$25.00	$30.00	3 OF 10
EDIBLES	$0.09	$0.08	$0.09	$0.09	4 OF 10
FLOWER	$3,181.27	$2,784.00	$3,243.18	$3,887.93	2 OF 10
PRE-ROLLS	$9.57	$8.00	$8.57	$10.00	3 OF 10

Maryland

IMPACT OF PRICING ON PRODUCT SALES

- Maryland has the second highest Cartridge pricing among the states we analyzed: $40 per gram, up 16% year-over-year.
- Similarly, wholesale Flower prices are nearly the highest at $3,181 per pound, only $5 less than in Alaska. This is due to a limited number of cultivators, processors, and brands in Maryland. Recently awarded cultivation and processing licenses (October 2020) should bring additional supply online and put downward pressure on prices.





WCPG 2020
STATE PROFILE MARYLAND 10

Steve Mariast HB 708 Testimony 3.2.2021.pdf
Uploaded by: Mariast, Steven
Position: FWA

March 3, 2021

Hearing Before: Maryland Senate

Re: HB 708

Testimony of Steven Mariast, Compliance Manager and Co-0wner, Dispensary Works, LLC

Senators and Esteemed Colleagues:

Thank you for the opportunity to comment on the proposed Bill to establish adult-use cannabis in Maryland.

I have a medical cannabis dispensary in Charles County, Maryland., and I speak for myself, and for the Dispensary Association in support of this bill with amendments. We applaud the inclusion of dual-licensure that uses our existing expertise and infrastructure to fast-track the availability of product and revenue for the state.

We advocate that one governing body administer the cannabis program for medical and adult-use. The cost to Maryland, and thereby taxpayers, to have two organizations with a great deal of overlap, would be exorbitant. It adds a level of complexity that is unnecessary, while increasing operating costs for cannabis businesses. The adult-use business could come on line much faster, with significantly greater efficiency if the existing Cannabis Commission would administer both.

We feel the tax rate is reasonable and reduces risks of individuals being driven to the black market based on cost. Pre-planned increases in the tax rate pre-suppose a market, which may or may not be realistic. Any increases should be done at a future date, carefully weighing market experience and risk to increasing black market sales.

We support an amendment to establish equitable treatment for existing licensees should their local jurisdiction opt out of adult-use

cannabis sales. Choice of a location in another jurisdiction is needed if this should occur.

We support the inclusion of the low-tier grow licenses. I speak for myself and other dispensaries unaffiliated with a grow or processor, in advocating for an amendment to fast-track low-tier grow licenses for these 30+ dispensaries. Without this amendment, we miss an opportunity to better support small-, women -and minority-owned businesses at a time when much energy and resources are being devoted to social equity among cannabis licensees. Early granting of these licenses will help us manage any potential impact to our medical patients as we implement adult-use. These early licenses would provide stability for us, while allowing rapid startup and revenues for the state.

Having a small number of cannabis strains available locally will provide consistent access to product that may be tailored to meet local requirements. These craft-style licenses will help ensure more equitable distribution of flower across the market,
and help with price stability. Too, the ability to grow a limited amount of flower would allow us to better guarantee a core set of products upon which consumers could depend.

Thank you for your consideration of these amendments.

Respectfully,

Steven Mariast

MPP SB 708 written testimony FWA.pdf
Uploaded by: Naugle, Olivia
Position: FWA

Marijuana Policy Project
P.O. Box 21824 • Washington, DC 20009
202-462-5747 • www.mpp.org

March 4, 2021 **SB 708**

Testimony from Olivia Naugle, legislative analyst, MPP, favorable with amendments SB 708

Dear Chair Kelly, and members of the Senate Finance Committee:

My name is Olivia Naugle, and I am a legislative analyst for the Marijuana Policy Project (MPP), the largest cannabis policy reform organization in the United States. MPP has been working to improve cannabis policy for 25 years; as a national organization, we have expertise taken by different states.

MPP has played a leading role in most of the major cannabis policy reforms since 2000, including more than a dozen medical cannabis laws and the legalization of marijuana by voter initiative in Colorado, Alaska, Maine, Massachusetts, Nevada, Michigan, South Dakota, and Montana. MPP's team spearheaded the campaigns that resulted in Vermont and Illinois becoming the first two states to legalize marijuana legislatively, and has played an important role in the Virginia legalization effort.

The Marijuana Policy Project strongly supports legalizing and regulating cannabis for adults 21 and older, and doing so in a way that repairs the damage inflicted by criminalization. That includes expungement of past cannabis convictions, provisions to ensure diversity and social equity in the industry, and reinvestment in communities hard-hit by the war on cannabis.

Given the trends in polling, and the increasing recognition by elected officials on both sides of the aisle that criminalizing cannabis users has done more harm than good, ending marijuana prohibition in Maryland has become less a question of "if" and more about "when" and "how."

MPP strongly supports Delegate Jazz Lewis' HB 32 — "The Cannabis Legalization and Regulation—Inclusion, Restoration, and Rehabilitation Act of 2021." S.B. 708 includes many of HB. 32's excellent provisions. On February 16, Del. Lewis submitted a reprint of HB 32 with the goal of creating a single, unity bill. We urge the committee to revise SB 708 to mirror the reprint of HB 32, to create mirror bills.

First, I would like to discuss the positive impacts SB 708 will have, followed by the amendments, which we believe will make this legislation stronger and more equitable. We encourage the legislature to legalize, tax, and regulate cannabis for adults this session.

I. Cannabis prohibition has failed.

Before discussing SB 708, I'd like to start by pointing out the problems with the current policy of prohibition. One does not have to support cannabis use to recognize that prohibition has not worked. Like alcohol prohibition before it, cannabis prohibition has failed — and it has caused tremendous amounts of suffering.

Despite the vast sums spent on hundreds of thousands of marijuana arrests made in the U.S. every year, prohibition hasn't stopped adults or youth from accessing cannabis. Cannabis remains readily available in Maryland and across the United States. Whereas cannabis use was relatively rare when it was first essentially prohibited nationwide in 1937,[1] after decades of prohibition, about half of Americans — including Presidents Bill Clinton, George W. Bush, and Barack Obama — acknowledge having used it.[2] In Maryland, almost 16 percent of adults admit having used cannabis in the past year. [3]

Prohibition has also failed our youth. Prior to any state legalizing adult-use cannabis sales, 40% of American high schoolers reported they had a peer who sold cannabis at school, compared with less than 1% who knew a peer selling alcohol in school.[4] This is probably because unlike licensed liquor stores, drug dealers do not check ID. Regulating cannabis moves sales into safe, licensed retail stores where the only people selling or buying cannabis are adults, not schoolchildren.

Criminalizing the production and distribution of cannabis only serves to enrich and empower the criminal organizations controlling this lucrative illicit market. Prohibition also ensures cannabis products are untested, increasing the risk of contamination with illicit pesticides, heavy metals, dangerous molds, hazardous thickening agents, or even other drugs. Only with legalization and regulation can the government control where, when, and to whom cannabis is sold. Only with legalization and regulation can the government ensure testing and labeling.

Further, the public recognizes the harm associated with marijuana prohibition. Popular support for legalization has increased significantly over time. Nationwide, a

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[1] At the dawn of prohibition, Harry Anslinger reportedly said there were 100,000 total marijuana smokers in the U.S. Today, according to the National Survey on Drug Use and Health, about 22 million Americans admit to having used cannabis in the past month. *See* www.drugabuse.gov/publications/research-reports/marijuana/what-scope-marijuana-use-in-united-states.

[2] Mary Emily O'Hara, "New Poll Finds Majority of Americans Have Smoked Marijuana," *NBC News*, April 17, 2017; Brendan Bures, "Here are 11 U.S. Presidents who smoked marijuana," *NY Daily News*, May 16, 2017.

[3] National Survey on Drug Use and Health, "Table 52 – Selected Drug Use, Perceptions of Great Risk, Past Year Substance Use Disorder and Treatment, and Past Year Mental Health Measures in Maryland, by Age Group: Percentages, Annual Averages Based," February 5, 2019. *See* https://www.samhsa.gov/data/report/2016-2017-nsduh-state-specific-tables

[4] Columbia University, National Center on Addiction and Substance Abuse Survey, 2012.

October 2020 Gallup poll found that 68% of Americans support making cannabis use legal for adults, up from 60% in 2016, 48% in 2008, and 36% in 2005.[5] Public support is also strong here in Maryland. A February 2019 Goucher poll found that 57% of Marylanders support legalization (with only 37% opposed), up from 54% in 2016.[6]

II. Prohibition has racist roots and continues to be unequally enforced.

While white and Black Marylanders consume cannabis at similar rates, the same cannot be said of the rate at which they are arrested. Prior to decriminalization, Black Marylanders were arrested or cited for marijuana possession 2.9 times more often than were white Marylanders despite similar usage rates.[7] And available evidence suggests that, although decriminalization helps by reducing the number of people who are criminalized, there continues to be a disparity in the remaining arrests. Black Marylanders are still twice as likely to be arrested for simple possession than white Marylanders.[8] Further, *Baltimore Fishbowl* reported in 2018 that even after decriminalization in 2014, Baltimore Police arrested 1,448 adults and 66 juveniles for cannabis possession during 2015, 2016, and 2017. Of those arrestees, 96% were African-American.[9] As a result of this disparity, Black Marylanders are far more likely to be plagued with an arrest record and conviction for cannabis, which makes it harder to get jobs, housing, an education, professional licensing, and other opportunities.[10]

Unfortunately, the racially disparate impact is hardly surprising upon examination of the history of marijuana prohibition and enforcement. In 1971, President Richard Nixon launched the War on Drugs, which a top advisor later explained was

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[5] Brennan, Megan, "Support for Marijuana Inches up to New High of 68%. *Gallup* https://news.gallup.com/poll/323582/support-legal-marijuana-inches-new-high.aspx

[6] "Marylanders support raising minimum wage, legalizing recreational marijuana, and banning Styrofoam containers: Feb. 18, 2019, at: https://htv-prod-media.s3.amazonaws.com/files/goucher-poll-feb19-part1-1550481111.pdf

[7] ACLU of Maryland, The War on Marijuana in Black and White, available at: https://www.aclu.org/report/report-war-marijuana-black-and-white.

[8] A Tale of Two Countries: Racially Targeted Arrests in the Era of Marijuana Reform. *ACLU*. 2020

[9] McLeod, Friedman, &Soderberg. "Structural Racism and Cannabis: Black Baltimoreans still disproportionately arrested for weed after decriminalization". *Baltimore Fishbowl.* Dec. 28, 2018, available at: https://baltimorefishbowl.com/stories/structural-racism-and-cannabis-black-baltimoreans-still-disproportionately-arrested-for-weed-after-decriminalization. It should be noted that the amount decriminalized by Maryland is lower than most other states that have implemented this policy; one ounce (28.3 grams).

[10] Rebecca Vallas, "Should a Criminal Record Be a Life Sentence to Poverty?," *The Nation*, March 11, 2015. (Nearly nine in 10 employers and four in five landlords conduct background checks.) *See also*, the American Bar Associations' National Inventory of the Collateral Consequences of Conviction, www.americanbar.org/groups/criminal_justice/niccc/ (cataloging over 45,000 federal and state statutes and regulations that impose collateral consequences on persons convicted of crimes.)

motivated by Nixon's desire for a pretext enabling the government to harass and arrest Black Americans and anti-Vietnam War activists.[11]

Unsurprisingly, legalizing cannabis has significantly reduced the number of searches and arrests for cannabis in those states among people of all races.

Data analyzed by the Stanford Open Policing Project found in the first two legalization states —Colorado and Washington — there have been dramatic decreases in traffic searches, which are disproportionately performed on cars with Black or Latino drivers.[12] Traffic stop interactions have led to violence and even death for Black Americans.[13] The data compiled by Stanford researchers shows searches dropped by about half in Washington and Colorado since legalization. Racial disparities have decreased, but have not been eliminated.

Meanwhile, a comprehensive report issued by the Colorado Division of Criminal Justice in October 2018 found that since legalization, the "number of marijuana arrests decreased by 56% for Whites, 39% for Hispanics, and 51% for Black people."[14] However, racial disparities remain. "The marijuana arrest rate for Black people (233 per 100,000) was nearly double that of White people (118 per 100,000) in 2017."

Washington State has also seen a striking reduction in the total number of cannabis arrests and in the number of arrests of black individuals for cannabis. Before legalization, there were nine cannabis arrests per 100,000 Washington residents every year.[15] That number approached zero per 100,000 residents by 2015. Unfortunately, as of 2015, Washington had seen an increase in the relative disparities, however.

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[11] Dan Baum, "Legalize It All," *Harper's Magazine*, Apr. 2016. (Quoting top Nixon aide John Ehrlichman, "The Nixon campaign in 1968, and the Nixon White House after that, had two enemies: the antiwar left and Black people. You understand what I'm saying? We knew we couldn't make it illegal to be either against the war or black, but by getting the public to associate the hippies with marijuana and blacks with heroin, and then criminalizing both heavily, we could disrupt those communities. We could arrest their leaders, raid their homes, break up their meetings, and vilify them night after night on the evening news. Did we know we were lying about the drugs? Of course we did.")

[12] Phillip Smith, "States that legalized marijuana see dramatic drop in police traffic searches," *Alternet*, April 1, 2019. (Before legalization 1.3% of black drivers were subject to traffic searches in Colorado. After legalization, the rate was under 0.2%. Among Hispanic drivers, the rate dropped from 1% to 0.1%. Among whites, the rate of searches dropped from 0.4% to 0.1%. Thus, black drivers went from being 6.5 times as likely to be searched as whites to twice as likely, and the total likelihood of black drivers being subject to a traffic search dropped eightfold.)

[13] Tanvi Misra, "Uncovering Disparities In Policing By Analyzing Traffic Stop Data," *Pacific Standard*, June 7, 2018.

[14] "Impacts of Marijuana Legalization in Colorado: A Report Pursuant to Senate Bill 13-283," Colorado Department of Criminal Justice, October 2018, p. 1.

[15] Caislin Firth, et al., "Did marijuana legalization in Washington State reduce racial disparities in adult marijuana arrests?," *Substance Use and Misuse*, May 2019.

While legalization has not eliminated disparities and arrests, it is important not to lose sight of the fact the total number of people — and the total number of Black people— arrested for cannabis has plummeted in states that have legalized it. This means thousands of people no longer face the trauma of arrests or having their opportunities for housing, education, and employment derailed. It also saves many from deportation: more than 6,000 individuals are deported per year for cases where their most serious offense was cannabis possession,[16] including many who were legally in the country and have established deep roots.[17]

III. Legalizing cannabis improves the fairness and efficiency of the criminal justice system.

SB 708 would legalize possession of up to four ounces of cannabis. By legalizing cannabis this year, the state will save thousands of Marylanders from being searched, arrested, and prosecuted for marijuana offenses. Many of the people who are being prosecuted for possession of over 10 grams will not have to enter the criminal justice system and have their lives impacted by the accompanying collateral consequences. Nor will people in possession of 10 grams or less continue to face fines and stigma for choosing to consume a substance that is a safer alternative to alcohol.

Importantly, this legislation provides for automatic expungement and release for possession and cultivation of the legal amounts and allows individuals to petition for expungement and release for all other cannabis offenses, at no cost to the individual. These strong expungement provisions for past convictions for cannabis possession and cultivation will remove the life-altering scarlet letter such a conviction carries, and allow individuals to move on with their lives.

Legalizing cannabis also frees up police time and resources that are currently wasted in prosecuting adults for cannabis offenses, allowing those resources to be focused on solving crimes with victims. A study published in *Police Quarterly* found that clearance rates (the percent of reported crimes resulting in arrests) increased significantly post-legalization in Washington and Colorado, while remaining basically unchanged in other states.[18] Burglary and motor vehicle theft clearance rates "increased dramatically" while violent crime clearance rates also increased.

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[16] "Secure Communities and ICE Deportation: A Failed Program?," TRAC Immigration, Syracuse University (finding 6,770 ICE deportations in FY 2013 where the most serious offense was marijuana possession and 6,447 in FY 2012).

[17] *Prado v. Barr*, No. 17-72914, (9th Cir. 2019) (ruled against a woman who had lived in the U.S. since she was six months old and became a lawful permanent resident in 1980; she had a felony marijuana charge prior to legalization in California); Matt Sintsing, "Disabled veteran's husband at risk for deportation over years old marijuana charges," Radio.com, December 13, 2018 (green card holder facing deportation for simple possession of cannabis convictions).

[18] "Positive policing changes after cannabis legalization: Clearance rates improve for burglaries, vehicle thefts," *Science Daily*, July 24, 2018.

The unequal way in which cannabis prohibition is enforced — coupled with its nature as a victimless crime — erodes trust between police and communities at a time when such trust is sorely lacking. As Washington, D.C.'s former police chief bluntly put it: "All these [marijuana] arrests do is make people hate us."[19] In addition to being valuable in itself, positive police/community relationships improve public safety. A Department of Jusice study found that trusting relationships with the local community was one of the most important factors in whether police were effective in solving violent crimes.[20]

IV. A path to a better solution — regulation — has been forged by other states.

As it became increasingly obvious prohibition was not working and was plagued by inequality, states began to choose a more sensible approach **—** taxing and regulating cannabis similarly to alcohol.

Colorado and Washington voters led the way in November 2012. Since then, Alaska, Oregon, California, Maine, Massachusetts, Nevada, Michigan, Illinois, and Vermont followed suit. Voters in New Jersey, Montana, South Dakota, and Arizona all legalized cannabis on November 3, 2020 — bringing the total number to 15. Most of the new laws will not be fully implemented for some time. However, Arizona became the quickest state to begin legal, adult-use sales — less than three months of passage of the law. Sales began on January 22, 2021.

Meanwhile, Washington, D.C. legalized adult possession and cultivation of cannabis, but they have not yet regulated cannabis sales. (This is due to Congress' Harris Rider prohibiting it from spending funds to do so.) Most recently, the Virginia House and Senate passed legalization bills on February 5, 2021, which are expected to head to a conference committee to harmonize the two bills.

As Gov. Jay Inslee and Attorney General Bob Ferguson of Washington State explained:

> Our state's efforts to regulate the sale of marijuana are succeeding. A few years ago, the illegal trafficking of marijuana lined the pockets of criminals everywhere. Now, in our state, illegal trafficking activity is being displaced by a closely regulated marijuana industry that pays hundreds of millions of dollars in taxes. This frees up significant law enforcement resources to protect our communities in other, more pressing ways.[21]

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[19] McCarton Ackerman, "D.C. Police Chief Supports Marijuana Legalization," *The Fix*, March 4, 2015.
[20] *See* "Getting Away with Murder," *The Economist*, July 4, 2015.
[21] February 15, 2017, Letter from Gov. Inslee and AG Ferguson to U.S. Attorney General Jeff Sessions, *available at* https://www.documentcloud.org/documents/3474339-Gov-AG-Ltr-to-Sessions-Re-Marijuana-002.html.

In Colorado, more than $290 million in adult-use cannabis tax revenue was collected in 2019.[22] As of June 2020, 41,144 individuals held licenses to work directly in Colorado's cannabis businesses.[23] Meanwhile, Washington State brought in more than $440 million in cannabis tax revenue in 2019.[24]

Cannabis tax revenue has been used to fund numerous programs improving the lives and health of the states' residents. Colorado devotes much of its cannabis tax revenue to school construction, and state education officials have used marijuana taxes to give $6 million dollars to 71 schools since 2016 to fund anti-bullying education.[25] Meanwhile, in 2018, Washington used $262 million of its cannabis tax revenue to help pay for its share of Medicaid, which insures nearly 1.8 million low-income Washington residents. It also allocated more than $5 million in a biennium to provide beds for youth residential treatment services and address substance use disorders.[26]

SB 708 would allocate tax revenue from legal cannabis sales to substance abuse prevention and treatment, funding cannabis research, public education on the risks of alcohol, tobacco, cannabis, and other substances, and to the state's general fund. Most notably, in total, this legislation targets 60 percent of all of the tax revenue to communities that have been disproportionately impacted by cannabis prohibition. These funds include;

- 27% to a community reinvestment and repair fund to serve communities impacted by poverty, mass incarceration, or racism via grants to organizations utilizing evidence-proven and evaluated tactics to address these challenges
- 20% to endowments for the four HBCU's in Maryland
- 10% for zero-interest loans and grants to social equity and minority business applicants;
- 3% for technical assistance for social equity and minority business applicants

More than 450,000 Marylanders use cannabis at least once per month.[27] Allowing legal businesses to meet that demand eliminates the vast majority of illicit market

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[22] https://www.colorado.gov/pacific/revenue/colorado-marijuana-tax-data

[23] Colorado Marijuana Enforcement Division, https://www.colorado.gov/pacific/enforcement/med-resources-and-statistics

[24] https://lcb.wa.gov/sites/default/files/publications/annual_report/2019-annual-report-final2.pdf ($390 million from excise taxes, $50.39 million from sales taxes, Washington Department of Revenue, Marijuana sales tax table, available at https://dor.wa.gov/about/statistics-reports/recreational-and-medical-marijuana-taxes)

[25] https://www.marijuanamoment.net/colorado-marijuana-money-funds-cleaner-highways-and-anti-bullying-programs/?fbclid=IwAR34z9AnhWKhc3P7sX4b7hyFfZKBMZaKyXNUgI4nJjqtXRTu12cpggoke9g

[26] Jake Whittenberg, "Where does Washington's marijuana tax money go?," *King 5 News*, August 8, 2018.

[27] *See* "2017-2018 National Surveys on Drug Use and Health: Model-Based Estimated Totals (in Thousands); Table 3 Marijuana Use in the Past Month, by Age Group and State: Estimated Numbers (in Thousands), Annual Averages," *National Survey on Drug Use and Health. See*

sales[28] and leads to safer outcomes for communities and consumers. In the underground market, both parties are vulnerable to armed robbery, and disputes cannot be solved in the courts.[29] In jurisdictions with prohibition, violence is sometimes employed to gain market share, further increasing the dangers.[30]

Replacing prohibition with legalization, taxation, and sensible regulation is also far better for workers. In the underground market, workers are vulnerable to exploitation, and they risk felony convictions and prison time.[31] A regulated market offers important protections to workers, from health and safety regulations to unemployment insurance and social security and all the advantages of working in a legal industry instead of the sometimes-dangerous criminal market.

Finally, prohibition guarantees cannabis won't undergo quality control testing, resulting in possible contamination by pesticides, fertilizers, molds, bacteria, or the lacing of cannabis with other drugs or additives, unnecessarily putting consumers at risk. SB 708 establishes a strong regulatory system in which the newly independent Alcohol and Tobacco Commission will be charged with regulating the new adult-use cannabis market. It will develop comprehensive rules governing security, laboratory testing, packaging, labeling, recordkeeping, inspections, prohibiting dangerous pesticides and additives, and restricting advertising.

The recent incidinces of severe lung ailments related to vaping underscores the need for effective public health regulations — regulations which are only possible in the context of legalization. As of Feburary 18, 2020, a CDC map shows Colorado, a legalization state, having experienced no more than nine illnesses requiring hopsitalization. Meanwhile in neighboring, less populous Utah — where marijuana is not legal — CDC data shows between 100 and 149 cases required

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https://www.samhsa.gov/data/sites/default/files/reports/rpt23259/NSDUHsaeTotals2018/NSDUHsaeTotals2018.pdf. This is based on federal survey data, which relies on respondents admitting to something that is illegal. Thus, it is almost surely underreported.

[28] "Market Size Demand for Marijuana in Colorado Market 2017," Colorado Marijuana Enforcement Division, August 2018. ("Colorado's preexisting illicit marijuana market for residents and visitors has been fully absorbed into the regulated market.") However, as long as some states prohibit cannabis, that demand will fuel illicit production and sales. In addition, a variety of policy choices in states that legalize influences how swiftly and completely sales transition to a legal market. For a quicker and more complete transition, regulators should expeditiously license enough businesses of all types to meet demand. Unduly onerous regulations and excessive taxes should be avoided to ensure illicit market cannabis is not cheaper. To avoid large pockets of prohibition, states should allow delivery statewide and incentivize localities to allow sales.

[29] *See* "Keansburg man found guilty of murder in marijuana robbery," *New Jersey 101.5*, October 23, 2019; Kathleen Hopkins, "Keyport pot deal murder: 'I didn't mean for any of this to happen' defendant says," *Asbury Park Press,* October 17, 2019; "NJ man, 22, joins girlfriend in prison for killing weed dealer," *New Jersey 101.5*, April 4, 2019; "Family of police informant who was murdered, dismembered agrees to $1M settlement," *WJBK*, October 4, 2017.

[30] *See* Dan Werb, et al., "Effect of drug law enforcement on drug market violence: A systematic review," *International Journal of Drug Policy*, March 2011.

[31] *See* Shoshana Walter, "In secretive marijuana industry, whispers of abuse and trafficking," *The Center for Investigative Reporting*, September 8, 2016.

hospitalization.[32] The far better safety profile of regulated products was underscored when CannaSafe, a California-based testing laboratory, recently tested illegal and legal vape cartridges. It found that 13 of the 15 illegal vape cartridges included vitamin E acetate[33] — an additive the CDC recently identified as the likely cause of the illnesses.[34] None of the legal products CannaSafe tested included vitamin E acetate.

VI. Much of the opposition to this reform is based on myths and misconceptions about marijuana.

Finally, I would like to address a few of the most prevalent myths and misconceptions associated with legalizing cannabis for adults.

First, some worry that marijuana is a so-called "gateway" to the use of harder drugs. This concern has been debunked by every major study on the subject. For example, in a seminal 1999 report by the prestigious Institute of Medicine (IOM), part of the National Academy of Sciences, researchers found "marijuana is not the most common, and is rarely the first, 'gateway' to illicit drug use. There is no conclusive evidence that the drug effects of marijuana are causally linked to the subsequent abuse of other illicit drugs."[35] The report went on to note, "There is no evidence that marijuana serves as a stepping stone on the basis of its particular physiological effect. … Instead, the legal status of marijuana makes it a gateway drug."[36] These findings have been confirmed by major peer-reviewed studies in the *American Journal of Psychiatry*, the *British Journal of Addiction*, and the *Journal of Health and Social Behavior*.[37] As William Martin, Director, Baker Institute for Public Policy at Rice University, Texas, recently explained:[38]

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[32] "Outbreak of Lung Injury Associated with the Use of E-Cigarette, or Vaping, Products," Centers for Disease Control & Prevention, (accessed March 2, 2020) https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html#latest-outbreak-information

[33] https://www.nbcnews.com/health/vaping/tests-show-bootleg-marijuana-vapes-tainted-hydrogen-cyanide-n1059356

[34] https://www.nytimes.com/2019/11/08/health/vaping-illness-cdc.html

[35] "Marijuana and Medicine: Assessing the Science Base," Institute of Medicine (1999), p. 6. *Available at* http://www.nap.edu/openbook.php?record_id=6376.

[36] Id at 99.

[37] "Predictors of Marijuana Use in Adolescents Before and After Licit Drug Use: Examination of the Gateway Hypothesis," Tarter, et al. (2006), *American Journal of Psychiatry*. *Available at* http://ajp.psychiatryonline.org/article.aspx?articleid=97496. "Using Marijuana May Not Raise the Risk of Using Harder Drugs," RAND (2002), published in the *British Journal of Addiction*. *Available at* http://www.rand.org/pubs/research_briefs/RB6010/index1.html. "A Life Course Perspective on the Gateway Hypothesis," Gundy and Rebellon (2010), *Journal of Health and Social Behavior*. *Available at* http://hsb.sagepub.com/content/51/3/244.abstract.

[38] William Martin, "Does marijuana use lead to harder drugs?," *Houston Chronicle*, April 30, 2015, *available at* http://www.chron.com/opinion/outlook/article/Martin-Does-marijuana-use-lead-to-harder-drugs-6234329.php.

> [T]he overwhelming majority of people who use marijuana do not go on to use harder drugs. Of those who do, extensive research has concluded that the causal factors reside not in the drug itself, but in the complex of genetic, social and psychological factors that lead them to seek relief in mind-altering substances in the first place. Prohibition cannot address those problems, but it does serve as a gateway into the criminal justice system, which will make them immeasurably worse.

In addition, available evidence suggests that cannabis is actually an "exit drug" that can help people who are struggling to stop using opioids, other more dangerous painkillers and sleep aids, and alcohol. An international team recently conducted one of the most comprehensive surveys of its kind, which examined 60 studies on cannabis and mental health. According to Zach Walsh, psychology professor at the University of British Columbia and lead author of the study, "Research suggests that people may be using cannabis as an exit drug to reduce use of substances that are potentially more harmful, such as opioid pain medication."[39]

A survey of 1,000 consumers at an adult-use counter in Denver found that most 65% used cannabis to relieve pain and 74% used cannabis to promote sleep. The abstract notes, "Among respondents taking cannabis for pain, … most of those taking over-the-counter pain medications (82%) or opioid analgesics (88%) reported reducing or stopping use of those medications. Among respondents taking cannabis for sleep,… most of those taking over-the-counter (87%) or prescription sleep aids (83%) reported reducing or stopping use of those medications."[40]

Second, opponents often claim that allowing adults to legally use cannabis will result in an increase in teenagers' cannabis use. That is not borne out in the data. In fact, the most in-depth surveys suggest modest decreases in rates of youth cannabis use in Colorado and Washington, both of which approved initiatives to regulate cannabis like alcohol in 2012. Public health programs can further reduce teen use regardless of the legality of the substance for adults. This is illustrated by the impressive reduction in teens' tobacco use, which has plummeted 79 percent from its peak in 1997.[41] This was due to strict regulations on cigarette sales and advertising, plus a robust public education campaign. The same can be done for cannabis, and it will likely be more effective when that education is based on real research and not "reefer madness."[42]

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[39] University of British Columbia, "Marijuana could help treat drug addiction, mental health, study suggests," *ScienceDaily*, Nov. 16, 2016.

[40] Marcus Bachhuber, Julia Arnsten, and Julia H Arnsten, "Use of Cannabis to Relieve Pain and Promote Sleep by Customers at an Adult Use Dispensary, Journal of Psychoactive Drugs," July 2019

[41] Truth initiative, "youth smoking rate falls to 6 percent," *available at* https://truthinitiative.org/news/youth-smoking-rate-falls-6-percent.

[42] In fact, some studies showed that the propaganda-based program D.A.R.E. actually had a "boomerang effect," increasing drug use among young people who took it. Rosie Cima, "DARE: The Anti-Drug Program That Never Actually Worked," *Priceconomics*, *available at* https://priceonomics.com/dare-the-anti-drug-program-that-never-actually/.

Finally, a book entitled *Tell Your Children: The Truth About Marijuana, Mental Illness, and Violence* by Alex Berenson has received a lot of media attention. The central claim of Berenson's book is that marijuana legalization will result in an increase in psychosis and violence in America. Berenson's claims are rooted in cherry-picked data and presenting correlation as causation. I would like to draw your attention to two key points rebutting these claims.

First, Berenson cites a 2017 report by the National Academies of Sciences, Engineering, and Medicine as evidence that marijuana use causes schizophrenia. That claim is a massive misinterpretation of the report. In fact, the claim was rebutted by Ziva Cooper, a committee member of the study, in a series of tweets. According to Cooper, that study did **not** conclude that cannabis causes schizophrenia, but rather that they found an association between cannabis use and schizophrenia.[43] Cooper wrote, "Since the report, we now know that genetic risk for schizophrenia predicts cannabis use, shedding some light on the potential direction of the association between cannabis use and schizophrenia."

Moreover, the National Academies of Sciences, Engineering, and Medicine report itself noted, "In certain societies, the incidence of schizophrenia has remained stable over the past 50 years despite the introduction of cannabis into those settings."[44] Surely, if marijuana use caused schizophrenia, that would not be the case.

Cannabis is not harmless, but the risks pale in comparison to alcohol. Consumers should be educated on the potential risks of cannabis, and HB 32 provides that an informational handout or label be made available to each consumer that includes information about the potential harms of cannabis.

Second, Berenson points out that the first four states to legalize cannabis — Alaska, Colorado, Washington, and Oregon — have seen an increase in murder rates since 2014 when the first adult-use cannabis sales began. What Berenson fails to mention is that FBI data shows that murder rates increased in 40 states during that time, and the top five percentage increases were in states that have not legalized marijuana. Meanwhile, government data also shows homicides *decreased* since marijuana was legalized in 2016 in California (which has more residents than all of the other legalization states combined).[45]

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[43] "Popular book on marijuana's apparent dangers is pure alarmism, experts say." *The Guardian.* Feb. 17, 2019. *Available at* https://www.theguardian.com/society/2019/feb/17/marijuana-book-tell-your-children-alex-berenson.

[44] "The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research." National Academies of Sciences, Engineering, and Medicine, 2017. *Available at* https://www.ncbi.nlm.nih.gov/books/NBK425748/.

[45] https://oag.ca.gov/news/press-releases/attorney-general-becerra-releases-2017-california-criminal-justice-data-reports

Furthermore, in a 2019 recent paper using regression analysis, a University of Washington researcher wrote, "Results indicate that the legalization of marijuana, both recreational and medical, does not increase violent crime rates. In contrast, marijuana legalization could lead to a decline in violent crime such as homicide, robbery and aggravated assault."[46] Again, there is no causation that can be drawn between marijuana and increases in violent crime.

VII Amending SB 708 to mirror HB 32

SB 708 mirrors many of the provisions of Delegate Jazz Lewis' HB 32. However, we believe that SB 708 offers fewer opportunities for new small and minority-owned businesses and less funding for social equity start-up and community reinvestment, among other differences.

Here are some of the most significant changes we recommend, to mirror the HB 32 reprint:

MPP urges SB 708 to be amended to uncap the number of micro-cultivation social equity licenses to be issued in 2023. HB 32 allows for uncapped social equity micro-cultivation licenses (of up to 5k square feet) to be issued early in 2023. By contrast, SB 708 only allows for 15 micro-cultivation to be issued in the social equity round. Capping micro-grow licenses reduces opportunities for small and minority-owned businesses and will prevent social equity producers and retailers from knowing they will be able to secure a cultivation license to ensure supply. This would put these new small businesses at a significant competitive disadvantage compared to large, vertically integrated growers they would have to depend on for supply.

MPP urges SB 708 to be amended to allow for more retailers to be licensed in 2023

With proposed amendments, HB 32 would license 100 new retailers in 2023 geographically distributed across the state by population. (As-introduced, HB 32 allowed 200.) In contrast, SB 708 currently only allows 47 new retailers in 2023. Only 47 new retailers in 2023 would mean far fewer opportunities for social equity applicants. It would also mean patients and other consumers would have to travel further and have fewer choices of cannabis. This would also likely lead to more illicit market activity.

MPP urges the tax rate proposed in SB 708 to be amended

SB 708 includes a lower tax rate than Delegate Jazz Lewis' HB 32. As introduced, HB 32 included a total tax rate of 29% — 20% excise, 6% standard sales, and 3% local

[46] Anjelica Rice, "A Blunt Look at the Impacts Marijuana Has on Violent Crime," Research Works Archive, 2019.

option. HB 32's February 16 reprint includes a middle ground, providing that, in years 1-2 of adult-use sales, a 15% excise sales tax will be imposed; it would increase in years 3-4 to 20%, and cap at 25% after that. Rates would automatically increase, but the commission could recommend changes. Localities may also impose a 3% sales tax. SB 708 provides that in years 1-3 of adult-use sales, a 10% excise tax would be imposed; it would increase in years 3-5 to 15%, and cap at 20% after that. The same 3% local sales tax applies.

In comparison, Virginia's bills include 30% in retail tax — which is higher than HB 32's highest possible tax rate of 28%. New Jersey's tax rate rises as prices drop. Its rates could be over 46% when prices drop below $150/ ounce.

We have seen that cannabis prices drop substantially after legalization. As long as Maryland has a competitive cultivation market with enough supply, pursuant to our recommendations, the price to the consumer will still be significantly lower than the illicit market.

Lower tax rates mean less revenue to fund automatic expungement, community reinvestment, HBCUs, cannabis training, and other state needs.

VIII Conclusion

Thank you Chair Kelly and members of the committee for your time and attention. I respectfully urge a favorable report of SB 708 with amendment to mirror the HB 32 reprint to legalize, tax, and regulate cannabis for adults 21 and older.

If you have any questions or need additional information, I would be happy to help and can be reached at the email address or phone number below.

Sincerely,

Olivia Naugle
Legislative Analyst
Marijuana Policy Project
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HB 32 v. SB 708 comparison.pdf
Uploaded by: O'Keefe, Karen
Position: FWA

Comparing Maryland's Legalization Bills — HB 32 and SB 708

In the summer and fall of 2020, Del. Jazz Lewis worked with a group of Maryland legislators from the Black Legislative Caucus and stakeholders to craft a legalization bill rooted in inclusion and equity that reflected lessons learned from other states' laws and Maryland's own medical cannabis experience. Marijuana Policy Project staffers assisted in the process.

In October, Del. Lewis pre-filed HB 32 — the Cannabis Legalization and Regulation, Inclusion, Restoration, and Rehabilitation Act of 2021. This bill would legalize personal possession and home cultivation of cannabis for adults 21 and older, automatically expunge past cannabis offenses, establish a social equity program to ensure inclusion in the industry from disproportionately impacted communities, and reinvest much of the tax revenue to communities hardest hit by the war on drugs. MPP and the Maryland Cannabis Policy Coalition strongly support HB 32.

On February 8, Sen. Brian Feldman introduced SB 708, which mirrors many of the provisions of HB 32. However, SB 708 has fewer opportunities for new small and minority-owned businesses and less funding for social equity start-up and community reinvestment, among other differences.

On February 16, 2021, Del. Lewis submitted a reprint of HB 32 in committee, which reflected a number of changes negotiated with Sen. Feldman, with the shared goal of passing a "unity bill." While negotiations are not yet complete, HB 32 as amended includes a middle ground for almost every area of departure.

This chart compares the differences between HB 32 — with amendments introduced in committee — and SB 708, as introduced. A summary of HB 32 (as amended) is available at www.mpp.org/HB32Summary.

	HB 32, with amendments offered on Feb. 16	**SB 708**	**Comments**
Number of social equity growers licensed in early 2023	HB 32 will include the following number of social equity grow licenses: *10 licenses to grow up to 50k sq. ft. *15 for up to 20k sq. ft. *10 for up to 10k sq. ft. *uncapped for micro-grows of up to 5k sq. ft. Canopy limits are tripled for outdoor. Regulators can stop issuing micro-grow licenses in the event of an oversupply.	HB 708 allows a total of 40 new social equity growers: *10 licenses to grow up to 50k sq. ft. *15 licenses to grow up to 20k sq. ft. *15 licenses to grow up to 5k sq. ft. Canopy amounts are tripled for outdoor grows.	Capping micro-grow licenses reduces opportunities for small and minority-owned businesses and will prevent social equity producers and retailers from knowing they will be able to secure a cultivation license to ensure supply. This would put these new small businesses at a significant competitive disadvantage compared to large, vertically integrated growers they would have to depend on for supply.

	HB 32, with amendments offered on Feb. 16	SB 708	Comments
Number of new retailers licensed in early 2023	With proposed amendments, HB 32 would license 100 new retailers in 2023 geographically distributed across the state by population. (As introduced, HB 32 allowed 200.)	SB 708 would license only 47 new retailers in 2023.	Only 47 new retailers in 2023 would mean far fewer opportunities for social equity applicants. It would also mean patients and other consumers would have to travel further and have fewer choice of cannabis. This would also likely lead to more illicit market activity.
Next retail licensing round	Regulators **shall** start accepting applications for more retail licenses starting February 1, 2024 after considering demand.	Regulators **may** start accepting applications for more retail licenses starting February 1, 2026 after considering demand.	Under SB 708, no additional retail licenses could be issued before 2026.
Next cultivation licensing round	Regulators **shall** start accepting applications for more cultivation licenses starting February 1, 2024 after considering demand.	Regulators **may** start accepting more cultivation applications starting Feb. 1, 2026 but "only if the study … determines that additional supply is needed."	SB 708's lengthy delay on the demand review and more cultivation licensing can be expected to cause a longer perpetuation of the illicit market, higher prices for consumers, and less choices. Independent medical dispensaries and patients already experience an inability to reliably source or find the products that work best for them.
"Race to the Top" to incentivize community contributions	Yes. Businesses expanding beyond two locations must show community benefits, such as related to diversity, labor practices, environmental stewardship, and equity contributions. Regulators may also apply this to growers moving to Tier 4 — the largest canopy.	No.	Both bills cap retailers at five locations. (HB 32 allows a non-controlling interest in up to five additional locations if they are social equity licensees.) HB 32 would require those with three or more locations to make contributions to the community.
Fee amounts for early start for medical businesses	HB 32 would cap dispensaries' and growers' early-start fee to the Social Equity Start-Up Fund at $1 million.	SB 708 would cap dispensaries' early-start fee to the Social Equity Start-Up Fund at $250,000 and would cap growers' fees at $750,000, regardless of profit.	Both bills include fees based on past sales, but SB 708 includes a lower cap for the fees. Both bills dedicate fees for start-up loans to social equity applicants. The lower the fees, lower the pool of start-up capital.

	HB 32, with amendments offered on Feb. 16	SB 708	Comments
Tax rates	HB 32 includes these adult-use taxes. State taxes: * Until spring 2024: 15% * From spring 2024 until spring 2026: 20% * Starting spring 2026: 25% + 3% local option tax Regulators could recommend changes to tax rates.	SB 708 includes these adult-use taxes. State taxes: * Until spring 2025: 10% * From spring 2025 until spring 2027: 15% * Starting spring 2027: 20% + 3% local option tax Regulators could recommend changes to tax rates.	Lower tax rates mean less revenue for automatic expungement, community reinvestment, and other state needs. In comparison, Virginia's bills include 30% in retail tax. New Jersey's tax rate rises as prices drop. Its rates could be over 46% when prices drop below $150/ ounce.
Can cultivators licensed under the adult-use law sell cannabis to medical dispensaries?	Not specified. Statutory and/or regulatory changes would likely be needed to the medical program to allow for such sales, but they are not specifically prohibited in HB 32.	No. Only medical growers could provide cannabis to medical dispensaries. However, both bills specify dual licensees (medical businesses approved to sell to adults) do not have to separate out adult-use and medical products.	
Labor Peace	HB 32, as it will be amended, includes a provision requiring adult-use cannabis businesses to sign a labor peace agreement with a bona fide union within 200 days of hiring a 10th employee.	SB 708 does not require a labor peace provision.	

SB 708 Karen O'Keefe MPP Testimony FWA .pdf
Uploaded by: O'Keefe, Karen
Position: FWA

Marijuana Policy Project Foundation
P.O. Box 21824 • Washington, DC 20009
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March 2, 2021

Re: Favorable With Amendments, SB 708: Cannabis – Legalization and Regulation

Dear Chair Kelley, Vice Chair Feldman, and members of the Finance Committee:

Thank you for the opportunity to testify on SB 708, Cannabis – Legalization and Regulation. My name is Karen O'Keefe. I'm an attorney and the director of state policies at the Marijuana Policy Project, where I've worked for 17 years. MPP is the nation's largest organization working to replace cannabis prohibition with equitable legalization.

We strongly support the goals of SB 708 and much of the language. As my colleague Olivia Naugle's testimony explains in more detail, we urge the committee to revise S.B. 708 to mirror the February 16 reprint of HB 32,[1] which represents a middle ground between the two bills and would harmonize them into a single unity bill. The reprint of HB 32 includes more robust provisions to ensure a diverse, equitable industry, with more opportunities for small businesses and those hardest hit by cannabis prohibition. It also would result in more funding for communities hardest hit by the war on drugs, HBCUs, to create an equitable industry, and for other state needs.

According to Gallup, more than two-thirds of Americans support legalizing marijuana.[2] In Maryland, Civiqs Research found 73% support.[3] Voters realize that, like alcohol prohibition before it, cannabis prohibition has been a destructive and wasteful failure. It squanders billions of dollars, tears families apart, derails dreams, and has been unequally enforced. Prohibition also makes control impossible. Only legalization and regulation allows for protections for communities, the environment, cannabis consumers, and workers.

Penalizing adults for using cannabis is also offensive to one of our core values — liberty. Cannabis is far safer than alcohol,[4] tobacco,[5] and many medications, and

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[1] Our summary is available here: https://www.mpp.org/states/maryland/summary-of-hb-32-the-cannabis-legalization-and-regulation-inclusion-restoration-and-rehabilitation-act-of-2021/
[2] "Support for Legal Marijuana Inches Up to New High of 68%," Gallup, November 9, 2020.
[3] https://civiqs.com/results/cannabis_legal?annotations=true&uncertainty=true&zoomIn=t
[4] For details and citations, *see* https://www.mpp.org/marijuana-is-safer/.
[5] Tobacco kills 480,000 Americans per year. (CDC, "Smoking & Tobacco Use.") Cannabis has not been shown to increase mortality. "The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research," *The National Academies of Sciences, Engineering, and Medicine*, January 2017. ("There is no or insufficient evidence to support or refute a statistical association between cannabis use and: All-cause mortality (self-reported cannabis use)")

grown-ups should be allowed to make their own decisions about whether to consume it.

Thus far, 15 states and D.C. have legalized cannabis for adult use. The sky hasn't fallen in states that have legalized. There has been no serious effort to repeal the laws, and their popular support has increased substantially.[6] Teen use has not increased, graduation rates are up, and costs related to workplace injuries are down.[7] Meanwhile, in Colorado alone, there are nearly 40,000 badged cannabis workers,[8] and the state brought in $362 million in cannabis tax revenue in 2020. Since 2014, Colorado has generated more than $1.4 billion in cannabis tax revenue.

We have calculated tax projections based on Colorado's year-by-year adult-use cannabis sales, which were then adjusted for Maryland's population, its pre-legalization cannabis use rate, and the tax rates in the HB 32 reprint.

We project the following amounts of tax revenue:

Year of Sales	**State Tax Rate**	**State Tax Revenue**	**Local Tax Revenue** (3%)
1 (begins 3/22)	15%	$45,033,039	$9,006,608
2 (begins 3/23)	15%	$83,954,425	$16,790,885
3 (begins 3/24)	20%	$165,026,447	$24,753,967
4 (begins 3/25)	20%	$209,679,967	$31,451,995
5 (begins 3/26)	25%	$296,220,747	$35,546,490
6 (begins 3/27)	25%	$423,551,755	$50,826,211

In all, we project nearly $800 million in state cannabis tax revenue over the first five years of legal sales, and $1.2 billion over the first six years. In addition, we project localities would generate $117.5 million over five years and $165.8 million over six years.

Over the first five years of legal sales, we project the following amounts of funding for the earmarks in HB 32/SB 708:

Five-Year Projected Total	**Earmark**
$213.5 million	Community Reinvestment and Repair Fund
$197.7 million	Maryland General Fund

[6] Current poll numbers in each state are available here: https://civiqs.com/results/cannabis_legal?annotations=true&uncertainty=true&zoomIn=t. For example, in the first two legalization states, Washington and Colorado, voters enacted legalization initiatives by 55% to 56%. Now, Civiqs shows 76% of Coloradans and 79% of Washington residents support legalization.

[7] For citations and more details, *see*: https://www.mpp.org/issues/legalization/teen-marijuana-use-does-not-increase/ and https://www.mpp.org/issues/legalization/colorado-and-washington-life-after-legalization-and-regulation/.

[8] https://sbg.colorado.gov/med-resources-and-statistics

Five-Year Projected Total	Earmark
$158.2 million	Endowments for Maryland's four HBCUs
$79.1 million	Social Equity Start-Up Fund
$23.7 million	Work-based learning programming
$23.7 million	Technical assistance for social equity applicants
$55.4 million	Substance abuse treatment and prevention
$15.8 million	Public education about alcohol, tobacco, and cannabis
$15.8 million	Cannabis research
$7.9 million	Training for law enforcement to recognize impaired driving

In addition to the social justice and economic benefits of legalization, legal cannabis has also improved the wellbeing of large numbers of people. Research shows most adult-use consumers are using cannabis as an over-the-counter medication. In Denver, 65% of surveyed adult-use customers reported taking cannabis to relieve pain, and 74% used it as a sleep-aid.[9] More than 80% of these people we able to stop or reduce their use of prescription or over-the-counter medications.

My husband, Mark, and I relocated to California from Maryland in 2011, and I have witnessed this firsthand. Mark has suffered from chronic back pain for decades. For years, he took substantial amounts of over-the-counter pain medicines, which can cause liver and kidney damage and stomach bleeding.[10] After legalization, he switched to cannabis. I no longer have to worry that he may be destroying his organs to reduce his pain. Thanks to cannabis, he didn't even take the opiates he was prescribed after kidney surgery.

Many individuals are like Mark and use legal cannabis as over-the-counter medicine, although they were never enrolled in their state's medical cannabis programs. Many doctors are not knowledgeable about cannabis or are unwilling to sign certifications. Some people don't even have a primary care physician or don't want to spend time or money to get on a government list before being allowed to see if cannabis might help. Others have conditions that don't qualify for medical cannabis.

While cannabis is not without risks for some individuals, regulation and education — not prohibition — is the best way to address and minimize those risks. SB 708 would include robust labeling, testing, and educational requirements, along with funding for education about the risks and substance abuse treatment.

The longer Maryland waits to pass this legislation, the more unnecessary harm will be inflicted. Legalizing cannabis will create tens of thousands of new jobs, hundreds of millions of dollars in revenue, and will reduce unnecessary, fraught police-civilian

[9] Marcus Bachhuber, et al., "Use of Cannabis to Relieve Pain and Promote Sleep by Customers at an Adult Use Dispensary," *Journal of Psychoactive Drugs*, Volume 51, 2019.
[10] *See*: https://www.healthline.com/health/pain-relief/ibuprofen-vs-acetaminophen - side-effects

interactions. It will also include automatic expungement, release for cannabis prisoners, and reinvestment in communities hardest hit by the war on drugs.

We appreciate your time and urge you to favorably report SB 708, with amendments we outlined.

Feel free to reach out to Olivia Naugle and myself if there is any other information we can provide as you consider this issue.

Sincerely,

Karen O'Keefe
323-568-1078
Karen@mpp.org

SSample.Testimony. SB708.pdf
Uploaded by: Sample, Sharron
Position: FWA

March 3, 2021

Hearing Before: Maryland Senate

Re: HB 708

Testimony of Sharron Sample, CEO, Dispensary Works, LLC

Senators and Esteemed Colleagues:

Thank you for the opportunity to comment on the proposed Bill to establish adult-use cannabis in Maryland.

I have a medical cannabis dispensary in Charles County, Maryland., and I speak for myself, and for the Dispensary Association in support of this bill with amendments. We applaud the inclusion of dual-licensure that uses our existing expertise and infrastructure to fast-track the availability of product and revenue for the state.

We advocate that one governing body administer the cannabis program for medical and adult-use. The cost to Maryland, and thereby taxpayers, to have two organizations with a great deal of overlap, would be exorbitant. It adds a level of complexity that is unnecessary, while increasing operating costs for cannabis businesses. The adult-use business could come on line much faster, with significantly greater efficiency if the existing Cannabis Commission would administer both.

We feel the tax rate is reasonable and reduces risks of individuals being driven to the black market based on cost. Pre-planned increases in the tax rate pre-suppose a market, which may or may not be realistic. Any increases should be done at a future date, carefully weighing market experience and risk to increasing black market sales.

We support an amendment to establish equitable treatment for existing licensees should their local jurisdiction opt out of adult-use cannabis sales. Choice of a location in another jurisdiction is needed if this should occur.

We support the inclusion of the low-tier grow licenses. I speak for myself and other dispensaries unaffiliated with a grow or processor, in advocating for an amendment to fast-track low-tier grow licenses for these 30+ dispensaries. Without this amendment, we miss an opportunity to better support small-, women -and minority-owned businesses at a time when much energy and resources are being devoted to social equity among cannabis licensees. Early granting of these licenses will help us manage any potential impact to our medical patients as we implement adult-use. These early licenses would provide stability for us, while allowing rapid startup and revenues for the state.

Having a small number of cannabis strains available locally will provide consistent access to product that may be tailored to meet local requirements. These craft-style licenses will help ensure more equitable distribution of flower across the market,

and help with price stability. Too, the ability to grow a limited amount of flower would allow us to better guarantee a core set of products upon which consumers could depend.

Thank you for your consideration of these amendments.

Respectfully,

Sharron Sample

SB0708 Testimony Lauren Simpson.pdf
Uploaded by: Simpson, Lauren
Position: FWA

GREENWAVE DISPENSARY
P.O. BOX 442
70 HOLIDAY DR.
SOLOMONS, MD 20688

March 2,202

Maryland Senate

RE: SENATE BILL 708 By: Senator Feldman

Maryland Senators,

I would like to offer my written testimony in support of SB0708 with amendments on behalf of Greenwave Dispensary located in Solomons, MD.

We are an independent woman owned and operated dispensary. As such I can provide valuable input in proposed adult use regulation. Senator Feldman's bill proposes a reasonable and well thought out approach to the next step in the Maryland Cannabis industry. There are a few key points to which I would recommend clarifying or adjusting.

1) Low tier cultivation licenses should be awarded for small independent dispensaries. Small cultivation licenses for dispensaries unaffiliated with a grow will help to create product and price stability. This will also help to ensure more equitable distribution of flower across the market. In the current medical market, most dispensaries unaffiliated with growers, myself included, are unable to source enough flower to meet demand. The four additional minority grow licenses awarded will not be enough to support a fully mature adult use market based on adoption rates seen in other states.

2) Local authority input should be treated as it was with the launching of the medical program. Local input is made through zoning regulations.

3) Equitable treatment for all license categories is important for a stable and competitive market. The bill legislates how the application must appear for retailers only, but no other kinds of licenses.

4) Ownership caps should be similar to medical program.

5) The geographic spread of dispensaries is important and 47 is a reasonable number.

6) The tax rate is reasonable and should be clarified as a sales tax.

Thank you for the opportunity to provide input at such a dynamic and exciting time in my industry.

Respectfully,

Lauren Simpson

Lauren Simpson
Director
Greenwave, LLC
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Cell: (443) 277-7046

Comments of SunMed on SB 708.PDF
Uploaded by: Weintraub, Jason
Position: FWA

SUNMED GROWERS

Medicine from the Sun

March 2, 2021

Senate Bill 708 – FAVORABLE WITH AMENDMENTS
Cannabis - Legalization and Regulation

SunMed Growers, LLC (SunMed) submits these comments in support of the statement of The Maryland Wholesale Medical Cannabis Trade Association (CANMD), in general support of SB 708, with suggested revisions.

SunMed is one of the largest cultivators of medical cannabis licensed by the Maryland Medical Cannabis Commission (MMCC). SunMed has been an active partner of MMCC in helping to achieve the General Assembly's objective of developing a well-regulated business industry devoted to providing safe and cost-effective medical cannabis to patients in need throughout the State. SunMed writes to highlight several concepts that it believes are important as the General Assembly considers moving from medical-use cannabis to fully legal adult-use cannabis.

Social Equity/Justice. SunMed embraces and supports the social equity/justice provisions of SB 708. Any move to legalized adult-use should appropriately address social equity/justice issues, seek to ameliorate historical harms and provide incentives and support to minorities and historically disadvantaged or harmed people. SunMed supports the concept of assessing a dual licensee fee on existing medical cannabis licensees as a fair methodology for providing financial and technical support to social equity applicants.

Immediate Participation for Medical-Use Licensees. Every state that has moved from medical-use to legalized adult-use cannabis has admitted medical licensees as licensees for adult-use without delay or onerous qualification. Medical licensees in good standing have demonstrated the ability to comply with stringent regulatory requirements and can provide an immediate jump-start to enable a successful adult-use program. This is key to a new industry and its success. SunMed supports the provisions of SB 708 that provide for dual licensee inclusion of existing medical use cultivators.

Regulatory Oversight. MMCC has an experienced, professional staff that has successfully overseen and regulated the blossoming and maturing of Maryland's medical cannabis industry. SunMed believes that such regulatory expertise and experience would be invaluable to the successful inauguration of legalized adult-use cannabis. If primary regulatory oversight were to be tasked to the recently created Alcohol and Tobacco Commission (ATC), SunMed fears that the success of the adult-use industry could be delayed or hampered as ATC seeks to wrestle through numerous safety, security and regulatory issues that may have already been encountered and addressed by MMCC. SunMed urges that primary regulatory authority for cannabis – medical and adult use – be vested in a single entity, MMCC, an experienced and successful regulator.

Cultivator Licenses. SB 708 would create up to 40 Cultivator Licenses for Social Equity Applicants in addition to dual licensee cultivator licenses, and thereafter allows the Commission to award additional cultivator licenses after a demand study is performed. SunMed supports the construct of the SB 708 that enables the Commission to award additional Cultivator Licenses if a demand study indicates additional licenses are warranted.

Classes/Tiers/Production Caps. While SunMed supports lowering barriers to entry to the cannabis market to achieve Social Equity/Justice objectives, and creating funding vehicles to encourage participation, it questions whether creating production caps or tier/classes of licenses is the most effective method to achieve such objectives. Any production caps/tiers limitations could hurt supply, lead to increased consumer prices, possibly encourage the illicit market in cannabis and possibly result in lower tax revenues to fund the social programs under SB 708. If tiers are created, any existing medical cultivation licensees who become dual license growers, and who would exceed proposed tiers created as of the date of passage of the bill, should be able to expand their businesses in accordance with their business plans and without any tier limitation, by an additional amount at least equal to their production capacity as of the date of bill passage, so that such dual licensees can supply the adult use market without impact upon existing medical consumers. This would enable prompt supply to the adult-use market and immediate tax revenues to fund social equity programs under the bill.

Taxation. SunMed supports the construct under SB 708 that taxation should occur only at the consumer point of sale, and not at any transfer between cannabis businesses. Additionally, it is imperative that total tax levied on legal cannabis is set at a level that makes the price of legal cannabis competitive with the market for illicit cannabis, otherwise taxation merely encourages the illegal, unregulated market. It appears that the total taxation level of SB 708 (potentially up to 25%) could make legally purchased adult-use cannabis marginally more expensive than illicit cannabis. This issue should be closely examined.

Consideration by General Assembly. The considerations involved in moving from medical-use cannabis to full adult-use cannabis are myriad and complex. SB 708 is comprehensive in its identification and addressing the intersection of many intricate issues and public policy objectives involved in legalizing cannabis. Limitations imposed by the current pandemic, however, stifle the ability to adequately communicate, discuss and fine-tune thoughts, ideas and suggestions of all stakeholders in such significant legislation. Written statements/views, remote video discussions and hearings, and telephonic conference calls – communication forms necessitated by the pandemic – impinge upon the ability of stakeholders and legislators to fully engage in dialogue and collaborative analysis needed to produce exemplary legislation on an important subject such as legalization of cannabis and addressing harms caused by historical injustice. SunMed applauds the introduction of SB 708 as a vehicle to focus attention and discussion and is willing to work with all interested stakeholders on adult-use legislation, whether in this year's session of the General Assembly or any other session when people can meet and exchange views in person.

Conclusion. SunMed would like to offer its support, insight and energies to crafting workable legalized adult-use legislation. We appreciate the introduction of SB 708 as a vehicle to focus upon the many issues involved in legalization of cannabis and we look forward to working with all stakeholders to insure that Maryland continues as a model for a well-run, well-conceived governmentally regulated cannabis industry. SunMed urges a continuation of input, discussions and proposed solutions to legislation that enables Maryland to move safely and successfully from medical-use to adult-use cannabis. SunMed believes that it is necessary to continue to refine issues and solutions, and SunMed will work diligently in that regard, with the prospect of fulsome debate and finely tuned legislation emerging from the General Assembly.

Thank you for considering the above thoughts and suggestions.

Sincerely,

SunMed Growers, LLC

Jake Van Wingerden

Jake Van Wingerden
President

CC: CANMD

20210304Testimony in Support of SB708 with amendme

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Position: FWA

Testimony in Support of SB708 with Amendment
Cannabis – Legalization and Regulation
March 4, 2021

To: Hon. Delores Kelley, Chair and members of the Senate Finance Committee
From: Michael Wilson, Executive Assistant to the President
United Food and Commercial Workers Union, Local 400

Chair Kelley and members of the Finance Committee. I am here today on behalf of the members of the United Food and Commercial Workers Union (UFCW), Local 400. We represent over 10,000 members in Maryland working on the front lines of the ongoing pandemic in grocery, retail, food distribution, law enforcement, and health care.

Nationally, UFCW represents over 1.3 million hard-working men and women who work in highly regulated industries including the emerging legal cannabis industry. Our cannabis members can be found across multiple states in growing and cultivating facilities, manufacturing, and processing facilities, and in laboratories and dispensaries, including in Maryland and the District of Columbia. Wherever cannabis is legalized, the UFCW is committed to building family sustaining jobs and a strong, diverse, and skilled workforce.

UFCW Local 400 supports SB 708 with the addition of labor peace agreements as a condition of cannabis licensure and renewal, as well as other amendments to allow for more social equity licenses and micro grow facilities that bring SB 708 in line with HB 32. Labor peace agreements protect businesses, workers, and consumers, and are an effective regulatory tool for the state, while allowing for micro grows and more licenses will allow more people who have been negatively impacted by the failed war on drug policies of the past to participate and be successful in this newly legal industry.

A labor peace agreement is an agreement between an employer and a bona fide labor organization in which the parties agree to maintain labor peace. Such agreements protect the government's interests by prohibiting labor organizations and their members from engaging in strikes, boycotts, picketing and any other interference with the employer's business. In return, the employer agrees not to interfere with efforts by the labor union to communicate with, and attempt to organize and represent, the employer's workers. At its core, these negotiated labor peace agreements create an orderly and fair process for workers to decide whether they want or don't want representation.

Labor peace agreements can help address the existing disparities in the cannabis market by providing equal opportunities for women, people of color, LGBTQ individuals, veterans, and people with disabilities to own businesses or work within the industry. **Access to representation**

helps ensure that a broad range of workers can benefit from the fledgling industry, especially workers from communities that have been disproportionately impacted by cannabis prohibition in the past.

For too long, communities of color have suffered as a result of top-down policy making that is disconnected from lived experiences. This is especially true for communities that have experienced extreme sentencing and racial profiling as a result of the criminalization of cannabis. To truly end cannabis prohibition, Maryland must take steps to redress the harms of decades of over-policing, criminalization, and incarceration of people of color that resulted from cannabis criminalization. The political will and financial resources mobilized in the War on Drugs to put people in jail must be matched with equal resources to create an equitable new industry. To fulfill the promise of this industry for impacted communities and to lead nationally in a just transition, Maryland leaders should consider how cannabis jobs can improve the lives of the families who were impacted by a failed and brutal cannabis prohibition. The political will to end cannabis prohibition must include taking the questions of race equity, harm, and redress seriously.

Unions and front-line cannabis workers can be important partners in equitable hiring and worker organizations can be important institutions for establishing hiring centers and training programs that ensure diverse, skilled, and long tenured workforces. But first we must decouple the new industry from an unjust criminal justice system and ensure that workers can organize without interference.

It is no surprise that multiple other states have chosen to include labor peace requirements for cannabis licensure. California, New Jersey, and New York all require cannabis operators to sign agreements requiring labor peace. Pennsylvania and Illinois incentivize operators with a merit-based system that gives points for labor peace agreements. Each of these states faced similar questions and arguments about labor peace and each of these states, their legislature and legislative counsel agreed that labor peace requirements in cannabis were good and consistent with state and federal law.

A study of a labor peace requirement, and other employment requirements, at San Francisco Airport, concluded that the requirements "dramatically reduced turnover, improved worker morale and [resulted in] greater work effort. Unions in general enhance worker's job satisfaction and consequently employees are more willing to work harder leading to higher productivity and quality of output. A workforce comprised of union members is characterized by reduced turnover, which in turn saves the business money in the long term with less spending on frequent training and induction of new employees. That is why localities require labor peace in other industries.

UFCW supports an adult use cannabis industry in Maryland that will create sustainable jobs for families for the foreseeable future. Our experience is that labor peace agreements are an effective way to achieve that. Labor peace agreements will reward responsible businesses and ensure that Maryland's cannabis industry is driven by companies committed to making long-term investments in local communities.

The nascent Maryland cannabis industry presents an unparalleled opportunity to build a new kind of industry for Maryland, one that redresses historical and continuing harms and gives workers an opportunity to exercise workplace democracy to improve both the industry and Maryland communities. Policymakers must embrace principles of equity and workplace democracy from recruitment to career advancement in order to build a shared culture of equality. One strong mechanism to do so is the labor peace agreement.

In addition to the other amendments we support, the specific amendment for labor peace we are recommending is:

1) On p. 50, after line 27, please insert:

4. Require all applicants for a dual license that have 10 or more employees to submit an attestation signed by a bona fide labor organization stating that the applicant has entered into a labor peace agreement with such bona fide labor organization.

2) On p. 59, after line 2, please insert:

(F) No later than 200 days after hiring a 10th employee, each cannabis establishment licensee shall submit an attestation signed by a bona fide labor organization stating that the applicant has entered into a labor peace agreement with such bona fide labor organization

(G) The maintenance of a labor peace agreement with a bona fide labor organization shall be an ongoing material condition of maintaining a cannabis establishment license with 10 or more employees beginning 200 days after the cannabis establishment hires its 10th employee.

Thank you for the opportunity to comment.

SB0708.Arria.Part1.Testimony.UMD.Research.pdf
Uploaded by: Arria, Amelia
Position: UNF

Oppose SB0708
Cannabis - Legalization and Regulation

Testimony of Amelia M. Arria, Ph.D.
Professor, Behavioral and Community Health
Director, Center on Young Adult Health and Development
University of Maryland School of Public Health
College Park, Maryland 20740

Before the
Maryland Senate Finance Committee and the Budget and Taxation Committee

March 4, 2021

Thank you for the opportunity to testify today. My name is Amelia Arria and I am a Professor at the University of Maryland School of Public Health and Director of the Center on Young Adult Health and Development. I have been conducting research on substance use, including cannabis, for twenty years. I have led one of the largest federally-funded studies to date of the impact of young adult substance use.

Today I would like to focus your attention on the negative impact of cannabis use on brain function and educational achievement. Unfortunately, these issues are seldom part of the legalization conversation. The brief summary of the scientific research findings you will find in my written testimony pertains to ten of our own published studies in Maryland and many other key recent studies conducted elsewhere on this topic, 58 of which I have attached for your reference.

The sheer volume of research showing the negative impact of cannabis is clear, strong and compelling.

Young adults between the ages of 18-29 are the most likely to use cannabis. Cannabis use places young people at substantially higher risk for impaired mental health, drug dependence, and blunted academic engagement and achievement—outcomes that are at direct odds with Maryland's mission to educate and prepare our youth to thrive in a competitive work environment. The negative impacts extend across genders, racial and ethnic groups, and individuals of all socioeconomic backgrounds. Indeed, such use has the potential to adversely impact their personal and professional trajectories for years after college. Specifically, scientific studies show that cannabis use is associated with erosion of an array of cognitive skills that help us focus, plan and prioritize tasks. These deficits appear to be dose dependent and more likely to occur with earlier age at first use.

The addictive potential of cannabis is rarely discussed but is very real. Our study of more than 1,200 undergraduates found that one quarter of users met criteria for cannabis use disorder, characterized by difficulty quitting, and using despite negative consequences. It is quite likely that the negative impacts will only get worse as cannabis use and THC potency of products that are available increases.

The average concentration of THC, the psychoactive component of cannabis, has risen dramatically among available products—from 4% in 1995 to 14.5% in recent years, and is even higher in states that have legalized cannabis use. Commercialization has led to the availability of: 1) even higher potency edible THC products; 2) "dabs"—highly concentrated products usually made from butane hash oil and, 3) hash oil and waxes that can be consumed using vape pens. Use of these highly potent cannabis concentrates can lead to greater risk of dependence through eliciting a more immediate and stronger "high" they are more reinforcing to the brain. These high potency products have also raised serious concerns because of the risk of triggering adverse mental health consequences.

Research has shown that use among young adults clearly has increased following legalization initiatives. The latest national data for youth indicate an increase in frequency of use among users, especially among racial and ethnic minority youth.

Cannabis use also increases the risk of progression to other kinds of substance use. Research has shown that about 45% of cannabis users will go on to use another drug for the first time. Our most recent analysis of data from the University of Maryland indicates that cannabis users in their first year of college are at elevated risk to start using prescription drugs nonmedically, cocaine, and tobacco cigarettes. For example, 25% of cannabis users at age 18 became a new user of cocaine during the four years after starting college, vs. 2% of cannabis non-users. These differences were statistically meaningful after controlling for other variables related to the propensity to use drugs. Other research has shown that heavy drinkers are the group most likely to increase their use of cannabis following passage of legalization policies.

We have shown that cannabis use clearly undermines academic performance and can derail a student's pathway to success. In secondary school, substance use is associated with poor grades and high school dropout. Similarly, in college, drug use is associated with skipping class, spending less time studying, earning lower grades, and taking longer to graduate or not graduating at all. Negative academic effects appear to be stronger for cannabis than alcohol in studies that have compared the two substances. We call these the academic opportunity costs of substance use.

We might debate about a lot of things today, but we would all agree that all young adults in Maryland deserve a chance to fulfill their potential. No one would agree that we should make it harder for our young people to achieve academically. The scientific evidence should guide our decision-making and the science tells us that making cannabis more available can increase the risk of cognitive problems, school dropout, and academic disengagement. The subtle changes incurred by substance abuse on the developing minds of our youth do not only destroy individual potential, they can cause a ripple effect of social and economic losses across our broader society. You have a critical choice to make and I urge you to listen to the scientific evidence when you make your decisions.

Let's make Maryland a leader, not a lemming. A leader in education, a leader in workplace productivity, a leader in innovation. Let's not put up barriers that can compromise academic achievement, motivation, and personal and professional success.

Research Articles on the Adverse Impact of Cannabis on Educational Achievement and Other Outcomes

University of Maryland Publications

University of Maryland School of Public Health in collaboration with the Hazelden Betty Ford Institute for Recovery Advocacy (2019). **Marijuana is not a public health solution to the opioid crisis.** *Emerging Drug Trends Report*.

Green, K.M., **Arria, A.M.** (2019). **Will persistent patterns of youth marijuana use compromise their futures?** *Addiction*. 114(6):1049-1050.

University of Maryland School of Public Health in collaboration with the Hazelden Betty Ford Institute for Recovery Advocacy and the (2017). **Concerns rising over high-potency marijuana use**. *Emerging Drug Trends Report*.

Arria, A. M., Caldeira, K. M., Bugbee, B. A., Vincent, K. B., & O'Grady, K. E. (2016**). Marijuana use trajectories during college predict health outcomes nine years post-matriculation**. *Drug and Alcohol Dependence, 159*, 158-165.

Arria, A. M., Caldeira, K. M., Bugbee, B. A., Vincent, K. B., & O'Grady, K. E. (2015). **The academic consequences of marijuana use during college**. *Psychology of Addictive Behaviors, 29*(3), 564-575.

Arria, A. M., Garnier-Dykstra, L. M., Cook, E. T., Caldeira, K. M., Vincent, K. B., Baron, R. A., & O'Grady, K. E. (2013). **Drug use patterns in young adulthood and post-college employment**. *Drug and Alcohol Dependence, 127*(1-3), 23-30.

Arria, A. M., Caldeira, K. M., Vincent, K. B., Winick, E. R., Baron, R. A., & O'Grady, K. E. (2013). **Discontinuous enrollment during college: Associations with substance use and mental health**. *Psychiatric Services, 64*(2), 165-172.

Arria, A. M., Caldeira, K. M., Bugbee, B. A., Vincent, K. B., & O'Grady, K. E. (2013**). *The academic opportunity costs of substance use during college.*** College Park, MD: Center on Young Adult Health and Development.

Caldeira, K. M., O'Grady, K. E., Vincent, K. B., & Arria, A. M. (2012). **Marijuana use trajectories during the post-college transition: Health outcomes in young adulthood**. *Drug and Alcohol Dependence, 125*(3), 267-275.

Caldeira, K. M., Arria, A. M., O'Grady, K. E., Vincent, K. B., & Wish, E. D. (2008). **The occurrence of cannabis use disorders and other cannabis-related problems among first-year college students**. *Addictive Behaviors, 33*(3), 397-411.

Other Relevant Publications and Abstracts are included following the publications

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The Academic Consequences of Marijuana Use during College

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Kevin E. O'Grady
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Abstract

Although several studies have shown that marijuana use can adversely affect academic achievement among adolescents, less research has focused on its impact on post-secondary educational outcomes. This study utilized data from a large longitudinal cohort study of college students to test the direct and indirect effects of marijuana use on college GPA and time to graduation, with skipping class as a mediator of these outcomes. A structural equation model was evaluated taking into account a variety of baseline risk and protective factors (i.e., demographics, college engagement, psychological functioning, alcohol and other drug use) thought to contribute to college academic outcomes. The results showed a significant path from baseline marijuana use frequency to skipping more classes at baseline to lower first-semester GPA to longer time to graduation. Baseline measures of other drug use and alcohol quantity exhibited similar indirect effects on GPA and graduation time. Over time, the rate of change in marijuana use was negatively associated with rate of change in GPA, but did not account for any additional variance in graduation time. Percentage of classes skipped was negatively associated with GPA at baseline and over time. Thus, even accounting for demographics and other factors, marijuana use adversely affected college academic outcomes, both directly and indirectly through poorer class attendance. Results extend prior research by showing that marijuana use during college can be a barrier to academic achievement. Prevention and early intervention might be important components of a comprehensive strategy for promoting post-secondary academic achievement.

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Drug use patterns in young adulthood and post-college employment

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Abstract

Background—The relationship between serious drug involvement and risk for unemployment is well recognized, but few studies have prospectively examined this relationship among college students. This study used longitudinal data to examine the association between drug use patterns during college and the likelihood of employment post-college, holding constant sociodemographic variables and personality characteristics. Second, we estimate the prevalence of alcohol and other drug use disorders among employed individuals.

Methods—Data were derived from the College Life Study. Participants entered college as traditional students and were assessed annually for six years, regardless of continued college attendance. Analyses were restricted to 620 individuals no longer enrolled in school by Year 6.

Results—Using multinomial regression modeling, persistent drug users [i.e., used illicit drugs (other than marijuana) and/or nonmedical prescription drugs every year they were assessed during the first four years of study] were significantly more likely than non-users to be unemployed vs. employed full-time post-college. Persistent drug users and infrequent marijuana users were also more likely than non-users to be unemployed vs. employed part-time. In Year 6, 13.2% of individuals employed full-time and 23.7% of individuals employed part-time met DSM-IV criteria for drug abuse or dependence during the past year.

Conclusions—If confirmed, the results of this study suggest that persistent drug use among academically-achieving young adults might increase risk for post-college unemployment. More research is needed to understand the processes underlying this association. Further attention should be directed at managing substance use problems among recent college graduates who have secured employment.

Keywords

College students; drug and alcohol use; employment; longitudinal study

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Discontinuous enrollment during college: Associations with substance use and mental health

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Abstract

Objective—To examine the prospective relationship of substance use and mental health problems with risk for discontinuous enrollment during college.

Methods—Participants were 1,145 college students interviewed annually at one large public university, beginning at college entry (year 1). Discontinuous enrollment was defined as a gap in enrollment of one or more semesters and operationalized as "early" (i.e., during the first two years) and "late" (i.e., during the second two years) versus "none" (i.e., continuously enrolled throughout college). Explanatory variables measured in year 1 were the Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), childhood conduct problems, cannabis use, number of illicit drugs used, and alcohol consumption. In years 3–4, participants reported lifetime history of clinically diagnosed ADD/ADHD, depression, and/or anxiety, including age at diagnosis. Multinomial logistic regression models were developed to evaluate the association between the independent variables and discontinuous enrollment, holding constant background characteristics.

Results—Higher BDI scores predicted early discontinuity but not late discontinuity, whereas cannabis and alcohol use predicted late discontinuity but not early discontinuity. Receiving a depression diagnosis during college was associated with both early and late discontinuity. None of the self-reported pre-college diagnoses were related to discontinuous enrollment once background characteristics were taken into account.

Conclusion—Students experiencing depressive symptoms and/or seeking treatment for depression during college might be at risk for interruptions in their college enrollment. Cannabis use and heavy drinking appear to add to this risk. Students entering college with pre-existing psychiatric diagnoses are not necessarily at risk for enrollment interruptions.

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Graduate degree completion: Associations with alcohol and marijuana use before and after enrollment☆

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ABSTRACT

Research has shown that alcohol and marijuana use are associated with academic performance difficulties, but the relationship to completion of a graduate degree has not been explored. Undergraduate students (n = 1253) were assessed during their first year of college and annually thereafter until age 29. Among the subset of the original sample who enrolled in graduate school (n = 520), measures of alcohol and marijuana use were averaged separately for the time periods before and after graduate school enrollment. Logistic regression models were developed to examine the associations between these variables and graduate degree completion, adjusting for other factors. In general, a minority of the sample were excessive drinkers or frequent marijuana users. The majority of drinkers (70%) drank an average of twice a week or less each year, and 62% of marijuana users used marijuana once a month or less each year. After adjusting for demographic and program characteristics, marijuana use frequency after graduate school enrollment was negatively associated with odds of graduate degree completion. Alcohol use frequency before graduate school enrollment was positively associated with odds of graduate degree completion. Results add to the growing body of literature on marijuana use and decreased academic achievement, but results should be interpreted with caution given the small, but significant, effect sizes found. The positive association between alcohol use frequency and degree completion might be attributed to engagement in the academic environment. Future studies should examine the potential mechanisms through which alcohol and marijuana use are related to the academic achievement of graduate students.

1. Introduction

Substance use among young adults is a major public health concern and is associated with academic problems. The bulk of research in this area has focused on undergraduate students, as alcohol and marijuana use among this population are fairly common (Schulenberg et al., 2017). In addition to academic difficulties, alcohol and marijuana use are associated with other negative consequences during the college years, including risky sexual behaviors, social and interpersonal problems, injury, and impaired driving (Caldeira et al., 2009; Merrill & Carey, 2016; Pearson, Liese, Dvorak, & Marijuana Outcomes Study Team, 2017; White & Hingson, 2013).

Longitudinal research has shown that alcohol and marijuana use during college might have long-term consequences after college graduation. Heavy drinking and marijuana use during college are associated with post-college substance abuse and dependence, unemployment, less prestigious employment, and lower income (Arria, Garnier-Dykstra, et al., 2013; Jennison, 2004; Schulenberg et al., 2005; Wilhite, Ashenhurst, Marino, & Fromme, 2017). Marijuana use during college and the immediate post-college years, particularly heavy use, is associated with several negative health outcomes at ages 24 and 27, including emotional problems, injury, illness, decreased quality of life, and less service utilization for physical and mental health problems (Arria, Caldeira, Bugbee, Vincent, & O'Grady, 2016; Caldeira, O'Grady, Vincent, & Arria, 2012).

Degree non-completion as a consequence of substance use has been

Abbreviations: Y, year

☆ Note: This research was conducted as part of the doctoral dissertation of the first author.

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Marijuana use trajectories during college predict health outcomes nine years post-matriculation

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Abstract

Background—Several studies have linked marijuana use with a variety of health outcomes among young adults. Information about marijuana's long-term health effects is critically needed.

Methods—Data are from a ten-year study of 1,253 young adults originally recruited as first-year college students and assessed annually thereafter. Six trajectories of marijuana use during college (Non-Use, Low-Stable, Early-Decline, College-Peak, Late-Increase, Chronic) were previously derived using latent variable growth mixture modeling. Nine health outcomes assessed in Year 10 (modal age 27) were regressed on a group membership variable for the six group trajectories, holding constant demographics, baseline health status, and alcohol and tobacco trajectory group membership.

Results—Marijuana trajectory groups differed significantly on seven of the nine outcomes (functional impairment due to injury, illness, or emotional problems; psychological distress; subjective well-being; and mental and physical health service utilization; all *ps*<.001), but not on general health rating or body mass index. Non-Users fared better than the Late-Increase and Chronic groups on most physical and mental health outcomes. The declining groups (Early-Decline, College-Peak) fared better than the Chronic group on mental health outcomes. The Late-Increase group fared significantly worse than the stable groups (Non-Use, Low-Stable, Chronic) on both physical and mental health outcomes.

Conclusions—Even occasional or time-limited marijuana use might have adverse effects on physical and mental health, perhaps enduring after several years of moderation or abstinence. Reducing marijuana use frequency might mitigate such effects. Individuals who escalate their marijuana use in their early twenties might be at especially high risk for adverse outcomes.

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Marijuana use trajectories during the post-college transition: Health outcomes in young adulthood

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Abstract

Background—Despite the relatively high prevalence of marijuana use among college students, little information exists regarding health outcomes associated with different use patterns or trajectories.

Methods—Seven annual personal interviews (Years 1–7) were administered to 1,253 individuals, beginning in their first year in college. Growth mixture modeling was used to identify trajectories of marijuana, alcohol, and tobacco use frequency during Years 1–6. Logistic regression was used to evaluate the relationship between marijuana use trajectories and several Year 7 health outcomes, holding constant Year 1 health, demographics, and alcohol and tobacco use trajectories.

Results—Six marijuana use trajectories were identified: Non-Use (71.5%$_{wt}$ of students), Low-Stable (10.0%$_{wt}$), Late-Increase (4.7%$_{wt}$), Early-Decline (4.3%$_{wt}$), College-Peak (5.4%$_{wt}$), and Chronic (4.2%$_{wt}$). The six marijuana trajectory groups were not significantly different on Year 1 health-related variables, but differed on all ten Year 7 health outcomes tested, including functional impairment due to injury, illness, or emotional problems; general health rating; psychiatric symptoms; health-related quality of life; and service utilization for physical and mental health problems. Non-Users fared significantly better than most of the marijuana-using trajectory groups on every outcome tested. Chronic and Late-Increase users had the worst health outcomes.

Conclusions—Marijuana use patterns change considerably during college and the post-college period. Marijuana-using students appear to be at risk for adverse health outcomes, especially if they increase or sustain a frequent pattern of use.

Keywords

Cannabis; health outcomes; physical and mental health; health care utilization; longitudinal studies

1. Introduction

Marijuana remains the most commonly used illicit substance worldwide. In the U.S., marijuana use increased significantly among college-attending 18- to 22-year-olds from

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The Occurrence of Cannabis Use Disorders and other Cannabis-Related Problems among First-Year College Students

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Abstract

This study reports the prevalence of cannabis use disorders (CUD) and other cannabis-related problems in a large cohort (n=1253) of first-year college students, 17 to 20 years old, at one large public university in the mid-Atlantic region of the U.S. Interviewers assessed past-year cannabis use, other drug use, and cannabis-related problems (including DSM-IV criteria for CUD). The prevalence of CUD was 9.4%$_{wt}$ among all first-year students and 24.6% among past-year cannabis users (n=739). Of those endorsing any CUD criteria, 33.8% could be classified as diagnostic orphans. Among 474 "at-risk" cannabis users (≥5 times in the past year), concentration problems (40.1%), driving while high (18.6%) and missing class (13.9%) were among the most prevalent cannabis-related problems, even among those who endorsed no CUD criteria. Placing oneself at risk for physical injury was also commonly reported (24.3%). A significant proportion of cannabis-using college students meet diagnostic criteria for disorder. Even in the absence of disorder, users appear to be at risk for potentially serious cannabis-related problems. Implications for prevention, service delivery, and future research are discussed.

Keywords

Cannabis; marijuana; drug dependency; drug abuse; college students; research diagnostic criteria

1. Introduction

According to the most recent data from *Monitoring the Future*, in 2006 close to one in three (30.2%) college students had used cannabis in the past year (Johnston, O'Malley, Bachman, & Schulenberg, 2007). These prevalence estimates are similar to findings from the 2001 *Harvard College Alcohol Study* (Mohler-Kuo, Lee, & Wechsler, 2003), which reported that 30% of college students used cannabis in the past year. Moreover, as with other forms of illicit drug use, young adults consistently have a higher prevalence of cannabis use than other age groups (Substance Abuse and Mental Health Services Administration [SAMHSA], 2006), and

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ADDICTION
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COMMENTARY

Commentary on Terry-McElrath *et al.* (2019): Will persistent patterns of youth marijuana use compromise their futures?

Recent increases in the prevalence of frequent marijuana use that extend well into adulthood raise concerns about the long-term consequences for population health and for the individuals engaging in these use patterns.

With the context of marijuana use changing rapidly and marijuana use prevalence continuing to increase in the United States [1,2], the public is in great need of rigorous science on the consequences of these trends to guide policymaking. Terry-McElrath and colleagues address this need by answering important questions regarding the continuation of youth marijuana use patterns to age 30 years [3]. Using data from the Monitoring the Future Survey, a national school-based sample, they find that more recent cohorts are at the highest risk for continued frequent marijuana use. Moreover, 60% of individuals who use marijuana frequently in high school continue to use marijuana at some level when assessed at age 30, and almost a quarter continued a frequent use pattern. The authors point to decreases in perceived risk, increased tetrahydrocannabinol (THC) potency and changes in the transition to adult roles as possible reasons for these findings.

The prevalence of long-term frequent use, however, is probably much greater than this study indicates. The latent classes estimated were identified using data collected during the study participants' senior year of high school. As mentioned in the limitations [3], this school-based sample excludes those who have dropped out of high school or who do not attend regularly. This exclusion may be a result of marijuana use, as our previous research, and that of others, shows a wide range of academic performance problems associated with frequent marijuana use, including school dropout [4,5]. Moreover, the exclusion might be even greater among vulnerable groups, such as racial minorities, where school dropout is more common [6] and marijuana use is increasing [7].

The educational consequences of frequent marijuana use also seem to extend past high school [8]. Terry-McElrath *et al.* find college enrollment and completion are low among frequent adolescent marijuana users [3]. Their analyses show that just 23.8% of 12th grade frequent marijuana users graduate college, with an additional 11.3% attending college but not graduating. This compares nationally to approximately 60–70% of high school graduates enrolling in college, depending on the cohort [9].

Educational consequences are probably just the beginning of a cascade of negative effects for frequent marijuana users [4,10]. Research has shown that the effects of such use are broad, and affect domains such as social role formation, social relationships, life satisfaction and physical health symptoms, such as sleep and irritability [4,11–13]. Accumulating evidence also shows that marijuana use can precipitate or worsen existing mental health symptoms [14,15]. Interestingly, some of the purported consequences of marijuana use might be the reason for using marijuana in the first place [16]. For example, many individuals who use marijuana to sleep or relieve anxiety might unknowingly be alleviating cannabis withdrawal symptoms, which have been recently reported to occur in 12% of frequent users [17]. Similarly, although underresearched, it is possible that initiating frequent use at an early age might lead to underdevelopment of adaptive coping strategies for stress and anxiety, which could drive continued use.

The sharp increased prevalence of frequent marijuana use in recent cohorts is likely to continue and potentially worsen, considering the high prevalence of this behavioral pattern among current 12th graders, as well as use trajectories that might extend longer during the lifecourse than previously seen and evidence that relaxed marijuana legislation in the United States may impact the course of adult use [18]. Moreover, the view of marijuana as a relatively harmless substance is at odds with mounting scientific evidence and it is unfortunate that public dialogue on the negative impacts of marijuana has not been more pronounced, as these consequences can dim the bright futures of our youth. Terry-McElrath *et al.* call for greater understanding of the possible broad impacts of long-term patterns of use [3]. We propose that a crucial next step for this work is to understand how its findings, along with accumulating evidence of negative consequences from marijuana use, can guide policymaking and public health efforts, as scientists have suggested that marijuana policy has outpaced the science [19]. As more states relax their marijuana policies, persistent use and related adverse consequences are likely to continue to grow. Fast-forward to 2031, when today's high school seniors are 30 years old: how prevalent will frequent patterns of use be then; and what will be the impact of these patterns on frequent marijuana users and the rest of society?

Declaration of interests

None.

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Keywords Adult outcomes, cannabis consequences, education effects, frequent marijuana use, longitudinal patterns, policy-relevant science.

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Hazelden Betty Ford
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Emerging Drug Trends Report

April 2017 | Shedding new light, every month, on America's No. 1 public health problem

Concerns Rising Over High-Potency Marijuana Use

New research raises concerns about the ever-increasing potency of marijuana and the new ways it is being used, according to an analysis by the Hazelden Betty Ford Institute for Recovery Advocacy, in partnership with the University of Maryland School of Public Health.

The two organizations report that several recent studies point to rising potencies, a new method of consumption called "dabbing" and the use of synthetic marijuana as areas of concern.

Potency climbing

Tetrahydrocannabinol (THC) is the component of marijuana—also referred to as cannabis—that causes the "high." A recent analysis of cannabis samples confiscated by the federal Drug Enforcement Agency showed a steady increase in THC content, from 4 percent to 12 percent between 1995 and 2014 (ElSohly et al., 2016).

Traditional forms of marijuana have long been linked to cognitive problems, underachievement in school and risk for dependence, especially for youth. High-potency marijuana may pose elevated risks for negative outcomes, including emergency department visits, mental health problems, and structural brain alterations such as decreased hippocampal volume and disturbed white matter connections in the corpus callosum.

The link between cannabis use and increased risk for psychosis is fairly clear but might be even stronger for high-potency forms, according to another recent study (Murray, Quigley, Quattrone, Englund, & Di Forti, 2016). Individuals who used high-potency cannabis on a daily basis were found to be five times more likely to experience a psychotic disorder than non-users. Among people with psychosis, daily users also experienced their first episode of psychosis an average of six years earlier than non-users.

"Synthetics"

Another danger is synthetic marijuana, which has increased dramatically in popularity since the late 2000s.

Individuals who use synthetic cannabis have been found to be 30 times more likely to visit an emergency unit than those who use traditional forms of cannabis (Murray et al.,2016). And a recent study of high school students found that those who had used synthetic marijuana were at increased risk for using other drugs such as cocaine, heroin and ecstasy; getting into a physical fight; having unprotected sex; and riding with intoxicated drivers, compared with those who used marijuana only (Clayton, Lowry, Ashley, Wolkin, & Grant, 2017).

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"Dabbing"

A third reason marijuana is getting more dangerous is the new method of consumption known as "dabbing," which involves heating a strong cannabis concentrate (up to 80 percent THC), usually an oil or wax, and then inhaling the vapor. This results in a quicker and more intense "high" but can also lead to serious health consequences.

A recent study analyzed 5,000 tweets from Twitter to gain insight into the use and effects of dabbing (Cavazos-Rehg et al.,2016). Among other findings, it noted that:

- Twenty-two percent of the tweets about dabbing referenced extreme physical effects, and 15 percent mentioned using an excessive amount or engaging in several sessions back to back.
- The most common physiological symptom mentioned was passing out/losing consciousness. The second most common symptom mentioned was respiratory effects such as coughing, loss of breath and lung pain. However, only 2 percent described disliking respiratory effects. Less common symptoms included loss of body control or inability to move, nausea and vomiting, perspiration and crying/tearing up.

"Our study adds to the limited understanding of marijuana concentrates and dabbing, which are increasing in use and accessibility across the U.S. and among young people especially, who are most vulnerable to marijuana-related harms," said Patricia A. Cavazos-Rehg, PhD, co-author of the study. "Our findings signal potentially intense experiences associated with dabbing (e.g., passing out), thereby stressing the need for continued surveillance of marijuana use in this form."

Implications

Despite the consequences associated with higher potency marijuana, dabbing and synthetics, the percentage of adults and adolescents who believe regular use of marijuana poses "no risk" tripled from 5 percent in 2004 to 15.3 percent in 2014 (Substance Abuse and Mental Health Services Administration, 2004; 2014).

"Recent research highlighting the dramatic increase in marijuana potency is concerning given what is known about the possible negative effects of cannabis on cognitive functioning and mental health," said Dr. Amelia Arria, Associate Professor and Director of the Center on Young Adult Health and Development at the University of Maryland School of Public Health.

Dr. Arria noted that drug use trends in the U.S. are monitored primarily using annual household surveys and classroom-based surveys of schoolchildren, which are useful for understanding how often individuals are engaging in traditional methods of cannabis use. But they do not comprehensively measure new routes of cannabis administration or the potency of products, and she urged those large drug trend surveys to "look at patterns of high-potency cannabis and new routes of administration so we can more thoroughly understand the impact of marijuana on our society."

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Hazelden Betty Ford Foundation Perspectives

Butler Center for Research:

- Within the Hazelden Betty Ford Foundation's national system of care, more than 22 percent of patients in 2015 had a cannabis use disorder, including 36 percent of the patients at the organization's national youth treatment center in Plymouth, Minnesota.

Nick Motu, Vice President, Hazelden Betty Ford Institute for Recovery Advocacy:

- "As debates continue over legalizing and regulating marijuana, ever-expanding access and demand may be leading to stronger marijuana, with greater potential for negative health consequences."
- "While the perceived risks of marijuana use are decreasing, some health concerns are actually on the rise."

Dr. Joseph Lee, Medical Director, Hazelden Betty Ford Foundation Youth Continuum:

- "It's economics. No matter what the consumable substance is, there will always be a demand for bigger, better, faster and more. This is true for caffeinated beverages and alcohol. It's also true for marijuana. Potency is one differentiator in a capitalistic marketplace."
- "The issue of higher potency cannabis, even five or six years ago, got a lot of laughter from those who joked that 'this isn't your parents' marijuana.' Today, though, there's no question that higher-grade marijuana is here, and some young people are actively seeking it out."
- "We are seeing more signs of psychosis among our young patients who use concentrates. Some kids even swear off dabs and concentrates because of the paranoia and anxiety they experience."
- "We know the earlier a young person starts to use any mood- and mind-altering substance, the greater the possibility of developing addiction. There are two important variables here. One is the impact of the substance on a developing person. The other is that early adopters of substance use are readily identifying themselves as high risk for future substance-related problems, in much the same way that people who frequent fast food restaurants are identifying as being at risk for metabolic syndrome."
- "Some people start dabbing because they have developed a tolerance for regular cannabis, and dabbing is the next step up. Some young people who smoke, however, are wary of dabbing and its psychoactive effects, so you'll find a diversity of opinion from using youth."
- "There are very specific kinds of psychotic symptoms that marijuana and concentrates can cause. They usually aren't hallucinations and are better classified as 'ideas of reference,' where they feel certain things in their environment are connected and that they have the unique perspective to tease out these hidden meanings. Kids joke about illuminati, aliens and conspiracy theories but also comment on people they know who smoke and become truly delusional about such concepts."

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- "I actually think some kids who smoke daily and use concentrates are more in tune with the pitfalls of compulsive use than adults. The youth we see talk quite honestly about whether they feel their use is compulsive or whether their use has had negative impacts on their lives. Some report being concerned by fellow smoking friends for getting 'carried away' or addicted. For the ones who do develop problems with marijuana, they actually fear backlash from others that their addiction won't be taken seriously and don't feel safe or supported in a social dialogue that invalidates their struggles."
- "Marijuana legalization efforts alter black market economics but are not effective in stopping black market sales. Perhaps due to poor regulation or supply chain issues, many young people I see from across the country talk about getting their 'high quality' marijuana and concentrates from 'legitimate' growers who liquidate their surplus at a heavily discounted price."

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Emerging Drug Trends Report | Hazelden Betty Ford Institute for Recovery Advocacy

Shedding new light, every month, on America's No. 1 public health problem

This report was produced in collaboration with the University of Maryland School of Public Health, with support from the Hazelden Betty Ford Foundation's Butler Center for Research.

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Our mission is to provide a trusted national voice on all issues related to addiction prevention, treatment and recovery and to facilitate conversation among those in recovery, those still suffering and society at large. We are committed to smashing stigma, shaping public policy and educating people everywhere about the problems of addiction and the promise of recovery.

Hazelden Betty Ford Foundation

Emerging Drug Trends Report

July 2019 | Shedding new light on America's No. 1 public health problem

Clearing Away the Confusion: Marijuana is not a Public Health Solution to the Addiction Crisis

Overview

With more than 70,200 deaths occurring in 2017, the public health crisis of fatal drug overdoses is headline news and shows no signs of abating (National Institute on Drug Abuse, 2019). Beneath this alarming statistic are also tens of millions of individuals and their loved ones who *live* every day with addiction. Expanding access to naloxone to help prevent opioid overdose deaths in the short term is critical, but we cannot let short-term solutions overshadow or replace the need to provide high-quality treatment services to individuals with all forms of addiction to stem the tide of future overdose cases. Individuals with opioid use disorder usually use other substances: cocaine and benzodiazepines figure prominently in overdose deaths, for example. Another fast-growing concern is methamphetamine use. Of course, alcohol remains ever-present as well and is part of the picture for the vast majority of people who suffer from addiction. As previously discussed in the *Emerging Drug Trends Report* "Widening the Lens on the Opioid Crisis," a continuum of approaches to identify high-risk individuals and intervene appropriately is needed to make progress.

Recently, some advocates have claimed that marijuana might be part of the solution to the opioid crisis. Within the past year, states such as New York and Illinois have passed legislation making medical marijuana more accessible to individuals with opioid prescriptions (Illinois General Assembly, 2018; New York State Department of Health, 2018). However, clinical evidence produced from rigorous research methodology that marijuana is an effective treatment for pain or opioid use disorder does not exist; therefore, marijuana should not be promoted as a safe alternative (Humphreys & Saitz, 2019). The notion that increased access to marijuana will help the country shed its current addiction crisis does not have scientific merit, and distracts from planning and implementing a longer-term and broader set of evidence-based strategies. A recent study by Chen et al. (2019) reaffirmed the urgency of implementing a multifaceted approach involving prevention, treatment and harm reduction to address the opioid overdose crisis. The annual number of overdose deaths is expected to increase by nearly 150% between 2015 and 2025.

This report clarifies the current state of scientific understanding on the relationship between marijuana and opioid use. While more research is needed to fully comprehend the complex issues discussed, and to develop new interventions and treatments for addiction, decades of existing research findings should serve as the foundation of policy decisions.

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State-level correlations between marijuana policies and opioid medication prescribing

A recent study examined data for Medicare Part D recipients living in all 50 states. The authors investigated whether prescribing patterns for opioids were different based on the state's marijuana policies. Bradford and colleagues (2018) specifically measured the total number of daily doses for any opioid medication prescribed to a person from 2010 through 2015. States with any type of medical marijuana law had an estimated 2.1 million fewer daily doses of opioid prescriptions per year than states without a medical marijuana law (the average among all states was 23.1 million daily doses). States with medical marijuana dispensaries and those that allow home cultivation were estimated to have 14.4% and 6.9% fewer, respectively, daily doses of opioids prescribed. Although it is tempting to speculate that the lower prescribing was due to marijuana policies, the study results cannot conclude that differences in marijuana policies were the reason for the different opioid prescribing rates. There could have been several other reasons for the state-level differences in opioid prescribing rates besides the marijuana laws that were in place at the time the data were examined.

Medicare Part D is an optional prescription drug benefit plan available to Medicare recipients in the U.S. More than 70% of Medicare recipients are enrolled in Medicare Part D.

Wen and Hockenberry (2018) examined opioid prescribing patterns among Medicaid recipients living in the eight states that implemented medical marijuana laws between 2011 and 2016. In four of the eight states, statistically significant reductions in opioid prescribing rates were found during this period. Of the four states that implemented recreational marijuana laws, three also experienced significant reductions in opioid prescribing rates. Just as in the study described above, however, this study cannot determine that the decrease in opioid prescribing was due to differences in the marijuana laws. It must also be noted that the results from these studies (Bradford et al., 2018; Wen & Hockenberry, 2018) were observed among specific groups of individuals: Medicare and Medicaid recipients. The researchers cannot say if state-level reductions in opioid prescribing have been or will be observed among the general public in states with marijuana laws. Caution is warranted when considering whether to use these findings when making policy decisions about access to marijuana that will affect the general public.

State-level correlations between marijuana policies and opioid overdoses

Bachhuber and colleagues (2014) compared opioid overdose death rates, rather than prescribing patterns, in states with and without marijuana legalization. Between 1999 and 2010, the opioid-related death rate rose in all states, but states with a medical marijuana law had higher rates of opioid-related mortality than states without such a law. However, when the influence of medical marijuana policies was isolated from the influence of the state and year in which the data were collected, the researchers found that states with a medical marijuana law had an estimated 24.8% fewer opioid overdoses per year on average compared with states that had no medical marijuana law. A more recent study (Shover, Davis, Gordon, & Humphreys, in press) refutes the findings of Bachhuber (2014). Using essentially the same approach but extending the time of analysis through 2017, the newer study found that the direction of the association reversed—states enacting a medical marijuana law experienced a 22.7% increase in opioid overdoses. When Shover and colleagues (in press) applied additional statistical controls that were not part of the earlier study, they found no association between the two variables. This more recent study seriously calls into question the claim that medical marijuana laws have any beneficial impact on opioid overdose death rates and suggests instead that such laws could potentially have a negative impact.

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Beware of the "ecological fallacy"

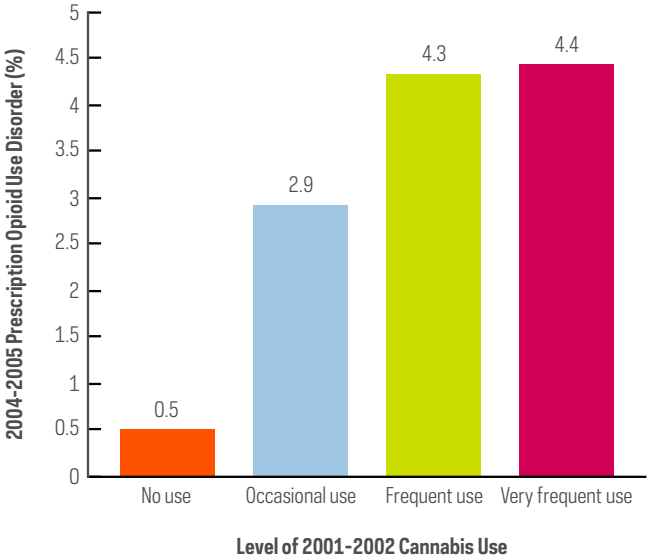
The most important consideration when evaluating the studies cited earlier is that they were all conducted at the state level. Ecological studies like these, which utilize measurements of health that have been averaged across a population, are often valuable first steps in identifying a possible relationship between an exposure and some outcome—in this case, marijuana policies and opioid prescribing rates or overdose deaths. However, studies conducted at the state level cannot and should not be used to draw conclusions about individual behaviors; such conclusions are known in public health science as "ecological fallacies."

For example, if you compared volunteering across multiple schools, you would discover that some schools have a higher proportion than others of students who volunteer in their community. Yet the reason for volunteering might not have anything to do with school policies or school environments. Rather, the choice to volunteer might stem from many other influences, such as home life, work schedules or personal interests. Similarly, it would be an ecological fallacy to assume that because opioid prescribing or overdose deaths decreased among states with legal marijuana policies, individuals in those states reduced their opioid use because of increased availability of marijuana.

Studies at the individual level: Marijuana use increases risk for subsequent opioid use and dependence

The other side to the story regarding marijuana and opioids is how the two substances are related to each other at the individual level. The vast majority of individuals who misuse prescription pain medication and/or heroin initiated their drug use early in their teens, usually beginning with alcohol and marijuana. Biologically, early initiation of drug use primes the brain for enhanced responses to other drugs later in life. Most recently, Caputi and Humphreys (2018) show the heightened risk of prescription opioid misuse among medical marijuana users. Using nationally representative data, they found that medical marijuana users have twice the risk for prescription opioid misuse compared with non-users of medical marijuana. Although this study used data collected at one point in time, the findings raise doubts that medical marijuana can be protective against the development of opioid use disorder.

Figure 1. Level of 2001-2002 Cannabis Use and Incident 2004-2005 Prescription Opioid Use Disorder in the National Epidemiological Survey on Alcohol and Related Conditions (NESARC); (Olfson, Wall, Liu, & Blanco, 2018)



Similarly, Olfson and colleagues (2018) analyzed a different nationally representative dataset from two time periods—2001 to 2002 and 2004 to 2005. Individuals who used marijuana from 2001 to 2002 had nearly three times the odds of starting to use opioids nonmedically three years later compared with their counterparts who did not use marijuana (after adjusting for demographic factors and other substance use history). Increased risk for beginning to use opioids nonmedically was observed among a subset of adults with moderate to severe pain as well.

Opioid use disorder is the clinical diagnosis used to identify whether or not use of pain relief medication or heroin causes an individual significant impairment, including health problems, physical withdrawal, persistent or increasing use, and failure to satisfy

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responsibilities at work, school or home (Substance Abuse and Mental Health Services Administration, 2017). In Olfson et al. (2018), marijuana use was associated with two times the odds of developing opioid use disorder within three years, compared with those who did not use marijuana. Figure 1 shows that the proportion of individuals who developed opioid use disorder by 2004 to 2005 increased as 2001 to 2002 frequency of marijuana use increased.

Another study utilizing several years of data also observed that marijuana use increases risk for subsequent nonmedical use of opioids. Fiellin et al. (2013) examined the association between marijuana use and subsequent misuse of prescription opioids among young adults 18 to 25 years old using nationally representative data from 2006 to 2008. More than one-third of young adults who misused opioids had already initiated marijuana use in their lifetime prior to prescription opioid misuse. Young adults who had previously used marijuana had 2.5 times the odds of starting to misuse prescription opioids compared with those who had not used marijuana. The risk posed by previous marijuana use was about twice the risk from using other common substances, such as alcohol and cigarettes (1.2 and 1.3 times the odds, respectively). A recent study by Butelman et al. (2018) underscored young adulthood as a critical developmental period for intervention as individuals with opioid dependence started their heaviest use of marijuana at 19 years old on average.

Substituting one drug for another has implications

Some authors of ecological studies examining the relationship between marijuana use and opioid prescribing rates have argued that more liberalized marijuana laws might help combat the current opioid epidemic by allowing individuals to manage their pain with marijuana rather than prescription opioids. However, these studies do not determine if successful pain treatment replacement is actually occurring. To our knowledge, the majority of studies of this nature conducted so far have utilized online questionnaires at one time point to ask individuals who already used marijuana—medically and nonmedically—about their opioid use and substitution practice (Boehnke, Litinas, & Clauw, 2016; Corroon, Mischley, & Sexton, 2017; Reiman, Welty, & Solomon, 2017; Sexton et al. 2016). These studies have shown that marijuana is being used to manage pain regardless of legalization laws; unfortunately, weak methodology prevents more substantive conclusions about the efficacy of replacing prescription opioid use with marijuana use. Longitudinal studies with longer-term data collection that could provide a clearer picture of the benefits and harms of pain management substitution have not yet been conducted.

Perhaps the methodologically strongest study that attempts to determine whether or not marijuana use for pain treatment improves patient outcomes is "The Pain and Opioids in Treatment" study (Campbell et al., 2018). Campbell et al. recruited 1,514 participants from pharmacies across Australia with non-cancer pain who were prescribed opioids between 2012 and 2014, and then followed up with them four years later. By the end of the study, 24% of the participants had also used marijuana for pain management and 60% had interest in using marijuana for pain (compared with 33% who had interest at the beginning of the study). Participants who used marijuana for pain had greater pain severity, reported that pain interfered with life more and had greater generalized anxiety disorder compared with their peers who did not use marijuana. Importantly, the research team did not find any relationship between marijuana use for pain and actual pain severity as time progressed. The study concluded that marijuana use did not reduce an individual's prescriptions for opioids or increase opioid discontinuation. While this study was conducted in Australia, and therefore cannot be directly generalized to the United States due to differences in marijuana use policies, this study offers the strongest evidence to date that at the individual level, marijuana use for pain does not decrease opioid use or improve pain outcomes.

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As described earlier, several studies assessing risk for opioid use conducted at the individual level have found that those who use marijuana are more likely to start misusing prescription opioids and developing opioid use disorder compared with those who do not use marijuana (Fiellin et al., 2013; Olfson et al., 2018). Individuals with chronic pain who use marijuana are also not immune from the increased risk for starting to misuse prescription opioids, a finding that further calls into question the claim that increased medical marijuana use would reduce opioid misuse and overdose (Olfson et al., 2018).

Conclusions

- The claim that increased access to marijuana through legalization policies could help combat the opioid crisis must be viewed with skepticism. These ideas were never directly tested but were derived from ecological studies comparing prescribing rates and overdose rates at a state level. From ecological studies, there is no way to attribute prescribing patterns and overdoses to the laws and not to other factors. The most recent replication of these earlier ecological studies utilizing data that extended through 2017 did not find any evidence that medical marijuana laws were associated with a decrease in opioid overdose mortality. Some analyses from the replication study actually suggested that comprehensive medical marijuana laws were associated with increases in overdose deaths.
- Studies using strong scientific methods show that marijuana use increases the risk for starting to misuse prescription opioids, rather than lowering the risk. Moreover, individuals with addiction to prescription opioids often have a history of using other drugs, including marijuana, and therefore need comprehensive addiction intervention and treatment.
- Marijuana use to manage pain does not appear to be related to decreases in pain, and evidence that marijuana is an effective treatment for opioid use disorder is even weaker (Humphreys & Saitz, 2019).
- Experts predict that the opioid overdose crisis will worsen in the coming decade. As a result, there is a need for novel, multipronged interventions in order to change the epidemic's trajectory.
- When dealing with the addiction and overdose crisis facing the U.S., policymakers should make decisions that have a strong scientific justification.

Making marijuana more available might appear to be a solution to the current drug crisis in our nation. However, a more critical look at the research evidence suggests just the opposite. Decades of research findings have shown that marijuana use puts an individual at heightened risk for misuse of prescription opioids, heroin and other drugs.

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Insights and Perspectives

Marvin D. Seppala, MD, Chief Medical Officer, Hazelden Betty Ford Foundation

- "We need to study cannabis and its derivatives (i.e., CBD) to determine which health conditions could benefit and how such products would work. As important, we need to determine the limitations—what cannabis and its derivatives do not affect or help. We've jumped the gun and allowed relatively indiscriminate use by a large portion of the population without adequate scientific study."

George Dawson, MD, Psychiatrist, Hazelden Betty Ford Foundation

- "The commercially driven political aspects of medical cannabis are undeniable. The legalization of cannabis for recreational purposes had no traction with American politicians or voters until it was promoted as a miracle drug. Due to that widespread promotion, medical cannabis is now legal in 33 states, and recreational cannabis is legal in 10. The legalization arguments have also suggested that the U.S. was behind other countries of the world despite the fact only two countries—Canada and Uruguay—have completely legalized cannabis for medical and recreational sale and purchase. In fact, only 22 of 195 countries have legalized medical cannabis, with widely varying restrictions on its use. The Netherlands is often cited as an example of recreational cannabis legalization, but most Americans don't realize that cannabis is illegal for recreational use in most places there, with use and sale allowed only in specially licensed coffee shops. The promotion of cannabis as a solution to the opioid overuse and chronic pain problems can be seen as an extension of the commercially driven political arguments for legalization that outpace any science to back them up.

  "At the scientific level, areas of research in the epigenetics of cannabis smoke and how that may predispose people to substance use problems has been left out of the debate. The neurobiological mechanisms of how cannabis can modify the underlying brain substrate at various developmental stages is currently an area of active research. Many such studies focus on the issue of whether cannabis-induced epigenetic changes predispose to the development of opioid use disorders."

Kate Gliske, PhD, Research Scientist, Butler Center for Research, Hazelden Betty Ford Foundation

- "These studies, and others like them, highlight an increasing trend across the U.S. and worldwide to minimize the harm associated with marijuana use. This is particularly problematic given the substantial evidence of marijuana's harmful effects on mental health disorders, pregnancy outcomes and brain functioning (see Memedovich et al., 2018 for review) among a significant minority of the population. Very little research currently exists about the relationship between marijuana legalization and its effects on the opioid crisis, and what is available presents a conflicted picture of its effectiveness. We are still years away from understanding the full effect of current marijuana legalization policies on opioid use, and it would be rash to base further policy decisions on so little data."

Stephen Delisi, MD, Medical Director, Professional Education Solutions, Hazelden Betty Ford Foundation

- "All aspects of the debate around medical cannabis for chronic pain and opioid use disorder point to the dire need for a deliberate, thoughtful and science-driven approach. Medical providers, payers, patients, governmental agencies and the general public should demand that science and research guide decision-making and policies around this issue."

Nick Motu, Vice President and Chief External Affairs Officer, Hazelden Betty Ford Foundation

- "The dialogue around cannabis legalization has been muddied by the federal government's neglect of this issue and the desperate desire for solutions to the nation's opioid crisis. It is time for Congress and the Administration to course-correct in a responsible, necessary and politically viable way—by having the science drive the policy to protect the health and well-being of Americans."

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The Academic Opportunity Costs of Substance Use During College

A Brief Report from the
Center on Young Adult Health and Development

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May 2013

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About the Center on Young Adult Health and Development

The Center on Young Adult Health and Development (CYAHD) was established at the University of Maryland School of Public Health in 2009. This research center is one of the first such centers in the United States specifically dedicated to understanding the health and development of young adults. More information about CYAHD can be found at www.cyahd.umd.edu.

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Introduction

Most people recognize the devastating toll alcohol poisonings and drug-related violence exact on college campuses. The more subtle academic costs of college drinking and drug use might be less noticeable—but can have long-term impacts on student success. National statistics paint a troubling picture of our nation's college graduation rates, with 56% of male and 61% of female first-time, full-time students who sought a bachelor's degree at a four-year college in fall 2004 completing their degree at that college within six years.[1]

To remain globally competitive in today's knowledge-based economy, colleges are placing a high priority on improving their graduation rates. While many factors are in play, this report sharpens the focus on how substance use and mental health problems might contribute to what we call a "cascade of academic problems", starting with missing class, through failing grades, to dropping out.

Another related issue is that even among college students who graduate, finding a job after college is not always easy. Many graduates report getting jobs after college that don't require a college degree,[2] *and they are beginning to wonder whether the time and money they spent on college was even worth it. Colleges and parents should promote the message that excessive drinking and substance use can interfere with acquisition of skills and experiences needed to be competitive in today's job market.*

Substance use has an insidious way of interfering with a student's ability to take advantage of all that college has to offer. Interventions to reduce rates of substance use should be part of any college's plan to improve student retention.

College can and should be one of the most rewarding and memorable periods in the lives of those who are fortunate enough to have the chance to experience it. But substance use has an insidious way of interfering with a student's ability to take advantage of all that college has to offer. The time has come to shift our thinking away from the normalcy of partying during college toward finding solutions to reduce rates of substance use to promote students' long-term success and well-being.

This report sheds light on the research linking excessive alcohol and drug use during college to academic performance. By interfering with the achievement of educational goals, substance use can be viewed as having "academic opportunity costs", which ultimately can undermine a student's ability to fulfill his/her individual potential. In sum, although partying might be emblematic of college life, it comes with a price.

op·por·tu·ni·ty cost:
what a person sacrifices when they choose one option over another

Key Research Findings

- ***Alcohol and drug use are prevalent among college students.*** On average, 40% of college students drink alcohol excessively, with little change in trends during the last decade,[3] 16% meet criteria for an alcohol use disorder, and 22% used a drug during the past month, with marijuana being the most common.[4] Nonmedical use of prescription medications can also be a serious problem, but this use varies significantly across colleges.[5,6] Moreover, excessive drinking and drug use often overlap.[7]

- ***Excessive drinking and drug use are both associated with short-term academic problems.*** Students who use substances during college spend less time studying and skip more classes,[8-11] thereby reducing their exposure to the classroom learning environment and the beneficial experience of interacting with faculty and other students.

- ***Excessive drinking and drug use can interfere with college degree completion.*** Longitudinal research has found that students who use alcohol and drugs are more likely to have disruptions in their enrollment in college and also fail to graduate.[12,13] Associated mental health problems can exacerbate the adverse academic consequences of excessive drinking and drug use.[14]

- ***Neurobiological research has identified mechanisms by which excessive drinking and drug use might interfere with academic performance.*** New neurobiological research shows that substance use "hijacks" reward pathways in the brain.[15,16] Over time, the rewards of academic achievement can be replaced with the temporary rewards of intoxication and getting high. The end result is decreased motivation to pursue academic goals and disengagement from college.

Reducing the rates of excessive drinking and drug use among college students could have profound impacts on student retention and could positively impact their long-term success and employability.

- ***Reducing excessive drinking and drug use is a viable strategy for improving academic performance and retention.*** The relationship between excessive drinking, drug use, and academic performance and retention in college is rarely acknowledged in educational circles. Interventions to reduce the rates of excessive drinking and drug use among America's college students could have profound impacts on college retention and could positively impact the long-term success and employability of college graduates.

Just how much are we investing in college students?

In 2010, there were roughly 21 million college students in the United States,[1] and the average annual cost of attending college was $21,889.[17] Most of this cost was paid by families (26% by students, 37% by parents), but 33% was provided by scholarships, grants, and other forms of financial aid.[17]

The 2013 budget for the Department of Education includes $165 billion for federal grants, loans, and work study, an increase of 69% from the 2008 budget.[18] In 2013, the American Opportunity Tax Credit will provide approximately $19.1 billion in tax breaks for students and their families.[18] The Department of Veterans Affairs spent an additional $11 billion on educational benefits to Veterans, reservists, and active duty personnel in 2012 through the GI Bill and other programs.[19]

Promoting College Student Success: What is at Stake?

The personal investments made by students and families leading up to college matriculation are enormous. Moreover, there is no question that financial investments in higher education are significant for taxpayers. For the individual student, a college degree translates to greater opportunities and earning potential over their lifetime.[20] For society, a well-educated workforce enhances the growth and stability of the entire economy, with attendant benefits in terms of global competitiveness and general welfare.

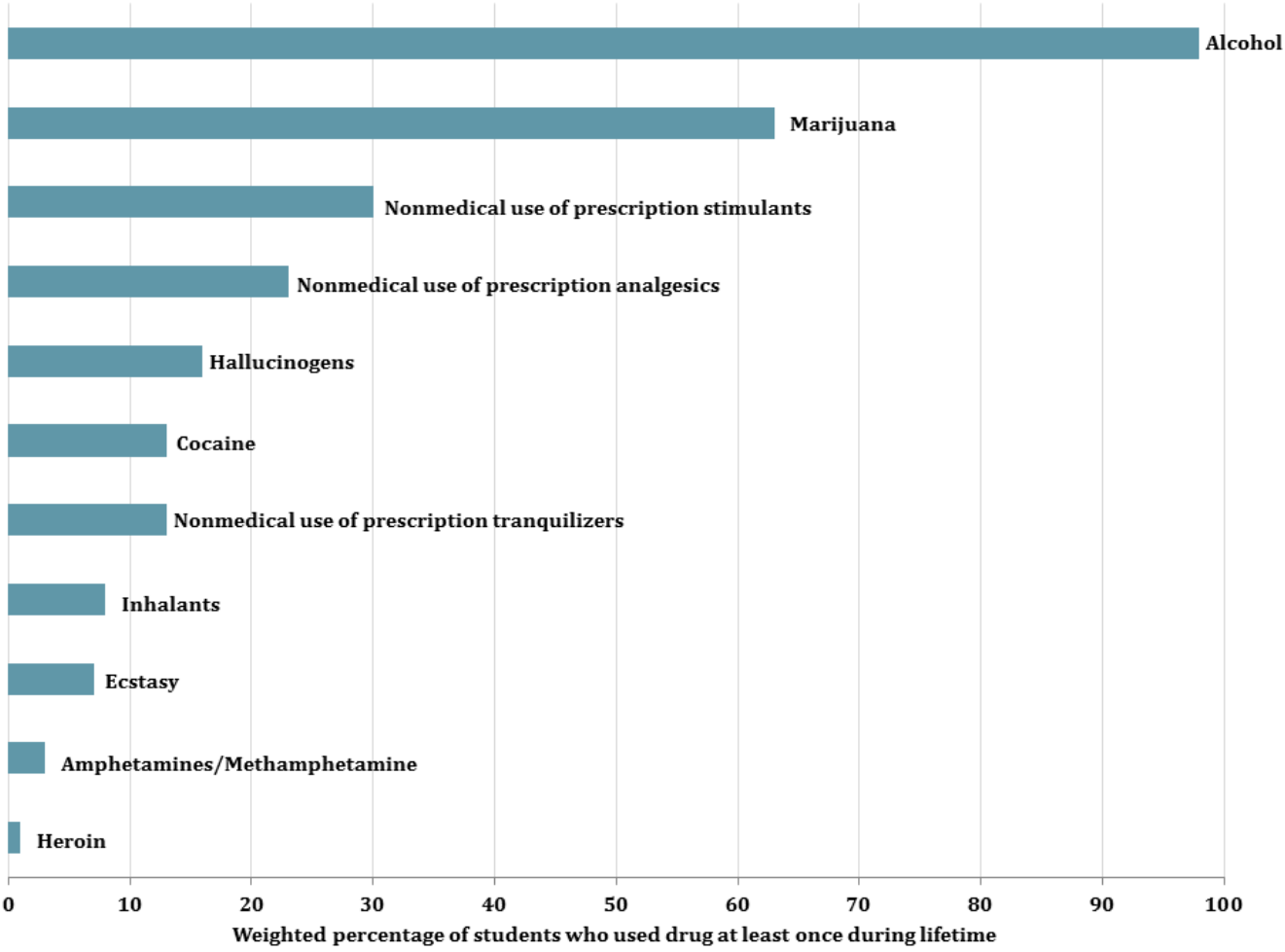
Unfortunately, too many college students in the U.S. are underperforming or failing to graduate. About half of students enrolled in a four-year college graduate within six years of entry to that college, and trends have not changed substantially during the last two decades.[1,21] Those who do graduate often do so without having mastered the skills employers demand.[22]

Prevalence of Alcohol and Drug Use During College

Alcohol and drug use are highly prevalent among college students. Forty percent of U.S. college students have had five or more drinks in a row during the past two weeks, with little change in trends during the last decade,[3] and 16% meet criteria for an alcohol use disorder.[4] Nationally, 22% are current drug users, with marijuana being the most common drug used.[4] For some students, use is far from being isolated occasions of "experimentation", with many developing alcohol and drug use patterns that are severe enough to be clinically significant. In one large study, one in four marijuana-using students met criteria for dependence.[23] Students who use drugs—either illicit drugs or prescription drugs used nonmedically—are often the same students who drink heavily. In fact, drug use typically signifies a higher level of alcohol involvement, and on average, the heavier the alcohol use, the heavier the drug use.[7,24]

Nationally, 58% of students who attend a four-year college complete a degree there within six years. Trends indicate little sign of improvement.[1,21] Moreover, many college graduates have not mastered the skills employers demand.[22]

Figure 1. Prevalence of alcohol and drug use by the fourth year of college



Source: College Life Study, unpublished data. See the following papers for more information:
Arria AM, Caldeira KM, O'Grady KE, Vincent KB, Fitzelle DB, Johnson EP, Wish ED. Drug exposure opportunities and use patterns among college students: Results of a longitudinal prospective cohort study. *Subst Abus. 2008;29(4):19-38.*
Vincent KB, Kasperski SJ, Caldeira KM, Garnier-Dykstra LM, Pinchevsky GM, O'Grady KE, Arria AM. Maintaining superior follow-up rates in a longitudinal study: Experiences from the College Life Study. *Int J Mult Res Approach. 2012;6(1):56-72.*

Problems Often Begin During High School

Alcohol use among college students typically begins long before college entry. Students who drink alcohol during high school are likely to continue their drinking patterns when they enter college,[25] and research shows that their frequency of excessive drinking sometimes escalates.[26] High school seniors with plans to go to college are less likely to have used marijuana than students with no college plans (35% vs. 42%),[27] but after starting college, opportunities to use drugs are common. One study found that while 38% of college students had tried marijuana before coming to college, an additional 25% began using marijuana for the first time after starting college.[28]

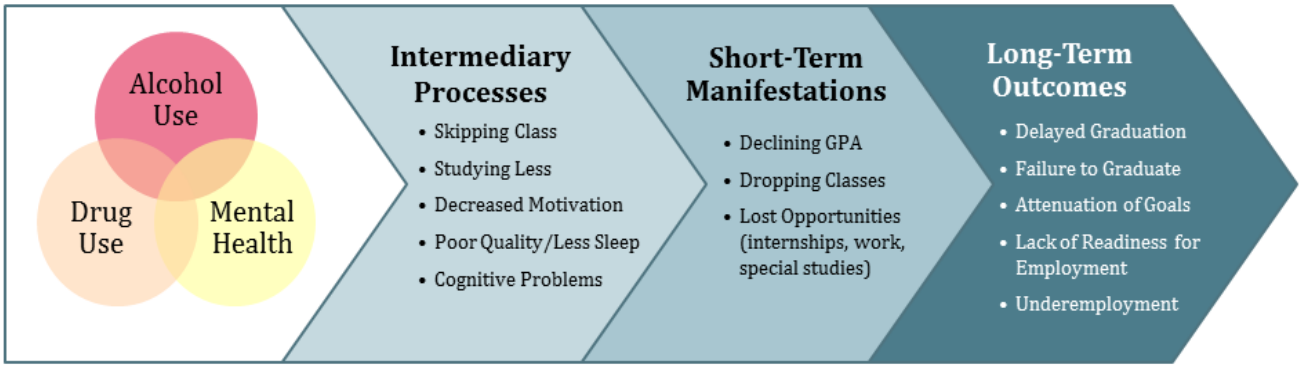
During adolescence, excessive drinking and drug use can affect academic performance in at least two major ways.[16] First, the use of alcohol and drugs during early adolescence adversely affects brain

development (see below, *Neurobiological Consequences of Substance Use*), potentially interfering with a student's motivation and ability to learn. Second, high school students who use alcohol or drugs often affiliate with peers who tend to reject conventional norms—such as a respect for authority and a belief in the value of academic pursuits. Although it is common for early conduct problems to be present even before alcohol or drug use begins, substance use can perpetuate the student's involvement in a variety of problem behaviors and can further their alienation from both school and their parents.

Excessive Alcohol Use and/or Drug Use During College Contributes to a Cascade of Adverse Consequences

Several research studies have shed light on the relationship between substance use during college and academic performance and retention. The effects of excessive drinking and/or drug use during college can be understood as a "cascade" of interrelated problems that accumulate over time (see Figure 2). Students who drink excessively tend to spend less time studying[8,10] and skip more of their classes.[11] As with excessive drinking, drug use—especially marijuana use—appears to contribute to college students skipping more classes, spending less time studying, earning lower grades, dropping out of college, and being unemployed after college.[8,9,11,12,29-33] In fact, the cascade of consequences is similar regardless of whether students are drinking excessively, using drugs, or nonmedically using prescription drugs. For example, one study showed that college students who nonmedically used prescription stimulants and analgesics skipped 21% of their classes, whereas non-users skipped only 9% of their classes.[9] Another study found that the more drinks a student consumed per drinking occasion, the less time they spent studying, which led to predictable negative effects on their GPA.[10] Accordingly, drug use and excessive drinking also set the stage for disruptions in college enrollment, or "stopping out" from college[12,32] (see Box 1). Ultimately, this trajectory can lead to a greater likelihood of delayed graduation or a failure to graduate.[34] The cascade of consequences even extends beyond college graduation in the form of poorer employment outcomes and lower lifetime earnings.[8,20,31,35]

Figure 2. Alcohol use, drug use, and mental health outcomes have a cascade of effects on college students' academic outcomes



Box 1. Drug Users Have Increased Risk for Discontinuous Enrollment

Students (*N*=1,133) at one large university were categorized into groups according to their longitudinal patterns of drug use during four years of college. Two sets of trajectory groups were created: 1) based on how often they used marijuana each year, and 2) based on how many drugs other than marijuana that they used each year.

Both marijuana (Figure 3) and drug use other than marijuana (Figure 4) were significantly related to higher chances of discontinuous enrollment (i.e., not being enrolled for one or more semesters) or "stop-out", sometime during the first four years of college, even after controlling for the effects of demographics, high school GPA, and personality variables. For example, students who used marijuana very frequently all four years (i.e., "Chronic/Heavy" users) were twice as likely as "Minimal" users to experience discontinuous enrollment. Even "Infrequent" marijuana users were 66% more likely than Minimal users to be discontinuously enrolled.

Figure 3. Risk for discontinuous enrollment or "stop-out" by pattern of past-month marijuana use

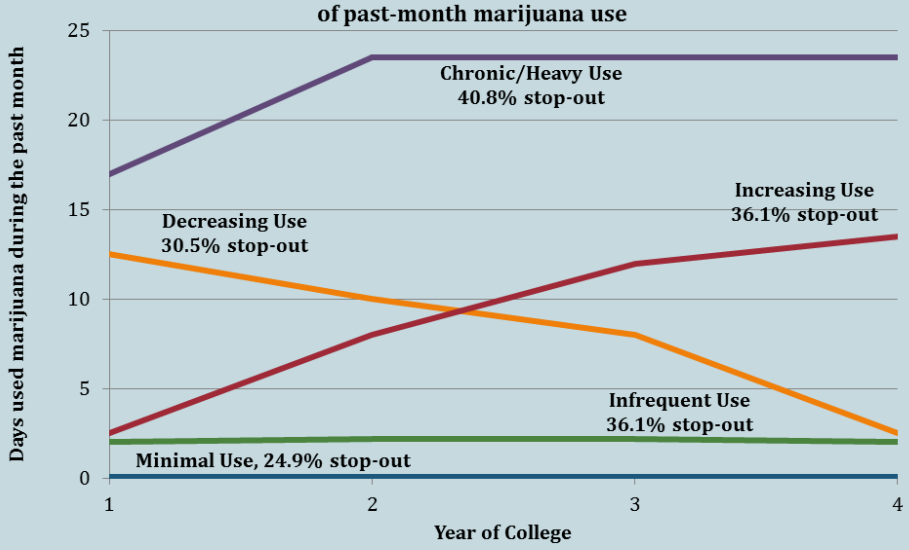
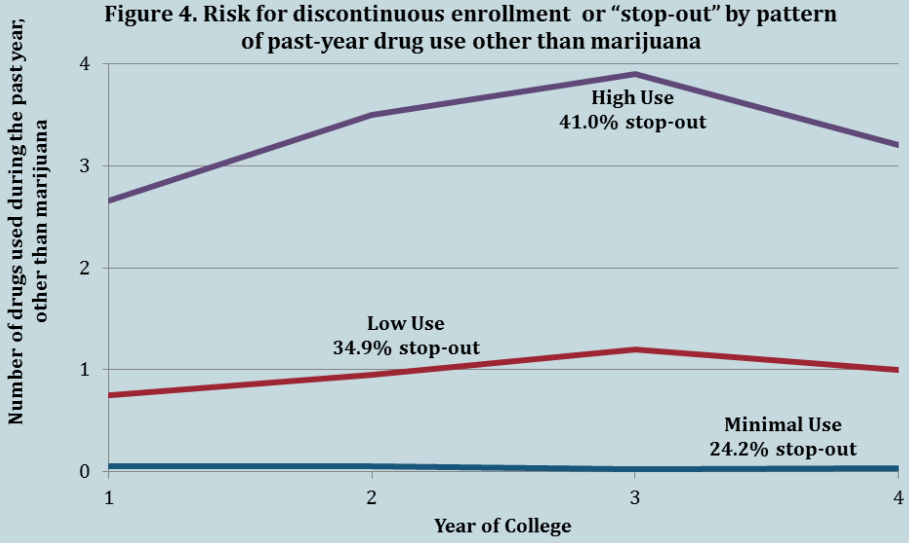


Figure 4. Risk for discontinuous enrollment or "stop-out" by pattern of past-year drug use other than marijuana



Source: Arria AM, Garnier-Dykstra LM, Caldeira KM, Vincent KB, Winick ER, O'Grady KE. Drug use patterns and continuous enrollment in college: Results from a longitudinal study. *J Stud Alcohol Drugs.* 2013;74(1):71-83.

Some of the other intermediary processes influencing academic outcomes supported by empirical research are alcohol-related changes in cognitive functioning and sleep problems. Specifically, excessive drinking is known to cause problems with short-term memory and other brain functions,[36] which in turn can undermine the efficiency and effectiveness of study time. It has also been observed that alcohol-related differences in sleep patterns contribute to greater daytime sleepiness and, consequently, lower grades.[37] Finally, although it is hard to account for differences in the difficulty of certain majors, there is some evidence that heavy drinkers gravitate toward less demanding majors.[8,38] For example, in one study heavy drinkers were more likely than their counterparts to choose a social science or business major and less likely to choose education, engineering, or the natural sciences.[8]

It is important to acknowledge that there are numerous challenges to overcome in this line of research, and findings have sometimes been mixed. Researchers have measured alcohol involvement in many different ways, and whereas students with greater severity of alcohol problems are more likely to have poorer academic outcomes, more moderate measures of alcohol use are not correlated as strongly with academic problems. There are many confounding factors that are related to both academic performance and heavy drinking, such as having an extraverted personality and being more engaged with campus life.[13,39-41] Once these factors are taken into account, the association between heavy drinking and attrition from college becomes more readily apparent.[13] For example, it might seem paradoxical that students who are highly engaged in campus life—meaning they attend more parties, concerts, and sporting events—are both more likely to stay enrolled in college and tend to get drunk more often, as compared to their less "engaged" counterparts. Because of this paradox, heavy drinking might appear to have no bearing on a student's likelihood of staying enrolled, but by using statistical methods that take into account the relationship between heavy drinking and event attendance, we can see that heavy drinking in fact strongly predicts a lower likelihood of re-enrolling the following semester.[13]

Neurobiological Consequences of Substance Use

Exposure to alcohol and drugs, especially during the vulnerable period of adolescent development as mentioned earlier, can lead to acute cognitive problems such as difficulty concentrating and sleep disturbances.[36,37,42-44] These cognitive problems no doubt make it more difficult to function academically. Recent research has identified areas of the brain involved in learning and memory that are adversely affected by alcohol consumption.[45] Heavy alcohol consumption during adolescence has been shown to be associated with structural and functional changes during brain development that can manifest as poor planning, impaired executive functioning, and spatial and attention deficits.[46]

Extensive research has documented the cognitive effects of marijuana use.[42,47-50] Deficits are more likely when use is initiated earlier in life and when use is more frequent.[51-53] While acute effects of marijuana intoxication are well recognized and include numerous attention and concentration difficulties, as well as decreased working memory, decision response speed, and information processing,[54,55] longer-term problems have been demonstrated as well.[56,57] Neuropsychological deficits

include impaired planning, organizing, and problem solving. Research studies have also shown longer-term residual deficits related to the allocation of attentional resources, filtering out irrelevant material, and retrieval and immediate verbal memory deficits related to substance use,[58,59] all of which are necessary for performing well inside and outside of the classroom. Importantly, these problems have been observed even after statistically adjusting for baseline intellectual ability.[58] Early chronic marijuana use has been linked to declines in IQ of up to 8 points,[60] which for a person with an average IQ corresponds to a drop from the 50th percentile to the 30th percentile.[61]

Mental Health is also an Important Part of the Picture

A more complete understanding of the relationship between substance use and academic outcomes must also take into account mental health problems, which often co-exist with substance use[62,63]—and can have similar adverse impacts on academic performance. Research shows a strong association between early and chronic marijuana use and mental health problems such as depression, anxiety, and early onset and worsening symptoms of psychosis.[64-69]

Many students meet criteria for psychiatric disorders—such as depression, bipolar, or anxiety disorders[70]—and nearly half say that their mental health affected their academic performance during the past month.[71] In general, the presence of a psychiatric disorder makes a student significantly less likely to complete college, especially when those disorders are diagnosed during college.[29,30,32,72] For first-year students in particular, the ability to persist into the second year of college is a critically important milestone—one that becomes more unlikely when they experience more depression, anxiety, and stress.[32,73] Even when students are able to persist in college, their grades are likely to suffer in proportion to their mental health symptoms.[74]

For first-year students in particular, the ability to persist into the second year of college is a critically important milestone—one that becomes less likely when they experience more depression, anxiety, and stress.

Because of the way that excessive drinking, drug use, and mental health problems tend to cluster together among the same students, it is important to recognize that their effects on academic outcomes do not overlap completely. In fact, all three problems appear to have separate, additive effects on some outcomes (e.g., discontinuous enrollment[32]). It is also not surprising that they interact in complex ways to influence academic performance. For example, the academic consequences of drinking—such as falling behind on work and missing class—can be more pronounced when the drinker also has mental health problems.[14]

Improved Academic Outcomes are Likely to Result from Effective Substance Use and Mental Health Interventions

A full discussion of the interventions available to address these issues is beyond the scope of this report. However, campus leaders who are ready to confront these issues do have a range of effective options at their disposal.[75-78] Research has shown that, for high school students, interventions that succeed in curbing drinking are likely to lead to improved class attendance in the short run.[79] College students are likely to experience similar benefits, thereby improving their grades and graduation rates in the long run. Motivational interviewing, during which feedback on alcohol consumption is provided by a counselor in a non-confrontational manner, has been shown to be effective at reducing alcohol use among college students.[80-82] This type of intervention can assist the student in identifying discrepancies between values or goals, such as academic success, and his/her drinking behavior,[83] and could be done in a variety of settings on campus, including health centers, counseling centers, or academic assistance centers. Computer-delivered interventions can also be used to assess alcohol consumption and provide personalized feedback to students.[84] In response to academic failure, rather than simply requiring students to stay out of school for a semester, administrators can engage students in personalized interventions to help students address any underlying problems with substance use, mental health, or other personal issues. This type of approach shows promise for improving their chances of persisting and eventually completing college.[85]

Interventions in the larger environment on- and off-campus can also help to curb excessive alcohol use among college students. Evidence-based strategies include campus-community partnerships, publicizing and enforcing underage-drinking laws and zero tolerance laws for drivers under 21, reducing youth access to alcohol, decreasing the density of alcohol outlets near the campus, and increasing the price of alcohol around college campuses.[86-90] An environment that is less supportive of excessive drinking and more

> ***"In addition to reducing other adverse outcomes associated with drinking…policies to reduce college students' drinking can be expected to improve the quality of human capital they accumulate. The immediate benefits of this include reducing the likelihood of students dropping out of college because of poor grades and improving the likelihood of entrance into graduate programs (which is based largely on college GPA). The long-term consequences of improved academic performance include greater labor market participation and higher earnings."[10]***

conducive to student success can be established by combining strong leadership from college administrators and an involved and informed community to implement a comprehensive program of evidence-based strategies.[87]

Summary

Excessive drinking and drug use remain significant problems on many college campuses. Contrary to the popular perception that substance use is a "normal" rite of passage endemic to the college experience, the more likely scenario—according to research evidence—is that it undermines students' ability to succeed academically. Given the new research evidence, it behooves college leaders to recognize the connection between alcohol and drug use and academic retention, readiness and motivation to succeed, and view substance use prevention and intervention as a viable strategy to promote student success. More attention should be focused on identifying existing successful intervention models and designing innovative comprehensive approaches to promote student success.

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Changes in Healthcare Encounter Rates Possibly Related to Cannabis or Alcohol following Legalization of Recreational Marijuana in a Safety-Net Hospital

An Interrupted Time Series Analysis

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Objectives: Liberalization of marijuana laws in Colorado contributed to increases in cannabis-related adverse events over time. We examined characteristics of patients with healthcare encounters possibly related to cannabis and assessed the temporal association between legalization of recreational marijuana and healthcare encounters possibly attributed to cannabis.

Methods: Annual encounter rates possibly related to cannabis and alcohol were compared using negative binomial regression. Two-time intervals, pre/post-recreational marijuana legalization (January 2009 to December 2013 and January 2014 to December 2015, respectively) were used to examine changes in monthly rates of emergency encounters and hospitalizations possibly related to cannabis. Level and trend changes on encounter rates by legalization period were assessed using interrupted time series analyses. Encounters possibly related to alcohol were used as a comparator group.

Results: Most encounters identified during the study period had alcohol-related International Classification of Diseases Diagnosis and Procedural Codes (ICD-9/10-CM) codes (94.8% vs 5.2% for cannabis). Patients with encounters possibly related to cannabis were younger, more likely to be hospitalized and more likely to be admitted to the psychiatric unit than patients with encounters possibly related to alcohol. Initial and sustained effects of encounter rates possibly related to cannabis demonstrated an increased trend in slope before and after recreational marijuana legalization. The slope became more abrupt following legalization with a significant increase in trend during the post-legalization period ($\beta = 2.7$, standard error = 0.3, $\rho < 0.0001$). No significant change was noted for encounters possibly related to alcohol.

Conclusions: Additional research should identify patients at highest risk of an adverse health event related to cannabis and quantify costs associated with cannabis-related healthcare delivery.

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Changes in undergraduates' marijuana, heavy alcohol and cigarette use following legalization of recreational marijuana use in Oregon

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ABSTRACT

Background and Aims Recreational marijuana legalization (RML) went into effect in Oregon in July 2015. RML is expected to influence marijuana use by adolescents and young adults in particular, and by those with a propensity for substance use. We sought to quantify changes in rates of marijuana use among college students in Oregon from pre- to post-RML relative to college students in other states across the same time period. **Design** Repeated cross-sectional survey data from the 2012–16 administrations of the Healthy Minds Study. **Setting** Seven 4-year universities in the United States. **Participants** There were 10 924 undergraduate participants. One large public Oregon university participated in 2014 and 2016 (n = 588 and 1115, respectively); six universities in US states where recreational marijuana use was illegal participated both in 2016 and at least once between 2012 and 2015. **Measurements** Self-reported marijuana use in the past 30 days (yes/no) was regressed on time (pre/post 2015), exposure to RML (i.e. Oregon students in 2016) and covariates using mixed-effects logistic regression. Moderation of RML effects by recent heavy alcohol use was examined. **Findings** Rates of marijuana use increased from pre- to post-2015 at six of the seven universities, a trend that was significant overall. Increases in rates of marijuana use were significantly greater in Oregon than in comparison institutions, but only among students reporting recent heavy alcohol use. **Conclusions** Rates of Oregon college students' marijuana use increased (relative to that of students in other states) following recreational marijuana legislation in 2015, but only for those who reported recent heavy use of alcohol. Such alcohol misuse may be a proxy for vulnerabilities to substance use or lack of prohibitions (e.g. cultural) against it.

Keywords Cannabis, cigarettes, early adulthood, heavy alcohol use, Oregon, recreational marijuana legalization.

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INTRODUCTION

More than half of Americans support the legalization of recreational marijuana use [1]. Supporters believe marijuana is relatively safe compared to other drugs, whereas opponents express concerns about harm to society and individuals, including health dangers and addiction concerns. Compared to research on alcohol and other drug use, there is indeed less evidence of harm from marijuana use [2,3], although there are negative health and educational consequences, particularly in cases of adolescent onset, or long-term, heavy use [4,5]. As such, there is great scientific and policy interest in understanding the public health effects of changes in marijuana laws.

Oregon voters passed a recreational marijuana legalization (RML) ballot measure in November, 2014. Recreational use became legal in July, 2015, and sales from retail dispensaries became legal and began in October, 2015. Frequency of use among marijuana users and numbers of new users are expected to have increased given lower prices, increased and safer access from legal sources, greater social approval of use and users, and the absence of criminal penalties that previously deterred consumption [6]. To date, however, there have been no studies of the impact of Oregon RML on rates of marijuana use.

RML is expected to have its greatest impact on use in adolescence and early adulthood, the developmental period in which marijuana experimentation, onset of patterned use and the establishment of chronic, problematic use

Modes of Marijuana Consumption Among Colorado High School Students Before and After the Initiation of Retail Marijuana Sales for Adults

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ABSTRACT. Objective: This study aimed to estimate the prevalence of different modes of marijuana consumption (e.g., smoking, ingesting) overall and by sociodemographic factors, marijuana-related perceptions, and other substance use among adolescents, as well as to characterize differences in the usual mode of consumption before and after the initiation of retail marijuana sales in 2014. **Method:** Data are from the 2013 and 2015 administrations of the Healthy Kids Colorado Survey, a cross-sectional, school-based survey. We included 9th–12th grade students who reported past-30-day marijuana use in 2013 (n = 2,792; 44.8% female) or 2015 (n = 1,664; 48.9% female). We estimated the prevalence of any past-month use of each mode in 2015 and usual mode of consumption the past month in both years. We tested differences by year, sociodemographics, marijuana-related perceptions, and other substance use using Rao–Scott chi-square tests and multivariable logistic regression. **Results:** The prevalence of past-month marijuana use was 20.7% in both years. In 2015, 39.8% of students reported using multiple modes in the past month. Use of any mode other than smoking and use of multiple modes differed by sociodemographics, marijuana-related perceptions, and other substance use. Smoking remained the most common usual mode in 2015. The prevalence of usually ingesting significantly decreased from 4.7% to 2.1% between years, whereas "other mode(s)" significantly increased from 4.0% to 6.0%. **Conclusions:** The use of multiple modes of marijuana consumption was prevalent among adolescents in Colorado. The usual mode of consumption changed in years before and after the implementation of retail marijuana sales, suggesting the need for continued surveillance. (*J. Stud. Alcohol Drugs, 80,* 46–55, 2019)

As STATE MARIJUANA POLICIES have evolved, noncombustible modes of marijuana consumption have proliferated (Krauss et al., 2017; Lee et al., 2016). These modes include ingesting edible products, inhaling vaporized liquid or plant material ("vaping"), or "dabbing" (inhaling vapor from heated cannabis concentrates ("dabs") containing high concentrations of Δ-9-tetrahydrocannabinol [THC] and other cannabinoids) (Johnson et al., 2016; Loflin & Earleywine, 2014; Russell et al., 2018). Although smoking remains the most common mode, between 30% and 35% of adults who use marijuana report ingesting edibles, dabbing, and/or vaping (Krauss et al., 2017; Lee et al., 2016). Further, adults who live in states with medical marijuana laws (MMLs) are more likely to use noncombustible modes of consumption (Borodovsky et al., 2016; Krauss et al., 2017). Therefore, modes other than smoking may also be increasingly common among adolescents, particularly in states that have passed MMLs or recreational marijuana laws (RMLs).

The number of different modes of use and legal access for adults introduces an unknown potential for adolescents to use marijuana and experience adverse effects. Smoking is associated with a number of health risks, including respiratory problems (Russell et al., 2018). Vaporizer products may be used to reduce the perceived risk of health problems associated with smoking, although research is limited (Russell et al., 2018). Edibles are smokeless, which may be particularly appealing to youth (Friese et al., 2016). Some research suggests that edibles may be associated with unintentional overconsumption and early and more frequent marijuana use among adolescents (Friese et al., 2016, 2017; Hancock-Allen et al., 2015). Dabbing is high potency, reinforcing, and may have higher abuse liability than smoked marijuana (Loflin

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Review

Biological Psychiatry

Acute and Chronic Effects of Cannabinoids on Human Cognition—A Systematic Review

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ABSTRACT

Cannabis use has been associated with impaired cognition during acute intoxication as well as in the unintoxicated state in long-term users. However, the evidence has been mixed and contested, and no systematic reviews of the literature on neuropsychological task-based measures of cognition have been conducted in an attempt to synthesize the findings. We systematically review the empirical research published in the past decade (from January 2004 to February 2015) on acute and chronic effects of cannabis and cannabinoids and on persistence or recovery after abstinence. We summarize the findings into the major categories of the cognitive domains investigated, considering sample characteristics and associations with various cannabis use parameters. Verbal learning and memory and attention are most consistently impaired by acute and chronic exposure to cannabis. Psychomotor function is most affected during acute intoxication, with some evidence for persistence in chronic users and after cessation of use. Impaired verbal memory, attention, and some executive functions may persist after prolonged abstinence, but persistence or recovery across all cognitive domains remains underresearched. Associations between poorer performance and a range of cannabis use parameters, including a younger age of onset, are frequently reported. Little further evidence has emerged for the development of tolerance to the acutely impairing effects of cannabis. Evidence for potential protection from harmful effects by cannabidiol continues to increase but is not definitive. In light of increasing trends toward legalization of cannabis, the knowledge gained from this body of research needs to be incorporated into strategies to minimize harm.

Keywords: Attention, Brain, Cannabis, Cognition, Executive function, Memory

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Shifts in public opinion and policies toward legalization of cannabis are poised to result in an increase in the prevalence of cannabis use beyond the 178 million users estimated to exist today (1–3). Although most individuals who try cannabis do not go on to use it regularly (1,2), individuals who do so risk adverse effects to physical and mental health (4). Negative sequelae that have been attributed to regular and prolonged cannabis use include alterations to brain morphology (5–7) and function (8–11); psychosis risk (12,13); poor psychosocial outcomes (4,14–17); and impaired cognition, especially deficits in attention, learning and memory (18–21), and executive functions (9,22). Morphological and connectivity changes in brain structures with high amounts of cannabinoid receptors (e.g., hippocampus, prefrontal cortex, cerebellum) (23) may mediate observed cognitive deficits in cannabis users (5–7, 9–11,24), although direct structure/function relationships are not readily demonstrated.

A substantial number of studies have been published in recent years, prompted by renewed interest in understanding the effects of cannabis on the brain partly as a result of mounting evidence for links between cannabis use and psychosis (25–28) and recognition of similarities between cognitive impairment in cannabis users and deficits observed in patients with schizophrenia (19). Interest has emerged in examining the effects of different compounds within cannabis plant matter, specifically (−)-*trans*-Δ^9-tetrahydrocannabinol (THC), the primary psychoactive constituent considered to be psychotogenic, and cannabidiol (CBD), the second most abundant cannabinoid, shown to have antipsychotic properties (29) and to attenuate the psychotogenic effects of THC, with opposite effects on brain function (30). Recent critical reviews have focused on neuroimaging outcomes from acute cannabinoid challenge (9,31) and on brain morphology in chronic users (5,7,32). However, to date, the literature on neuropsychological task-based measures of cognition has not been examined in the form of a systematic review. We systematically review the empirical research published in the past decade. We identify core themes that have emerged from the recent literature or continue to plague this field and study limitations and future directions for this research area.

METHOD

This systematic review was conducted in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (Figure 1) (33). The search strategy and

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Full length article

Marijuana use trajectories and academic outcomes among college students

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ABSTRACT

Background: Marijuana is the most commonly used illicit drug by college students. Prior studies have established an association between marijuana use and poor academic performance in college, but research on the frequency of marijuana use over the entire college career is limited. The study objective was to examine the association of marijuana use trajectories on academic outcomes, including senior year enrollment, plans to graduate on time, and GPA.
Methods: Data were collected from a cohort of 3146 students from 11 colleges in North Carolina and Virginia at six time points across the college career. Group-based trajectory models were used to characterize longitudinal marijuana use patterns during college. Associations between marijuana trajectory groups and academic outcomes were modeled using random-effects linear and logistic regressions.
Results: Five marijuana trajectory groups were identified: non-users (69.0%), infrequent users (16.6%), decreasing users (4.7%), increasing users (5.8%), and frequent users (3.9%). Decreasing users and frequent users were more likely to drop out of college and plan to delay graduation when compared to non-users. All marijuana user groups reported lower GPAs, on average, than non-users.
Conclusion: These results identify marijuana use patterns that put students at risk for poor academic performance in college. Students who use marijuana frequently at the beginning of the college career are especially at risk for lower academic achievement than non-users, suggesting that early intervention is critical.

1. Introduction

Marijuana is the most commonly used illicit substance among college students, with 48.5% reporting lifetime use, 20.8% past month use, and 5.9% reporting daily use in 2013 (Johnston et al., 2015). Daily and past 30 day marijuana use among college students has risen steadily since 2007. Daily marijuana users exhibit more characteristics of dependence than less frequent users (Hammersley and Leon, 2006), which makes the increase in daily use particularly concerning. At the same time that daily use is increasing, perceptions of harm associated with regular marijuana use are declining; only 35.1% of young adults think smoking marijuana regularly places the user at great risk compared to 57.2% a decade ago (Johnston et al., 2015).

Prior research has found that college student marijuana users are more likely to be white, male, single, members of fraternities or sororities, non-athletes, not religious, cigarette smokers, and heavy episodic drinkers (Bell et al., 1997; Johnston et al., 2015; Buckman et al., 2011; Wechsler et al. 1997; Yusko et al., 2008; McCabe et al., 2005; Mohler-Kuo et al., 2003). Students who initiate marijuana prior to age 16 are more likely to continue to use marijuana in college and be regular users (Mohler-Kuo et al., 2003), and early age of initiation has been shown to be associated with problems later in life such as depression and drug dependence (Green and Ritter, 2000; Ellickson et al., 2005; Chen et al., 2009). In one study, initiation of marijuana use during freshman year was found to be associated with living on campus, using cigarettes or alcohol, and Hispanic ethnicity (Suerken et al., 2014).

Acute effects of marijuana use among college students include impaired driving (Whitehill et al., 2014) and engaging in risky sex-

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ORIGINAL ARTICLE

Effect of high-potency cannabis on corpus callosum microstructure

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Background. The use of cannabis with higher Δ9-tetrahydrocannabinol content has been associated with greater risk, and earlier onset, of psychosis. However, the effect of cannabis potency on brain morphology has never been explored. Here, we investigated whether cannabis potency and pattern of use are associated with changes in corpus callosum (CC) microstructural organization, in patients with first-episode psychosis (FEP) and individuals without psychosis, cannabis users and non-users.

Method. The CC of 56 FEP (37 cannabis users) and 43 individuals without psychosis (22 cannabis users) was virtually dissected and segmented using diffusion tensor imaging tractography. The diffusion index of fractional anisotropy, mean diffusivity (MD), axial diffusivity (AD) and radial diffusivity was calculated for each segment.

Results. Across the whole sample, users of high-potency cannabis had higher total CC MD and higher total CC AD than both low-potency users and those who never used ($p = 0.005$ and $p = 0.004$, respectively). Daily users also had higher total CC MD and higher total CC AD than both occasional users and those who never used ($p = 0.001$ and $p < 0.001$, respectively). However, there was no effect of group (patient/individuals without psychosis) or group x potency interaction for either potency or frequency of use. The within-group analysis showed in fact that the effects of potency and frequency were similar in FEP users and in users without psychosis.

Conclusions. Frequent use of high-potency cannabis is associated with disturbed callosal microstructural organization in individuals with and without psychosis. Since high-potency preparations are now replacing traditional herbal drugs in many European countries, raising awareness about the risks of high-potency cannabis is crucial.

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Key words: Cannabis, corpus callosum, first-episode psychosis, tractography, white matter.

Introduction

Cannabis use has been associated with an increased risk of subsequent psychosis (Henquet *et al.* 2008; Casadio *et al.* 2011). Our group has previously shown that this risk is greater, and onset occurs earlier, in those individuals who use more frequently and those who use cannabis with higher Δ9-tetrahydrocannabinol (THC) content (high-potency types such as 'skunk') (Di Forti *et al.* 2009, 2014). Exploring the role of potency in increasing the risk of psychosis has become particularly important since, over the last decade, modern 'high-potency' products (sinsemilla or 'skunk') in 'street cannabis' have been found to have higher THC (16–22%) and lower cannabidiol (CBD) (<0.1%) content (Potter *et al.* 2008). Interestingly, the THC component of cannabis has been proposed to have a neurotoxic effect on the brain (Gilman *et al.* 2014), while the CBD component has been proposed to be actually neuroprotective (Pertwee, 2008). While the long-term use of cannabis has been associated with alterations in both brain function and morphology (Lorenzetti *et al.* 2010; Schacht *et al.* 2012; Battistella *et al.* 2014), the effect of potency on the brain has never been explored.

THC acts on cannabinoid-1 (CB1) receptors, which, among other effects, modulate a variety of glial cell functions, including oligodendrocytes, and may induce

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Adolescent substance use and educational attainment: An integrative data analysis comparing cannabis and alcohol from three Australasian cohorts

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ABSTRACT

Background: The relative contributions of cannabis and alcohol use to educational outcomes are unclear. We examined the extent to which adolescent cannabis or alcohol use predicts educational attainment in emerging adulthood.

Methods: Participant-level data were integrated from three longitudinal studies from Australia and New Zealand (Australian Temperament Project, Christchurch Health and Development Study, and Victorian Adolescent Health Cohort Study). The number of participants varied by analysis (N = 2179–3678) and were assessed on multiple occasions between ages 13 and 25. We described the association between frequency of cannabis or alcohol use prior to age 17 and high school non-completion, university non-enrolment, and degree non-attainment by age 25. Two other measures of alcohol use in adolescence were also examined.

Results: After covariate adjustment using a propensity score approach, adolescent cannabis use (weekly+) was associated with 1½ to two-fold increases in the odds of high school non-completion (OR = 1.60, 95% CI = 1.09–2.35), university non-enrolment (OR = 1.51, 95% CI = 1.06–2.13), and degree non-attainment (OR = 1.96, 95% CI = 1.36–2.81). In contrast, adjusted associations for all measures of adolescent alcohol use were inconsistent and weaker. Attributable risk estimates indicated adolescent cannabis use accounted for a greater proportion of the overall rate of non-progression with formal education than adolescent alcohol use.

Conclusions: Findings are important to the debate about the relative harms of cannabis and alcohol use. Adolescent cannabis use is a better marker of lower educational attainment than adolescent alcohol use and identifies an important target population for preventive intervention.

1. Introduction

Successfully completing high school and attaining a university degree are critical developmental milestones linked to better health (Cutler and Lleras-Muney, 2010) and greater economic productivity (US Bureau of Labor Statistics, 2014). Alcohol and cannabis are commonly used by young people in the school-age years.

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Marijuana Use Predicts Cognitive Performance on Tasks of Executive Function

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ABSTRACT. Objective: Despite growing evidence that chronic marijuana use is associated with cognitive impairment, particularly when use is initiated at an early age, national trends demonstrate significant decreases in the perceived risk of marijuana corresponding with increased use, especially among youth. The current study assessed the impact of marijuana use on executive function and whether patterns of marijuana use, including earlier age at onset, higher frequency, and increased magnitude of use, predict impairment. **Method:** Forty-four chronic, heavy marijuana smokers (37 male, 7 female) and 32 healthy, nonsmoking control participants (20 male, 12 female) recruited from the Greater Boston area completed two assessments of executive function: the Stroop Color Word Test and Wisconsin Card Sorting Test (WCST). **Results:** Marijuana smokers had poorer executive function relative to control participants, a between-group difference that was primarily driven by individuals with early onset of marijuana use (before age 16; $n = 21$); significance remained even when controlling for frequency and magnitude of use. Further, earlier age at marijuana onset and increased marijuana use predicted poorer neurocognitive performance, and perseverative errors on the WCST significantly predicted marijuana group membership. **Conclusions:** These findings underscore the impact of early onset of marijuana use on executive function impairment independent of increased frequency and magnitude of use. In addition, poorer performance on the WCST may serve as a neuropsychological marker for heavy marijuana users. These results highlight the need for additional research to identify predictors associated with early marijuana use, as exposure to marijuana during a period of developmental vulnerability may result in negative cognitive consequences. (*J. Stud. Alcohol Drugs, 77*, 298–308, 2016)

MARIJUANA REMAINS THE MOST commonly used drug other than alcohol in the United States. Results from the Substance Abuse and Mental Health Services Administration (SAMHSA, 2014) national survey reported that between 2007 and 2013, the number of Americans reporting marijuana use within the past month increased from 14.5 million to 19.8 million. Similarly, heavy marijuana use (marijuana use on 20 or more days in the past month) increased from 5.1 million to 8.1 million people (SAMHSA, 2014). According to the Monitoring the Future study, which surveys drug use among high school students and young adults, 21.2% of high school seniors used marijuana within the past 30 days, and more than a quarter of these—5.8% of seniors overall—reported daily marijuana use (Johnston et al., 2015).

Results from the Monitoring the Future survey also suggest that perceived risk related to marijuana use may be a leading indicator of marijuana use patterns. For the past two decades, perceived risk of marijuana use has substantially declined among 12th graders, dovetailing with increased use in this population. In 2014, 36% of high school seniors viewed regular marijuana use as harmful, compared with 52% of seniors surveyed 5 years earlier (Johnston et al., 2015). Together, these data indicate a trend of decreased perception of risk related to marijuana use coinciding with increased marijuana use among the nation's most vulnerable population, those who are not yet neurodevelopmentally mature.

Increasing national media coverage and ongoing debates regarding the legalization of medical marijuana often highlight potential benefits, and it is therefore not surprising that national trends demonstrate a strong relationship between decreased perception of risk and increased marijuana use. In light of these shifts in attitude, it is important to examine the impact of chronic marijuana use and to determine if assessing such factors as age at onset, frequency, and magnitude of marijuana use provides an opportunity to predict neurocognitive outcomes.

Numerous studies have reported marijuana-associated impairments in frontal function, most notably during tasks that require executive control, inhibition, and decision making (for review, see Crane et al., 2013; Crean et al., 2011). Further, several investigations have specifically examined the role of age at marijuana onset, with results suggesting that earlier age at marijuana onset is related to impairment on measures of visual scanning (Ehrenreich et al., 1999), verbal IQ (Pope et al., 2003; Solowij et al., 2011), and executive function (Battisti et al., 2010; Fontes et al., 2011; Gruber et al., 2012b). Gruber and colleagues (2012b) found that mari-

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Cannabis use among Swedish men in adolescence and the risk of adverse life course outcomes: results from a 20 year-follow-up study

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ABSTRACT

Aims To examine associations between cannabis use in adolescence (at age 18) and unemployment and social welfare assistance in adulthood (at age 40) among Swedish men. **Design** Longitudinal cohort study. **Setting and Participants** A total of 49 321 Swedish men born in 1949–51, who were conscripted to compulsory military service at 18–20 years of age. **Measurements** All men answered two detailed questionnaires at conscription and were subject to examinations of physical aptitude psychological functioning and medical status. By follow-up in national databases, information on unemployment and social welfare assistance was obtained. **Findings** Individuals who used cannabis at high levels in adolescence had increased risk of future unemployment and of receiving social welfare assistance. Adjusted for all confounders (social background, psychological functioning, health behaviours, educational level, psychiatric diagnoses), an increased relative risk (RR) of unemployment remained in the group reporting cannabis use > 50 times [RR = 1.26, 95% confidence interval (CI) = 1.04–1.53] only. For social welfare assistance, RR in the group reporting cannabis use 1–10 times was 1.15 (95% CI = 1.06–1.26), RR for 11–50 times was 1.21 (95% CI = 1.04–1.42) and RR for > 50 times was 1.38 (95% CI = 1.19–1.62). **Conclusions** Heavy cannabis use among Swedish men in late adolescence appears to be associated with unemployment and being in need of social welfare assistance in adulthood. These associations are not explained fully by other health-related, social or behavioural problems.

Keywords Cannabis, cohort study, education, longitudinal, social welfare assistance, unemployment.

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INTRODUCTION

Cannabis use, and especially heavy use, in adolescence has been associated with social and socio-economic consequences, such as impaired cognitive functioning [1], low educational attainment [2,3] and educational problems [4]. Cannabis use in late adolescence and early adulthood has also been associated with lower income and lower work commitment in early adulthood, i.e. before 30 years of age [5–7]. Cannabis users have been found less likely to work [8,9], and in a recent study we found adolescent heavy cannabis users to be at an increased risk of later receiving disability pension [10]. Moreover, cannabis users have been found to be at an increased risk for receiving social welfare assistance and to be less likely to leave the assistance system [11].

However, previous research on possible associations between cannabis use and later social outcomes is inconsistent, and above all fails to elucidate the causal direction and possible mechanisms behind these associations. For one thing, a recent Australian study combining three long-running longitudinal studies showed that adolescent cannabis users had an increased risk of dropping out of high school, but not of later welfare dependence [12]. In a recent American study, the importance of unobserved confounding in the relationship between cannabis use and labour market outcomes was examined, and the authors concluded that cannabis use may be less harmful with regard to employment and income than previous studies have reported [13].

Given that cognitive impairment may possibly result from heavy cannabis use [1,14], one would expect

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Original article

Predicting Young Adult Degree Attainment by Late Adolescent Marijuana Use

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Keywords: Marijuana use; Marijuana use consequences; Drug use consequences; Educational attainment; Degree attainment; Propensity score methods; Adolescents; Young adults

ABSTRACT

Purpose: The purpose of this study was to assess whether infrequent and frequent marijuana use at age 19/20 years predicts receipt of educational degrees by the mid-20s, independent of confounding age 18 adolescent risk factors.

Methods: Data were from the Monitoring the Future study, an annual nationally representative survey of high school seniors followed into adulthood. Thirteen cohorts (1990–2002) of high school seniors were followed longitudinally to their mid-20s (n = 4,925; 54% female). We used logistic regression and propensity score matching with successive inclusion of age 18 risk factors and substance use to compare age 19/20 frequent marijuana users (six or more occasions in past 30 days) to nonusers, frequent users to infrequent users (1–6 occasions), and infrequent users to nonusers on their likelihood of degree attainment by the mid-20s.

Results: Frequent marijuana users were less likely than infrequent users and nonusers to earn bachelor's degrees, even after controlling for a host of age 18 risk factors (e.g., family socioeconomic background, academic performance, educational expectations, truancy). However, these differences were reduced in magnitude to statistical nonsignificance when we controlled for age 18 substance use. Across analyses, the proportion reaching this educational milestone did not differ significantly between infrequent users and nonusers.

Conclusions: Results support a growing body of work suggesting that frequent marijuana use predicts a lower likelihood of postsecondary educational attainment, and this difference may originate during secondary school.

IMPLICATIONS AND CONTRIBUTION

In a national sample, late adolescent frequent marijuana users were less likely to attain bachelor's degrees by their mid-20s compared with infrequent and nonusers, independent of adolescent risk factors but not of adolescent substance use. Infrequent users and nonusers did not differ in degree attainment.

Marijuana is the most widely used illegal drug among adolescents [1]. Marijuana use during adolescence is clearly associated with many deleterious social and psychological correlates, with evidence of a link to lower educational attainment, especially among early and frequent users [2–6]. However, significant methodological challenges have led some scholars to question the evidence for marijuana's detrimental *causal* impact [4,7,8]. Notably, ethical and legal constraints against randomized trials

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Cannabis-Related Episodic Memory Deficits and Hippocampal Morphological Differences in Healthy Individuals and Schizophrenia Subjects

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ABSTRACT: Cannabis use has been associated with episodic memory (EM) impairments and abnormal hippocampus morphology among both healthy individuals and schizophrenia subjects. Considering the hippocampus' role in EM, research is needed to evaluate the relationship between cannabis-related hippocampal morphology and EM among healthy and clinical groups. We examined differences in hippocampus morphology between control and schizophrenia subjects with and without a past (not current) cannabis use disorder (CUD). Subjects group-matched on demographics included 44 healthy controls (CON), 10 subjects with a CUD history (CON-CUD), 28 schizophrenia subjects with no history of substance use disorders (SCZ), and 15 schizophrenia subjects with a CUD history (SCZ-CUD). Large-deformation, high-dimensional brain mapping with MRI produced surface-based representations of the hippocampus that were compared across all four groups and correlated with EM and CUD history. Surface maps of the hippocampus were generated to visualize morphological differences. CON-CUD and SCZ-CUD were characterized by distinct cannabis-related hippocampal shape differences and parametric deficits in EM performance. Shape differences observed in CON-CUD were associated with poorer EM performance, while shape differences observed in SCZ-CUD were associated with a longer duration of CUD and shorter duration of CUD remission. A past history of CUD may be associated with notable differences in hippocampal morphology and EM impairments among adults with and without schizophrenia. Although the results may be compatible with a causal hypothesis, we must consider that the observed cannabis-related shape differences in the hippocampus could also be explained as biomarkers of a neurobiological susceptibility to poor memory or the effects of cannabis. © 2015 Wiley Periodicals, Inc.

KEY WORDS: hippocampus; Marijuana; neuroimaging; morphology; shape analysis

INTRODUCTION

Over the past decade, policy makers have redefined state laws surrounding cannabis use in the United States, including the decriminalization or legalization of cannabis possession for medical and recreational purposes. In 2010, the National Survey on Drug Use and Health (SAMHSA, 2011) identified cannabis as the most commonly used illicit drug in the United States and recent policy changes regarding cannabis in Colorado resulted in an increased prevalence of cannabis abuse and a decrease in perceived risk of cannabis use among adolescents (Schuermeyer et al., 2014). Based on recent evidence that cannabis use beginning in adolescence has been linked to cognitive deficits Meier et al., 2012, it is important to evaluate the relationship between cannabis use and the morphology of brain structures underlying specific cognitive functions.

Cannabis use and the acute administration of delta-9-tetrahydrocannabinol (Δ_9-THC) (a CB1 receptor agonist and main psychoactive compound in cannabis) have been associated with impairments in episodic memory (EM) (see Ranganathan and D'Souza, 2006; Crane et al., 2013) for review), the type of memory associated with autobiographical events (Stark, 2007). Limbic structures, in particular the hippocampus, play an integral role in memory formation and are characterized by a high density of cannabinoid type 1 (CB1) receptors (Svizenska et al., 2008). Cannabis use disrupts memory by overactivating CB1 receptor expression in the hippocampus which inhibits glutamateric and GABAergic neurotransmission and suppresses LTP and LTD (Navakkode and Korte, 2014).

Recent evidence suggests that heavy cannabis users had altered hippocampal morphology (Medina et al., 2014; Yucel et al., 2008; Ashtari et al., 2011; Solowij et al., 2013) that was related to cannabis use history (e.g., age of onset, duration of use). Specifically, reduced hippocampal volume and shape differences were correlated with recent and overall duration of cannabis use (Ashtari et al., 2011; Solowij et al., 2013). However, these recent findings differ from older studies looking at hippocampal volume

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Neurobiology of Disease

Cannabis Use is Quantitatively Associated with Nucleus Accumbens and Amygdala Abnormalities in Young Adult Recreational Users

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Marijuana is the most commonly used illicit drug in the United States, but little is known about its effects on the human brain, particularly on reward/aversion regions implicated in addiction, such as the nucleus accumbens and amygdala. Animal studies show structural changes in brain regions such as the nucleus accumbens after exposure to Δ9-tetrahydrocannabinol, but less is known about cannabis use and brain morphometry in these regions in humans. We collected high-resolution MRI scans on young adult recreational marijuana users and nonusing controls and conducted three independent analyses of morphometry in these structures: (1) gray matter density using voxel-based morphometry, (2) volume (total brain and regional volumes), and (3) shape (surface morphometry). Gray matter density analyses revealed greater gray matter density in marijuana users than in control participants in the left nucleus accumbens extending to subcallosal cortex, hypothalamus, sublenticular extended amygdala, and left amygdala, even after controlling for age, sex, alcohol use, and cigarette smoking. Trend-level effects were observed for a volume increase in the left nucleus accumbens only. Significant shape differences were detected in the left nucleus accumbens and right amygdala. The left nucleus accumbens showed salient exposure-dependent alterations across all three measures and an altered multimodal relationship across measures in the marijuana group. These data suggest that marijuana exposure, even in young recreational users, is associated with exposure-dependent alterations of the neural matrix of core reward structures and is consistent with animal studies of changes in dendritic arborization.

Key words: cannabis; gray matter density; marijuana; multimodal imaging; reward; topology/shape

Introduction

Marijuana (cannabis) is the most commonly used illicit drug in the United States (15.2 million past-month users; US Department of Health and Human Services, 2008). It is also the most widely used illicit drug on college campuses (Mohler-Kuo et al., 2003). Moreover, its use is increasing among adolescents and young adults (Henry et al., 2003), partially due to society's changing beliefs about cannabis use and its legal status.

Cannabis use is associated with impairments of cognitive functions, including learning and memory, attention, and decision-making. Animal studies show structural changes in brain regions underlying these functions after exposure to Δ9-tetrahydrocannabinol (THC), the main psychoactive component of cannabis (Lawston et al., 2000; Downer et al., 2001). In the nucleus accumbens, the length of the dendrites and number of dendritic spines increases with THC exposure in rats (Kolb et al., 2006). Less is known about the relationship between cannabis use and brain structure in humans. Although some studies have shown volume reductions in the hippocampus, amygdala, and cerebellum, others have not shown such effects (see Lorenzetti et al., 2010 for review). Differences in methodology may have contributed to these mixed results, suggesting that using a variety of structural methods together to quantify brain morphology may be important.

In the present study, we collected high-resolution T1 MRI scans on young adult (age 18–25 years) cannabis/marijuana users and matched nonusing controls. We conducted three blinded, automated, and independent analyses of brain structure and their

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Long-Term Effects of Cannabis on Brain Structure

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The dose-dependent toxicity of the main psychoactive component of cannabis in brain regions rich in cannabinoid CB1 receptors is well known in animal studies. However, research in humans does not show common findings across studies regarding the brain regions that are affected after long-term exposure to cannabis. In the present study, we investigate (using Voxel-based Morphometry) gray matter changes in a group of regular cannabis smokers in comparison with a group of occasional smokers matched by the years of cannabis use. We provide evidence that regular cannabis use is associated with gray matter volume reduction in the medial temporal cortex, temporal pole, parahippocampal gyrus, insula, and orbitofrontal cortex; these regions are rich in cannabinoid CB1 receptors and functionally associated with motivational, emotional, and affective processing. Furthermore, these changes correlate with the frequency of cannabis use in the 3 months before inclusion in the study. The age of onset of drug use also influences the magnitude of these changes. Significant gray matter volume reduction could result either from heavy consumption unrelated to the age of onset or instead from recreational cannabis use initiated at an adolescent age. In contrast, the larger gray matter volume detected in the cerebellum of regular smokers without any correlation with the monthly consumption of cannabis may be related to developmental (ontogenic) processes that occur in adolescence.
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INTRODUCTION

Cannabis is one of the most widely used recreational drugs, taking third place among drugs of concern in addiction treatment services (Degenhardt *et al*, 2008). Despite these statistics pointing to the potential harms associated with long-term cannabis use, little is known about the progression from recreational to regular use and its effects on brain structure.

Current knowledge is mostly inferred from animal studies; it has been demonstrated that the main psychoactive component of cannabis (Δ9-Tetrahydrocannabinol, THC) induces dose-dependent toxicity and structural changes in brain regions rich in cannabinoid CB1 receptors. These are mainly located in the hippocampus, amygdala, cerebellum, prefrontal cortex, and striatum (Burns *et al*, 2007; Downer *et al*, 2001; Lawston *et al*, 2000).

In contrast to the animal literature, the investigation of the structural effects of long-term cannabis use on the human brain has brought less consistent findings. Changes in gray or white matter density have been reported in different locations in frontal and parietal lobes without overlapping findings across studies (Churchwell *et al*, 2010; Gruber *et al*, 2011; Matochik *et al*, 2005). The discrepancy in the results might be due to heterogeneity in sample characteristics, inter-individual differences linked to past history of drug use, amount of consumption, related psychological problems (temperament, level of anxiety or arousal), and/or methodological differences in data processing (Batalla *et al*, 2013; Lorenzetti *et al*, 2010). However, changes in the hippocampus/parahippocampal complex and in the amygdala have often been reported (Demirakca *et al*, 2011; Matochik *et al*, 2005; Yücel *et al*, 2008; Zalesky *et al*, 2012). These findings suggest that long-term cannabis use is associated with brain morphology alterations in regions linked to memory and executive and affective processing (Yücel *et al*, 2008).

Decrease in hippocampal volume in regular cannabis smokers has been correlated with lifetime consumption (Ashtari *et al*, 2011; Yücel *et al*, 2008) and psychotic symptoms (Yücel *et al*, 2008). In Cousijn *et al* (2012), volume reduction in the amygdala and the hippocampus does not differ significantly between regular cannabis users and controls but still correlates with the amount of cannabis used and the severity of cannabis dependence, respectively.

In addition to the several issues characterizing the literature so far, most of the studies examine only predefined regions of interest (i.e., the hippocampus and

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Effects of marijuana consumption in students on brain functions demonstrated by means of neuropsychological tests and neuro-SPECT imaging

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Original article

SUMMARY

Comparative study based on 565 school adolescents coming from four schools in the metropolitan area of Santiago, Chile. All were interviewed in order to select a sample that was stratified by sex, class and condition of users or non users. The variables of intelligence quotient and socioeconomic status were maintained constant. Two groups were made: 40 marijuana-only users and 40 non users. We compared the results obtained in both groups in the neuropsychological tests while the neuroSPECT studies of users were compared against a normal database for the same age group.

Adolescent marijuana users demonstrate less cognitive capacity related to the process of learning such as attention, concentration, ranking, visuo-spatial integration, immediate retention and visual memory. The differences between both groups are statistically significant.

The findings of neuroSPECT show subgenual bilateral hypoperfusion, more marked on the left side (Brodmann's area 25), frontal bilateral hypoperfusion (Brodmann's areas 10 and 32), front cingulate *gyrus* hypoperfusion (Brodmann's area 24) and hypoperfusion of Brodmann's area 36 that projects over the hippocampus.

Students that were only-marijuana users demonstrate coincident abnormal findings of neuroimages and neuropsychological tests in brain learning-related areas and also significant differences between users with non users in the neuropsychological tests.

Key words: Cannabis, marijuana, adolescents, NeuroSPECT, HMPAO, neuropsychological tests.

RESUMEN

Estudio comparativo basado en 565 escolares adolescentes pertenecientes a cuatro colegios de Santiago, Chile. Fueron encuestados todos para seleccionar una muestra estratificada por sexo, curso y condición de consumidores o no consumidores, manteniendo constante las variables coeficiente intelectual y nivel socioeconómico. Se conforman dos grupos: 40 consumidores exclusivos de marihuana y 40 no consumidores. Se comparan los resultados obtenidos en ambos grupos en los Test Neuropsicológios y del NeuroSPECT de consumidores con una base de datos considerados normales para el mismo grupo etario.

Los adolescentes consumidores de marihuana evidencian menores habilidades cognitivas asociadas al proceso de aprendizaje, tales como atención, concentración, jerarquización, integración visoespacial, retención inmediata y memoria visual. Las diferencias entre ambos grupos son estadísticamente significativas.

Los hallazgos del NeuroSPECT muestran hipoperfusión subgenual bilateral, más marcada en el hemisferio izquierdo (área 25 de Brodmann), hipoperfusión frontal bilateral (areas 10 y 32 de Brodmann), hipoperfusión del *gyrus* cingulado anterior (área 24 de Brodmann) e hipoperfusión del área 36 de Brodmann que proyecta sobre el hipocampo.

Los estudiantes consumidores exclusivamente de marihuana muestran compromiso coincidente en neuroimágenes y test neuropsicológicos en áreas del cerebro relacionadas con el aprendizaje y se diferencian significativamente de los no-consumidores en las pruebas neuropsicológicas.

Palabras claves: *Cannabis*, marihuana, adolescentes, NeuroSPECT, HMPAO, pruebas neuropsicológicas.

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Cannabis use before age 15 and subsequent executive functioning

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Background
Many studies have suggested that adolescence is a period of particular vulnerability to neurocognitive effects associated with substance misuse. However, few large studies have measured differences in cognitive performance between chronic cannabis users who started in early adolescence (before age 15) with those who started later.

Aims
To examine the executive functioning of individuals who started chronic cannabis use before age 15 compared with those who started chronic cannabis use after 15 and controls.

Method
We evaluated the performance of 104 chronic cannabis users (49 early-onset users and 55 late-onset users) and 44 controls who undertook neuropsychological tasks, with a focus on executive functioning. Comparisons involving neuropsychological measures were performed using generalised linear model analysis of variance (ANOVA).

Results
The early-onset group showed significantly poorer performance compared with the controls and the late-onset group on tasks assessing sustained attention, impulse control and executive functioning.

Conclusions
Early-onset chronic cannabis users exhibited poorer cognitive performance than controls and late-onset users in executive functioning. Chronic cannabis use, when started before age 15, may have more deleterious effects on neurocognitive functioning.

Declaration of interest
None.

Studies have demonstrated neuropsychological deficits associated with acute exposure to cannabis.[1,2] However, results from studies examining persistent cognitive impairments associated with chronic cannabis use are contradictory, with some studies,[3,4] but not all,[5,6] showing significant neuropsychological deficits even after some weeks of abstinence. One possible explanation for these inconsistent findings is that cannabis is more neurotoxic for some populations than for others. Individuals who are exposed to potentially neurotoxic substances before age 15, while the brain is still developing,[7] may be at higher risk of developing persistent neuropsychological deficits compared with older individuals. One model of genetic control postulates that species with delayed brain development have a larger relative volume of later-developing structures (for example cortical areas, particularly the prefrontal cortex). Consequently, later-developing structures interact with environmental factors for prolonged postnatal periods, which can importantly contribute to the tuning and shaping of circuitry. Prefrontal cortex anatomical development continues after birth with full maturation being achieved only around the early 20s.[8] In addition, different areas within the prefrontal cortex mature at different times. This area of the brain encompasses a number of distinct cognitive processes with different developmental trajectories, including planning, verbal fluency, complex problem-solving and impulse control.[9]

Studies have suggested that adolescence is a period of particular vulnerability to development of neurocognitive effects associated with substance use.[10–12] Findings from animal studies have suggested that cannabinoid 1 (CB_1) receptor levels peak in early adolescence[13] and animals exposed to cannabis in adolescence are more vulnerable to learning impairments compared with animals exposed in adult life. Medina *et al* demonstrated that after a month of abstinence, adolescent cannabis users showed slower psychomotor speed, poorer complex attention and memory skills, and degraded planning/sequencing abilities compared with 34 non-users.[14] Furthermore, there was an inverse correlation between lifetime marijuana exposure and cognitive performance in the same cognitive domains, suggesting a dose-dependent effect. The authors conclude that frequent marijuana use during adolescence may negatively influence neuromaturation and cognitive development. Wilson *et al* evaluated the possible role of age on first use of cannabis interfering with brain and body development.[15] Brain volume measurements (whole brain, grey matter, white matter and lateral ventricle volumes) and global cerebral blood flow were evaluated in 57 chronic cannabis users. Participants who started using cannabis before age 17 had smaller total brain and cortical grey matter volumes with larger white matter volumes. Both males and females who started regular early use were physically smaller in height and weight, with greater effects in males.

Executive functioning is a term that refers to complex mental control processes reflected in future-oriented behaviour that includes cognitive flexibility in problem-solving, focused attention, inhibition of impulsive responses, monitoring, evaluating and adjusting self-directed perception and working memory. From a neurophysiological point of view, executive functions mainly rely on circuits involving prefrontal areas.[16] According to DSM-IV,[17] compulsive use and intense, persistent desire to use a substance, despite the presence of physical and psychological consequences related to the substance use, is a core symptom of dependence syndrome. In this sense, executive deficits might play a central role in the development of addictive behaviours and, consequently, in substance use disorder treatment issues.[18]

Undoubtedly, adolescents are vulnerable to impaired cognitive effects associated with cannabis misuse.[19] The results suggest that chronic cannabis users process complex information more slowly and performance worsens in cognitive overload tasks as lifetime consumption increases.[20] With this in mind, we examined the

Psychology of Addictive Behaviors

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Age of Onset of Marijuana Use and Executive Function

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Marijuana (MJ) remains the most widely abused illicit substance in the United States, and in recent years, a decline in perceived risk of MJ use has been accompanied by a simultaneous increase in rates of use among adolescents. In this study, the authors hypothesized that chronic MJ smokers would perform cognitive tasks, specifically those that require executive function, more poorly than control subjects and that individuals who started smoking MJ regularly *prior to age 16* (early onset) would have more difficulty than those who started *after age 16* (late onset). Thirty-four chronic, heavy MJ smokers separated into early and late onset groups, and 28 non-MJ smoking controls completed a battery of neurocognitive measures. As hypothesized, MJ smokers performed more poorly than controls on several measures of executive function. Age of onset analyses revealed that these between-group differences were largely attributed to the early onset group, who were also shown to smoke twice as often and nearly 3 times as much MJ per week relative to the late onset smokers. Age of onset, frequency, and magnitude of MJ use were all shown to impact cognitive performance. Findings suggest that earlier MJ onset is related to poorer cognitive function and increased frequency and magnitude of MJ use relative to later MJ onset. Exposure to MJ during a period of neurodevelopmental vulnerability, such as adolescence, may result in altered brain development and enduring neuropsychological changes.

Keywords: cognitive function, marijuana, adolescence, early onset

Within the United States, marijuana (MJ) remains the most widely used illicit substance. In 2009, 16.7 million Americans aged 12 and older reported at least one instance of use in the past month, and MJ use within youths aged 12–17 rose to 7.3%, a significant increase from 2008 (Substance Abuse and Mental Health Services Administration [SAMHSA], 2010). Relatively few studies have examined the direct relationship between age of onset of MJ use and cognitive performance, despite the alarming number of adolescent consumers. National survey data suggest that attentional problems exist in young smokers, with 71.7% of adolescents who used MJ at least once a week reporting trouble concentrating compared to 50.8% of nonsmokers (SAMHSA, 1998). Additionally, surveys have shown that perceived risk and perceived disapproval are linked to increased rates of MJ use among adolescents, with current MJ use much less prevalent among youths who perceived strong parental disapproval for trying MJ than for those who did not (4.8% vs. 31.3%; SAMHSA, 2010). In recent years, a decline in perceived risk of MJ has been accompanied by a simultaneous increase in rates of use among adolescents (Johnston, O'Malley, Bachman, & Schulenberg, 2011). As rates of perceived risk decline and MJ use among adolescents increases, age of onset of first regular MJ use has also dropped significantly (Copeland & Swift, 2009; Degenhardt et al., 2008; SAMHSA, 2010). Adolescence is a time of neuromaturation, with increasing evidence that the adolescent brain may be more vulnerable to the effects of drugs and alcohol than the adult brain (Monti et al., 2005), and those who are at the greatest risk for adverse consequences appear to represent a growing population of consumers of MJ (Schneider, 2008).

Previous studies focused on neurocognitive function have reported significantly altered frontal–executive function in MJ smokers. Pope and Yurgelun-Todd (1996) reported lower performance scores on tests designed to measure frontal–executive function in MJ smokers relative to control subjects, and Solowij et al. (2002) reported significantly worse performance on a battery of neurocognitive measures that included attention, memory, and executive function in heavy MJ smokers relative to both lighter smokers and non-smoking controls. Studies of the cognitive effects of MJ following a brief abstinence period have also reported that heavy MJ use is associated with deficits in cognitive tasks mediated by the frontal system (Fletcher et al., 1996; Harvey, Sellman,

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An Evidence Based Review of Acute and Long-Term Effects of Cannabis Use on Executive Cognitive Functions

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Abstract

Cannabis use has been shown to impair cognitive functions on a number of levels—from basic motor coordination to more complex executive function tasks, such as the ability to plan, organize, solve problems, make decisions, remember, and control emotions and behavior. These deficits differ in severity depending on the quantity, recency, age of onset and duration of marijuana use. Understanding how cannabis use impairs executive function is important. Individuals with cannabis-related impairment in executive functions have been found to have trouble learning and applying the skills required for successful recovery, putting them at increased risk for relapse to cannabis use. Here we review the research on the acute, residual, and long-term effects of cannabis use on executive functions, and discuss the implications for treatment.

Keywords

cannabis; marijuana; cognition; executive functions; treatment

OVERVIEW

Consumption of cannabis for medical purposes is legal with a prescription in 15 states, and many states are in the process of decriminalizing non-medical marijuana use. More than 97.5 million Americans over the age of 12 have used illicit marijuana, and it is considered by many to be a benign recreational drug. However, evidence exists of significant harm for some individuals, with 1 in 10 users developing cannabis dependence (SAMHSA, 2007). Furthermore, sixteen percent (~300,000) of all substance abuse treatment admissions in the United States were for cannabis-related disorders; this is second only to alcohol-related disorders (SAMHSA, 2006). It is estimated that more than 4 million Americans meet Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV; APA, 1994) diagnostic criteria for cannabis dependence (SAMHSA, 2007). This figure has doubled from 2001, and will likely continue to grow. Thus, an understanding of the effects of cannabis on executive functions is likely to be of widespread clinical relevance.

Delta 9-tetrahydrocannabinol (THC) is the primary psychoactive constituent of the cannabis sativa plant and is believed to be primarily responsible for the cognitive effects and the addictive potential of smoked cannabis. THC intoxication has been shown to impair cognitive function on a number of levels—from basic motor coordination to more complex

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ORIGINAL INVESTIGATION

Verbal learning and memory in adolescent cannabis users, alcohol users and non-users

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Abstract
Rationale Long-term heavy cannabis use can result in memory impairment. Adolescent users may be especially vulnerable to the adverse neurocognitive effects of cannabis.
Objectives and methods In a cross-sectional and prospective neuropsychological study of 181 adolescents aged 16–20 (mean 18.3 years), we compared performance indices from one of the most widely used measures of learning and memory—the Rey Auditory Verbal Learning Test—between cannabis users (n=52; mean 2.4 years of use, 14 days/month, median abstinence 20.3 h), alcohol users (n=67) and non-user controls (n=62) matched for age, education and premorbid intellectual ability (assessed prospectively), and alcohol consumption for cannabis and alcohol users.
Results Cannabis users performed significantly worse than alcohol users and non-users on all performance indices. They recalled significantly fewer words overall (p<0.001), demonstrating impaired learning (p<0.001), retention (p<0.001) and retrieval (p<0.05) (Cohen's d 0.43–0.84). The degree of impairment was associated with the duration, quantity, frequency and age of onset of cannabis use, but was unrelated to alcohol exposure or other drug use. No gender effects were detected and the findings remained after controlling for premorbid intellectual ability. An earlier age of onset of regular cannabis use was associated with worse memory performance after controlling for extent of exposure to cannabis.
Conclusions Despite relatively brief exposure, adolescent cannabis users relative to their age-matched counterparts demonstrated similar memory deficits to those reported in adult long-term heavy users. The results indicate that cannabis adversely affects the developing brain and reinforce concerns regarding the impact of early exposure.

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Cognitive Function as an Emerging Treatment Target for Marijuana Addiction

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Cannabis is the most widely used illicit substance in the world, and demand for effective treatment is increasing. However, abstinence rates following behavioral therapies have been modest, and there are no effective pharmacotherapies for the treatment of cannabis addiction. We propose a novel research agenda and a potential treatment strategy, based on observations that both acute and chronic exposure to cannabis are associated with dose-related cognitive impairments, most consistently in attention, working memory, verbal learning, and memory functions. These impairments are not completely reversible upon cessation of marijuana use, and moreover may interfere with the treatment of marijuana addiction. Therefore, targeting cognitive impairment associated with chronic marijuana use may be a promising novel strategy for the treatment of marijuana addiction. Preclinical studies suggest that medications enhancing the cholinergic transmission may attenuate cannabis-induced cognitive impairments, but these cognitive enhancing medications have not been examined in controlled human studies. Preliminary evidence from individuals addicted to other drugs suggests that computerized cognitive rehabilitation may also have utility to improve cognitive function in marijuana users. Future clinical studies optimally designed to measure cognitive function as well as drug use behavior would be needed to test the efficacy of these treatments for marijuana addiction.

Keywords: marijuana, cannabis, cognitive function, acetylcholine, cholinesterase inhibitors

Marijuana (cannabis) is the most widely used illicit substance in the world. In the United States, there are approximately 2 to 3 million new users of marijuana every year, and significantly, two-thirds of them are between 12 and 17 years of age (Compton, Grant, Colliver, Glantz, & Stinson, 2004; ONDCP, 2008; SAMHSA, 2008). It is estimated that one out of 12 marijuana users will eventually become dependent on marijuana (Wagner & Anthony, 2002).

As with other addictions, cannabis-dependent individuals continue to use marijuana despite significant problems associated with its use. Marijuana use has been associated with low academic achievement, early school dropout, delinquency, legal problems, unemployment, cigarette smoking, and risk for the development of psychotic disorder (Ferdinand et al., 2005; Friedman, Glassman, & Terras, 2001; Hall & Degenhardt, 2009; Henquet et al., 2005), although there may be alternative explanations for these associations that need to be ruled out before a causal link can be established (Hall & Degenhardt, 2009; Sewell, Poling, & Sofuoglu, 2009). For example, the association between marijuana and nicotine addiction, could be because of common genetic vulnerability (Agrawal et al., 2008). However, reports from several countries (including the United States, United Kingdom, and the Netherlands) indicate that the average age of initiation of marijuana use is decreasing, while the average delta-9-tetrahydrocannabinol (THC; the main psychoactive ingredient of cannabis) content of cannabis is increasing (ElSohly et al., 2000; Pijlman, Rigter, Hoek, Goldschmidt, & Niesink, 2005; Potter, Clark, & Brown, 2008). This may result in greater addictive potential as well as increased negative consequences of marijuana use.

While individuals seeking treatment for marijuana use problems were once comparatively rare (Stephens, Babor, Kadden, Miller, & MTP Research Group, 2002), increased treatment-seeking has been observed among marijuana users, making marijuana one of the most common illicit drugs of use among admissions to treatment programs in the United States (SAMHSA, 2008). Currently, there are no effective medications for the treatment of marijuana addiction, and available behavioral treatments are modestly effective (Nordstrom & Levin, 2007). Thus, development of effective treatment strategies, specifically for cannabis use disorders (dependence or abuse), is urgently needed.

Many studies have demonstrated that chronic exposure to marijuana is associated with dose-related cognitive impairments, most consistently in attention, working memory,

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Altered frontal cortical volume and decision making in adolescent cannabis users

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Anticipating future outcomes is central to decision making and a failure to consider long-term consequences may lead to impulsive choices. Adolescence is a vulnerable period during which underdeveloped prefrontal cortical systems may contribute to poor judgment, impulsive choices, and substance abuse. Conversely, substance abuse during this period may alter neural systems involved in decision making and lead to greater impulsivity. Although a broad neural network which supports decision making undergoes extensive change during adolescent development, one region that may be critical is the medial prefrontal cortex. Altered functional integrity of this region may be specifically related to reward perception, substance abuse, and dependence. In the present investigation, we acquired structural magnetic resonance images (MRI), using a 3T Siemens Trio scanner, from 18 cannabis abusing adolescents (CA; 2 female and 16 male subjects; mean age, 17.7 years; range 16–19 years), and 18 healthy controls (HC; 6 female and 12 male subjects; mean age, 17.2 years; range 16–19 years). In order to measure medial orbital prefrontal cortex (moPFC) morphology related to substance abuse and impulsivity, semi-automated cortical reconstruction and volumetric segmentation of MRIs was performed with FreeSurfer. Impulsivity was evaluated with the Barratt Impulsiveness Scale (BIS). Our results indicate that cannabis abusing adolescents have decreased right moPFC volume compared to controls, $p = 0.01$, $d = 0.92$, $CI_{0.95} = 0.21, 1.59$. Cannabis abusing adolescents also show decreased future orientation, as indexed by the BIS non-planning subscale, when compared to controls, $p = 0.01$, $d = 0.89$, $CI_{0.95} = 0.23, 1.55$. Moreover, total moPFC volume was positively correlated with age of first use $r(18) = 0.49$, $p < 0.03$, suggesting that alterations in this region may be related to initiation of cannabis use or that early initiation may lead to reduced moPFC volume.

Keywords: adolescence, cannabis, prefrontal, orbitofrontal, decision making, impulsivity, marijuana, development

INTRODUCTION

Adolescence is a time during which a variety of factors may converge to increase the likelihood of substance use initiation, abuse, and dependence (Schepis et al., 2008). Adolescents may be particularly susceptible to cannabis use since it is the most commonly abused substance worldwide with North America ranking second for reported utilization (UN, 2008). Adolescence may also be a time of vulnerability to addiction, as it has been reported that early initiation increases the risk for cannabis dependence (Chen et al., 2005). A greater risk for dependence may be associated with an increased sensitivity to the rewarding properties of drugs during this developmental stage (Spear, 2000) and cannabis abuse may disrupt normal neuromaturation and reward sensitivity (Crews et al., 2007). Consistent with this perspective, preclinical models indicate that cannabinoid receptor type 1 (CB_1) significantly changes density in prefrontal cortex and other reward related brain regions during adolescence (Ellgren et al., 2008), suggesting a possible interval of neural vulnerability to cannabis exposure.

Preclinical models have provided further evidence that chronic or escalating doses of delta-9-tetrahydrocannabinol produce alterations in prefrontal and nucleus accumbens dendritic morphology 30 days following treatment (Kolb et al., 2006) and this cellular reorganization may be related to disruptions in the function of these structures which are normally involved in reward representation and goal-directed behavior (Robinson and Kolb, 2004; Kalivas and Volkow, 2005). In accordance with this view, animal models have shown that brain reward systems become hypersensitive to drugs of abuse such as heroin and cocaine following adolescent cannabis exposure (Ellgren et al., 2007; Higuera-Matas et al., 2008). Collectively, these studies indicate that the transition from childhood to adulthood involves a critical window during which cannabis use can impact normal remodeling of the prefrontal cortex (Egerton et al., 2006; Crews et al., 2007) and possibly alter the incentive salience of other drugs of abuse (Robinson and Berridge, 1993).

The neurocognitive impact of initiating cannabis use early in life is also of great concern (Medina et al., 2007; Jacobus et al., 2009). Studies employing neuroimaging techniques have shown that prefrontal cortical gray matter undergoes significant morphological change during adolescence and research investigating prefrontal functioning during this period suggests that delayed development of this region may be related to both cannabis use and risk for substance abuse. For example, Medina et al. (2007) demonstrated that adolescent cannabis users who were

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Frequent Marijuana Use, Binge Drinking and Mental Health Problems Among Undergraduates

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Background and Objectives: In light of the rapidly changing legal status of marijuana in the U.S., there has been increased interest in the potentially adverse outcomes of heavy marijuana use among young persons. The goal of this study was to investigate frequent marijuana use among undergraduates, and its association with the use of illicit substances, mental health problems, and stress.
Methods: Undergraduates from one university in the Northeast were surveyed using a questionnaire derived from the American College Health Association-National College Health Assessment ($N = 1,776$). Logistic regression analyses were used to examine relationships between frequency of marijuana use and other substance use, binge drinking, negative consequences of drinking, mental health problems, and perceived stress. Analyses were adjusted for demographics differences such as gender, race, year in school, and sorority/fraternity membership.
Results: Approximately 1 in 12 undergraduates (8.5%) reported using marijuana more than 10 days in the past month. Frequent marijuana use was associated with increased likelihood of other substance use and alcohol-related negative outcomes. Marijuana use was associated with increased reports of anxiety, and frequent use was associated with depression and substance use problems. Perceived stress was not associated with marijuana use.
Conclusions and Scientific Significance: These findings, indicating that frequent use is related to depression, other substance use and negative outcomes, contribute to our understanding of marijuana use among undergraduates. Given the relatively high prevalence of marijuana use among young persons, future studies should seek to uncover potentially causal relationships between frequent marijuana use and a variety of negative outcomes. (Am J Addict 2015;24:499–506)

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INTRODUCTION

Marijuana is the most commonly used illicit drug in the United States.[1] Data indicate that the prevalence of marijuana use among college students has increased since 2000.[2] For example, in 2000, 13.6% of young adults reported past-month marijuana use[3]; by 2013, the percentage increased to 19.1%.[1] In addition, 23 states and the District of Columbia now allow the medical use of marijuana for certain conditions, and within the past two years, four states legalized the recreational use of marijuana for adults. These developments may increase the availability and use of marijuana by adults and there is some concern that use by young people might be increased as a result.[4,5] It is important to note that there are not yet any data to support or refute this concern.

Heavy, long-term use of smoked marijuana use has been shown to negatively affect lung function[6] and cardiovascular health.[7] In addition, it is estimated that approximately 9% of those who use marijuana will become dependent at some point in their lifetime.[8,9] Young adulthood is a particularly critical period for the development of drug use problems. It has been estimated that 20% of young adults meet criteria for substance abuse or dependence, and only 7% of these young adults receive treatment.[10] As the availability of marijuana becomes more widespread, it will be important to monitor the correlates of frequent marijuana use in young adults, a group that might

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Probability and predictors of the cannabis gateway effect: A national study

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Abstract

Background—While several studies have shown a high association between cannabis use and use of other illicit drugs, the predictors of progression from cannabis to other illicit drugs remain largely unknown. This study aims to estimate the cumulative probability of progression to illicit drug use among individuals with lifetime history of cannabis use, and to identify predictors of progression from cannabis use to other illicit drugs use.

Methods—Analyses were conducted on the sub-sample of participants in Wave 1of the National Epidemiological Survey on Alcohol and Related Conditions (NESARC) who started cannabis use before using any other drug (n= 6,624). Estimated projections of the cumulative probability of progression from cannabis use to use of any other illegal drug use in the general population were obtained by the standard actuarial method. Univariate and multivariable survival analyses with time-varying covariates were implemented to identify predictors of progression to any drug use.

Results—Lifetime cumulative probability estimates indicated that 44.7% of individuals with lifetime cannabis use progressed to other illicit drug use at some time in their lives. Several sociodemographic characteristics, internalizing and externalizing psychiatric disorders and indicators of substance use severity predicted progression from cannabis use to other illicit drugs use.

Conclusion—A large proportion of individuals who use cannabis go on to use other illegal drugs. The increased risk of progression from cannabis use to other illicit drugs use among individuals with mental disorders underscores the importance of considering the benefits and adverse effects of changes in cannabis regulations and of developing prevention and treatment strategies directed at curtailing cannabis use in these populations.

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Long-Term Effects of Cannabis on Brain Structure

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The dose-dependent toxicity of the main psychoactive component of cannabis in brain regions rich in cannabinoid CB1 receptors is well known in animal studies. However, research in humans does not show common findings across studies regarding the brain regions that are affected after long-term exposure to cannabis. In the present study, we investigate (using Voxel-based Morphometry) gray matter changes in a group of regular cannabis smokers in comparison with a group of occasional smokers matched by the years of cannabis use. We provide evidence that regular cannabis use is associated with gray matter volume reduction in the medial temporal cortex, temporal pole, parahippocampal gyrus, insula, and orbitofrontal cortex; these regions are rich in cannabinoid CB1 receptors and functionally associated with motivational, emotional, and affective processing. Furthermore, these changes correlate with the frequency of cannabis use in the 3 months before inclusion in the study. The age of onset of drug use also influences the magnitude of these changes. Significant gray matter volume reduction could result either from heavy consumption unrelated to the age of onset or instead from recreational cannabis use initiated at an adolescent age. In contrast, the larger gray matter volume detected in the cerebellum of regular smokers without any correlation with the monthly consumption of cannabis may be related to developmental (ontogenic) processes that occur in adolescence.
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INTRODUCTION

Cannabis is one of the most widely used recreational drugs, taking third place among drugs of concern in addiction treatment services (Degenhardt *et al*, 2008). Despite these statistics pointing to the potential harms associated with long-term cannabis use, little is known about the progression from recreational to regular use and its effects on brain structure.

Current knowledge is mostly inferred from animal studies; it has been demonstrated that the main psychoactive component of cannabis (Δ9-Tetrahydrocannabinol, THC) induces dose-dependent toxicity and structural changes in brain regions rich in cannabinoid CB1 receptors. These are mainly located in the hippocampus, amygdala, cerebellum, prefrontal cortex, and striatum (Burns *et al*, 2007; Downer *et al*, 2001; Lawston *et al*, 2000).

In contrast to the animal literature, the investigation of the structural effects of long-term cannabis use on the human brain has brought less consistent findings. Changes in gray or white matter density have been reported in different locations in frontal and parietal lobes without overlapping findings across studies (Churchwell *et al*, 2010; Gruber *et al*, 2011; Matochik *et al*, 2005). The discrepancy in the results might be due to heterogeneity in sample characteristics, inter-individual differences linked to past history of drug use, amount of consumption, related psychological problems (temperament, level of anxiety or arousal), and/or methodological differences in data processing (Batalla *et al*, 2013; Lorenzetti *et al*, 2010). However, changes in the hippocampus/parahippocampal complex and in the amygdala have often been reported (Demirakca *et al*, 2011; Matochik *et al*, 2005; Yücel *et al*, 2008; Zalesky *et al*, 2012). These findings suggest that long-term cannabis use is associated with brain morphology alterations in regions linked to memory and executive and affective processing (Yücel *et al*, 2008).

Decrease in hippocampal volume in regular cannabis smokers has been correlated with lifetime consumption (Ashtari *et al*, 2011; Yücel *et al*, 2008) and psychotic symptoms (Yücel *et al*, 2008). In Cousijn *et al* (2012), volume reduction in the amygdala and the hippocampus does not differ significantly between regular cannabis users and controls but still correlates with the amount of cannabis used and the severity of cannabis dependence, respectively.

In addition to the several issues characterizing the literature so far, most of the studies examine only predefined regions of interest (i.e., the hippocampus and

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PSYCHOLOGICAL AND COGNITIVE SCIENCES

Persistent cannabis users show neuropsychological decline from childhood to midlife

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Recent reports show that fewer adolescents believe that regular cannabis use is harmful to health. Concomitantly, adolescents are initiating cannabis use at younger ages, and more adolescents are using cannabis on a daily basis. The purpose of the present study was to test the association between persistent cannabis use and neuropsychological decline and determine whether decline is concentrated among adolescent-onset cannabis users. Participants were members of the Dunedin Study, a prospective study of a birth cohort of 1,037 individuals followed from birth (1972/1973) to age 38 y. Cannabis use was ascertained in interviews at ages 18, 21, 26, 32, and 38 y. Neuropsychological testing was conducted at age 13 y, before initiation of cannabis use, and again at age 38 y, after a pattern of persistent cannabis use had developed. Persistent cannabis use was associated with neuropsychological decline broadly across domains of functioning, even after controlling for years of education. Informants also reported noticing more cognitive problems for persistent cannabis users. Impairment was concentrated among adolescent-onset cannabis users, with more persistent use associated with greater decline. Further, cessation of cannabis use did not fully restore neuropsychological functioning among adolescent-onset cannabis users. Findings are suggestive of a neurotoxic effect of cannabis on the adolescent brain and highlight the importance of prevention and policy efforts targeting adolescents.

marijuana | longitudinal | cognition

Cannabis, the most widely used illicit drug in the world, is increasingly being recognized for both its toxic and its therapeutic properties (1). Research on the harmful and beneficial effects of cannabis use is important because it can inform decisions regarding the medicinal use and legalization of cannabis, and the results of these decisions will have major public-health consequences. As debate surrounding these issues continues in the United States and abroad, new findings concerning the harmful effects of cannabis on neuropsychological functioning are emerging.

Accumulating evidence suggests that long-term, heavy cannabis use may cause enduring neuropsychological impairment—impairment that persists beyond the period of acute intoxication (2). Studies of long-term, heavy cannabis users fairly consistently show that these individuals perform worse on neuropsychological tests (2–5), and some (6–8) but not all (9) studies suggest that impairment may remain even after extended periods of abstinence. The magnitude and persistence of impairment may depend on factors such as the quantity, frequency, duration, and age-of-onset of cannabis use (2), as more severe and enduring impairment is evident among individuals with more frequent and prolonged heavy use and a younger age-of-onset (3, 6, 8, 10–16).

The extant evidence base draws on case–control studies of recruited cannabis users and comparison subjects. These studies screen participants for potential confounding factors, such as alcohol and drug dependence, and compare them on neuropsychological test performance after a period of abstinence from cannabis. There are two commonly cited potential limitations of this approach. One is the absence of data on initial, precannabis-use neuropsychological functioning. It is possible that differences in test performance between cannabis users and controls are attributable to premorbid rather than cannabis-induced deficits (17–20). A second limitation is reliance on retrospectively reported quantity, frequency, duration, and age-of-onset of cannabis use, often inquired about years after initiation of heavy use.

A prospective, longitudinal investigation of the association between cannabis use and neuropsychological impairment could redress these limitations and strengthen the existing evidence base by assessing neuropsychological functioning in a sample of youngsters before the onset of cannabis use, obtaining prospective data on cannabis use as the sample is followed over a number of years, and readministering neuropsychological tests after some members of the sample have developed a pattern of long-term cannabis use. To our knowledge, only one prospective, longitudinal study of the effects of cannabis on neuropsychological functioning has been conducted (21), and, in this study, the sample was small and the average duration of regular cannabis use was only 2 y.

In the present study, we investigated the association between persistent cannabis use—prospectively assessed over 20 y—and neuropsychological functioning in a birth cohort of 1,037 individuals. Study members underwent neuropsychological testing in 1985 and 1986 before the onset of cannabis use and again in 2010–2012, after some had developed a persistent pattern of cannabis use. We tested six hypotheses. First, we tested the "cognitive decline" hypothesis that persistent cannabis users evidence greater decline in test performance from childhood to adulthood than nonusers. By examining within-person change in neuropsychological functioning, any effect of premorbid deficits on later (postcannabis-initiation) test performance was nullified. Second, we tested the "specificity" hypothesis to address whether impairment is confined to specific neuropsychological domains or whether it is more global. To test this hypothesis, we administered multiple tests for each of five specific domains, as different tests may be differentially sensitive to cannabis-associated neuropsychological impairment. In conducting our analyses, we tested alternative explanations for the association between per-

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RESEARCH ARTICLE

Alcohol, tobacco and cannabis use are associated with job loss at follow-up: Findings from the CONSTANCES cohort

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Data Availability Statement: Personal health data underlying the findings of our study are not publicly available due to legal reasons related to data privacy protection. However, the data are available upon request to all interested researchers after authorization of the French "Commission nationale de l'informatique et des libertés". The persons to contact are Dr. Marie Zins (rf.mresni@sniz.eiram) or Pr. Marcel Goldberg (rf.mresni@grebdlog.lecram).

Abstract

Background

Substance use is more prevalent among unemployed subjects compared to employed ones. However, quantifying the risk subsequent of job loss at short-term according to substance use remains underexplored as well as examining if this association persist across various sociodemographic and occupational positions previously linked to job loss. We examined this issue prospectively for alcohol, tobacco, cannabis use and their combination, among a large population-based sample of men and women, while taking into account age, gender, overall health status and depressive symptoms.

Methods

From the French population-based CONSTANCES cohort, 18,879 working participants were included between 2012 and 2016. At baseline, alcohol use disorder risk according to the Alcohol Use Disorders Identification Test (mild, dangerous, problematic or dependence), tobacco (non-smoker, former smoker, 1–9, 10–19, >19 cigarettes/day) and cannabis use (never, not in past year, less than once a month, once a month or more) were assessed. Employment status at one-year (working versus not working) was the dependent variable. Logistic regressions provided Odds Ratios(OR(95%CI)) of job loss at one-year, adjusting for age, gender, self-reported health and depressive state (measured with the Center of Epidemiologic Studies Depression scale). Stratified analyses were performed for education, occupational grade, household income, job stress (measured with the Effort-Reward Imbalance), type of job contract, type of work time and history of unemployment. In sensitivity analyses, employment status over a three-year follow-up was used as dependent variable.

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Marijuana use trends among college students in states with and without legalization of recreational use: initial and longer-term changes from 2008 to 2018

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ABSTRACT

Background and aims Young adult college students in the United States are likely to be affected by marijuana liberalization trends. However, changes in students' marijuana use following recreational marijuana legalization (RML) have not been examined in more than one RML state at a time, or beyond 1–2 years post-legalization. **Design** Cross-sectional National College Health Assessment survey administered twice yearly from 2008 to 2018. **Setting** A total of 587 4-year colleges and universities in 48 US states. **Participants** Undergraduates aged 18–26 years attending college in US states that did (n = 234 669 in seven states) or did not (n = 599 605 in 41 states) enact RML between 2008 and 2018. **Measurements** Self-reported marijuana use (past 30 days) and individual and contextual covariates, institution-provided institutional and community covariates and publicly available dates when states enacted RML. **Findings** Adjusting for covariates, state differences and state-specific linear time trends (accounting for pre-RML trends), prevalence of 30-day marijuana use increased more among students exposed to RML [odds ratio (OR) = 1.23, 95% confidence interval (CI) = 1.19–1.28, $P < 0.001$] than among non-RML state students throughout the same time-period; the results were similar for frequent use (≥ 20 days) (OR = 1.18, 95% CI = 1.10–1.27, $P < 0.001$). Interaction models supported stronger RML effects among students who were female, residing off-campus and aged 21 years and older; sexual orientation did not moderate RML effects. In the earliest states to enact RML (2012) there were increases in use prevalence in the second through the sixth year post-RML compared to pre-RML. In the second legalization group (2015) there were increases in the first and second year post-RML, and greater increases in the third year. In the later states (2016–17), increases were observed in both years after RML. **Conclusions** In US states that enacted recreational marijuana legislation from 2012 to 2017 there was evidence for a general trend towards greater increases in marijuana use by college students and differential impact by gender, legal using age and campus residence.

Keywords Adolescence, cannabis, college students, early adulthood, recreational marijuana legalization, substance use.

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INTRODUCTION

Seven years after states first passed recreational marijuana legalization (RML) in the United States, the effects of these laws on the prevalence of marijuana use are not well understood. There is particular interest in how RML may be impacting adolescents and young adults. During this developmental period, experimentation, onset of regular use and escalation to problem use often occur and show peak prevalence [1–3]. Additionally, the negative academic and employment consequences of marijuana use can be observed in these age groups [4–6], perhaps because brain areas and functions sensitive to cannabis are still rapidly maturing [7]. Young people may be particularly susceptible to the policy environment, as genetic factors account for fewer than half of the variations in marijuana and other substance use in early adulthood [8] and are attenuated by legislative, institutional and interpersonal controls [9]. The impact of the marijuana policy context is evident, for example, in the observation that the prevalence of marijuana use among young people varies markedly by US region, is higher in states that

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The neuropsychopharmacology of cannabis: A review of human imaging studies

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ABSTRACT

The laws governing cannabis are evolving worldwide and associated with changing patterns of use. The main psychoactive drug in cannabis is Δ^9-tetrahydrocannabinol (THC), a partial agonist at the endocannabinoid CB_1 receptor. Acutely, cannabis and THC produce a range of effects on several neurocognitive and pharmacological systems. These include effects on executive, emotional, reward and memory processing via direct interactions with the endocannabinoid system and indirect effects on the glutamatergic, GABAergic and dopaminergic systems. Cannabidiol, a non-intoxicating cannabinoid found in some forms of cannabis, may offset some of these acute effects. Heavy repeated cannabis use, particularly during adolescence, has been associated with adverse effects on these systems, which increase the risk of mental illnesses including addiction and psychosis. Here, we provide a comprehensive state of the art review on the acute and chronic neuropsychopharmacology of cannabis by synthesizing the available neuroimaging research in humans. We describe the effects of drug exposure during development, implications for understanding psychosis and cannabis use disorder, and methodological considerations. Greater understanding of the precise mechanisms underlying the effects of cannabis may also give rise to new treatment targets.

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Abbreviations: ACC, Anterior cingulate cortex; ASL, Arterial spin labelling; BOLD, Blood-oxygen-level dependent; CBD, Cannabidiol; CBF, Cerebral blood flow; CB_1R, Endocannabinoid type 1 receptor; CT, Computed tomography; D_2R, Dopamine type 2 receptor; DLPFC, Dorsolateral prefrontal cortex; DTI, Diffusion tensor imaging; EEG, Electroencephalography; OFC, Orbitofrontal cortex; FDG, Fludeoxyglucose; fMRI, Functional magnetic resonance imaging; GABA, γ-Aminobutyric acid; MID, Monetary incentive delay; MRI, Magnetic resonance imaging; MRS, Magnetic resonance spectroscopy; NAA, N-Acetylaspartate; NAc, Nucleus accumbens; PCC, Posterior cingulate cortex; PET, Positron emission tomography; PFC, Prefrontal cortex; THC, Δ^9-Tetrahydrocannabinol.

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Changes in Healthcare Encounter Rates Possibly Related to Cannabis or Alcohol following Legalization of Recreational Marijuana in a Safety-Net Hospital

An Interrupted Time Series Analysis

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Objectives: Liberalization of marijuana laws in Colorado contributed to increases in cannabis-related adverse events over time. We examined characteristics of patients with healthcare encounters possibly related to cannabis and assessed the temporal association between legalization of recreational marijuana and healthcare encounters possibly attributed to cannabis.

Methods: Annual encounter rates possibly related to cannabis and alcohol were compared using negative binomial regression. Two-time intervals, pre/post-recreational marijuana legalization (January 2009 to December 2013 and January 2014 to December 2015, respectively) were used to examine changes in monthly rates of emergency encounters and hospitalizations possibly related to cannabis. Level and trend changes on encounter rates by legalization period were assessed using interrupted time series analyses. Encounters possibly related to alcohol were used as a comparator group.

Results: Most encounters identified during the study period had alcohol-related International Classification of Diseases Diagnosis and Procedural Codes (ICD-9/10-CM) codes (94.8% vs 5.2% for cannabis). Patients with encounters possibly related to cannabis were younger, more likely to be hospitalized and more likely to be admitted to the psychiatric unit than patients with encounters possibly related to alcohol. Initial and sustained effects of encounter rates possibly related to cannabis demonstrated an increased trend in slope before and after recreational marijuana legalization. The slope became more abrupt following legalization with a significant increase in trend during the post-legalization period ($\beta = 2.7$, standard error = 0.3, $\rho < 0.0001$). No significant change was noted for encounters possibly related to alcohol.

Conclusions: Additional research should identify patients at highest risk of an adverse health event related to cannabis and quantify costs associated with cannabis-related healthcare delivery.

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Dopaminergic Function in Cannabis Users and Its Relationship to Cannabis-Induced Psychotic Symptoms

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Background: Cannabis is the most widely used illicit drug globally, and users are at increased risk of mental illnesses including psychotic disorders such as schizophrenia. Substance dependence and schizophrenia are both associated with dopaminergic dysfunction. It has been proposed, although never directly tested, that the link between cannabis use and schizophrenia is mediated by altered dopaminergic function.

Methods: We compared dopamine synthesis capacity in 19 regular cannabis users who experienced psychotic-like symptoms when they consumed cannabis with 19 nonuser sex- and age-matched control subjects. Dopamine synthesis capacity (indexed as the influx rate constant K_i^{cer}) was measured with positron emission tomography and 3,4-dihydroxy-6-[^{18}F]-fluoro-*l*-phenylalanine ([^{18}F]-DOPA).

Results: Cannabis users had reduced dopamine synthesis capacity in the striatum (effect size: .85; $t_{36} = 2.54$, $p = .016$) and its associative (effect size: .85; $t_{36} = 2.54$, $p = .015$) and limbic subdivisions (effect size: .74; $t_{36} = 2.23$, $p = .032$) compared with control subjects. The group difference in dopamine synthesis capacity in cannabis users compared with control subjects was driven by those users meeting cannabis abuse or dependence criteria. Dopamine synthesis capacity was negatively associated with higher levels of cannabis use ($r = -.77$, $p < .001$) and positively associated with age of onset of cannabis use ($r = .51$, $p = .027$) but was not associated with cannabis-induced psychotic-like symptoms ($r = .32$, $p = .19$).

Conclusions: These findings indicate that chronic cannabis use is associated with reduced dopamine synthesis capacity and question the hypothesis that cannabis increases the risk of psychotic disorders by inducing the same dopaminergic alterations seen in schizophrenia.

Key Words: Addiction, dependence, dopamine, drugs, imaging, psychosis

Cannabis is the most widely used illicit drug globally (1), and the prevalence of cannabis abuse or dependence in the United States is 4.4% (2). Cannabis can induce transient psychotic symptoms in healthy individuals (3,4), and there is consistent epidemiologic evidence that cannabis dose-dependently increases the risk of psychotic disorders (5,6).

Dopaminergic dysfunction is linked to drug dependence (7–11) and psychosis (12–17). Increased dopamine synthesis capacity and release have been reported in psychotic patients (18–26), drugs that increase dopamine release can induce or worsen psychosis (15,27,28), and elevated dopamine synthesis capacity has been reported in people who subsequently develop a frank psychotic disorder (29–32). Patients with cannabis-induced psychosis have elevated peripheral dopamine metabolites (33), and a case report found striatal dopamine release and symptom exacerbation in a schizophrenic patient following cannabis use (34). Thus, cannabis has been proposed to increase psychosis risk by causing striatal hyperdopaminergia (32).

Supporting this, preclinical studies indicate acute administration of Δ9-tetrahydrocannabinol (THC), the main psychoactive ingredient of cannabis (35), increases mesolimbic dopaminergic neuron firing rates via endocannabinoid CB_1 receptor agonism (36). CB_1 agonists inhibit striatal dopamine reuptake (37), selectively increase tyrosine hydroxylase expression (38), and increase dopamine release (39) and synthesis (40) in the majority of, although not all, studies (41).

Dopaminergic sensitisation to THC occurs in animals (42), suggesting that dopaminergic effects are greater with regular cannabis exposures. Studies in recently abstinent and ex-cannabis users have not found abnormal striatal dopamine release (43) or $D_{2/3}$ receptor availability (44,45), but this may be due to normalization of dopaminergic function with abstinence, as has been observed with alcohol (46). One study reported reduced dopamine transporter availability in cannabis users (47), although this was related to concurrent tobacco use, rather than cannabis. However, to our knowledge, no study has examined dopamine synthesis capacity in cannabis users or whether acute psychotic response to cannabis is related to dopaminergic function.

We therefore sought to study presynaptic dopaminergic function in active cannabis users who experienced cannabis-induced psychotic-like symptoms because these individuals are most at risk of psychosis (48). We hypothesized that regular cannabis users sensitive to cannabis' psychotogenic effects would exhibit elevated dopamine synthesis capacity compared with nonuser control subjects, and this would be directly related to cannabis-induced psychotic-like symptom severity.

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Cannabis with high Δ^9-THC contents affects perception and visual selective attention acutely: An event-related potential study

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ABSTRACT

Objective: Cannabis intake has been reported to affect cognitive functions such as selective attention. This study addressed the effects of exposure to cannabis with up to 69.4 mg Δ^9-tetrahydrocannabinol (THC) on Event-Related Potentials (ERPs) recorded during a visual selective attention task. Methods: Twenty-four participants smoked cannabis cigarettes with four doses of THC on four test days in a randomized, double blind, placebo-controlled, crossover study. Two hours after THC exposure the participants performed a visual selective attention task and concomitant ERPs were recorded. Results: Accuracy decreased linearly and reaction times increased linearly with THC dose. However, performance measures and most of the ERP components related specifically to selective attention did not show significant dose effects. Only in relatively light cannabis users the Occipital Selection Negativity decreased linearly with dose. Furthermore, ERP components reflecting perceptual processing, as well as the P300 component, decreased in amplitude after THC exposure. Only the former effect showed a linear dose–response relation. Conclusions: The decrements in performance and ERP amplitudes induced by exposure to cannabis with high THC content resulted from a non-selective decrease in attentional or processing resources. Significance: Performance requiring attentional resources, such as vehicle control, may be compromised several hours after smoking cannabis cigarettes containing high doses of THC, as presently available in Europe and Northern America.

1. Introduction

Cannabis, also known as marijuana, is the plant material of the *Cannabis sativa* L. It is one of the most commonly used recreational drugs in the Western world. The main reasons for its abuse are its reinforcing (Justinova et al., 2005), relaxing, euphoric and psychedelic effects. Cannabis exerts its psychoactive effects mainly through Δ^9-tetrahydrocannabinol (THC). THC is an agonist of Cannabinoid type 1 (CB1) receptors. These receptors are vastly present all over the cortex (Herkenham et al., 1990; Eggan and Lewis, 2007). They typically reside on presynaptic neurons and are inhibited by retrograde transmission of endogenous cannabinoids (Wilson and Nicoll, 2001).

Numerous studies have shown that acute exposure to cannabinoids has detrimental effects on cognitive functioning, including psychomotor and memory performance (for reviews, see Ameri, 1999; Lichtman et al., 2002; Iversen, 2003; Ramaekers et al., 2004; Lundqvist, 2005; Ranganathan and D'Souza, 2006). Acute exposure to THC and cannabis also affects selective attention (Hooker and Jones, 1987; for a review Pope et al., 1995; more recently Curran et al., 2002) and executive functions such as planning, psychomotor inhibition and performance monitoring (Ramaekers et al., 2006).

In recent years the average THC content of (sinsemilla or "skunk") cannabis cigarettes has increased to about 50 mg in Western Europe (61 mg cf. Niesink et al., 2004; 42 mg cf. Potter et al., 2008) and to 63 mg in the United States of America (El Sohly, 2004). In contrast acute effects in laboratory tests have been studied up to doses of about 40 mg THC (Hart et al., 2001; Ramaekers et al., 2006). The present study assessed the effects of exposure to cannabis cigarettes containing doses up to 69.4 mg THC in regular non-daily cannabis users. Intermediate doses studied were 29.3 and 49.1 mg, next to placebo. The present article focuses on the effects of these doses on non-spatial visual attention and concurrent ERP recordings. Elsewhere we reported that these high doses of THC are detrimental to processing speed and accuracy on a number of psychomotor tasks (Hunault et al., 2009) that were dependent on sustained attention, working memory and motor control.

Six ERP components were recorded at various latencies and scalp positions in the present non-spatial visual attention task. These included manifestations of 1) perception of the stimulus features that defined relevant and irrelevant stimuli (the exogenous Spatial-

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Cannabis use and later life outcomes

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ABSTRACT

Aim To examine the associations between the extent of cannabis use during adolescence and young adulthood and later education, economic, employment, relationship satisfaction and life satisfaction outcomes. **Design** A longitudinal study of a New Zealand birth cohort studied to age 25 years. **Measurements** Measures of: cannabis use at ages 14–25; university degree attainment to age 25; income at age 25; welfare dependence during the period 21–25 years; unemployment 21–25 years; relationship quality; life satisfaction. Also, measures of childhood socio-economic disadvantage, family adversity, childhood and early adolescent behavioural adjustment and cognitive ability and adolescent and young adult mental health and substance use. **Findings** There were statistically significant bivariate associations between increasing levels of cannabis use at ages 14–21 and: lower levels of degree attainment by age 25 ($P < 0.0001$); lower income at age 25 ($P < 0.01$); higher levels of welfare dependence ($P < 0.0001$); higher unemployment ($P < 0.0001$); lower levels of relationship satisfaction ($P < 0.001$); and lower levels of life satisfaction ($P < 0.0001$). These associations were adjusted for a range of potentially confounding factors including: family socio-economic background; family functioning; exposure to child abuse; childhood and adolescent adjustment; early adolescent academic achievement; and comorbid mental disorders and substance use. After adjustment, the associations between increasing cannabis use and all outcome measures remained statistically significant ($P < 0.05$). **Conclusions** The results of the present study suggest that increasing cannabis use in late adolescence and early adulthood is associated with a range of adverse outcomes in later life. High levels of cannabis use are related to poorer educational outcomes, lower income, greater welfare dependence and unemployment and lower relationship and life satisfaction. The findings add to a growing body of knowledge regarding the adverse consequences of heavy cannabis use.

Keywords Cannabis use, education, life satisfaction, longitudinal study, mental health, unemployment, welfare.

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INTRODUCTION

In recent years, there have been growing concerns and debates about the effects of cannabis use on the health and wellbeing of young people. These concerns have been motivated by evidence of growing cannabis use in young people [1,2], changes in the nature and strength of cannabis [3,4] and by growing evidence linking cannabis to mental health and other problems [1,5–9]. While the role of cannabis in encouraging psychosocial problems in young people remains controversial, there is growing evidence from both epidemiology and neuroscience that cannabis may be more harmful than believed previously [10,11].

An aspect of these concerns that requires further attention is the extent to which the use, and in particular heavy use, of cannabis may have adverse consequences for a number of important life-course outcomes, including educational achievement, income, welfare dependence, unemployment, relationship satisfaction and life satisfaction. Specifically, there have been frequent references in the literature on cannabis to suggest that cannabis use may reduce educational achievement [12–14], increase welfare dependence [15], reduce income [16] and lead to impaired interpersonal relationships [17]. While there is some evidence of statistical linkage with these outcomes, it may be suggested that the apparent associations between cannabis use and these life-course outcomes may reflect the presence of uncontrolled sources of confounding [18].

In this study, we use data gathered over the course of a 25-year longitudinal study to examine the linkages

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INVITED REVIEWS

Psychosocial sequelae of cannabis use and implications for policy: findings from the Christchurch Health and Development Study

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Abstract
Background The Christchurch Health and Development Study is a longitudinal study of a birth cohort of 1265 children who were born in Christchurch, New Zealand, in 1977. This cohort has now been studied from birth to the age of 35.
Scope of this review This article examines a series of findings from the CHDS that address a range of issues relating to the use of cannabis amongst the cohort. These issues include: (a) patterns of cannabis use and cannabis dependence; (b) linkages between cannabis use and adverse educational and economic outcomes; (c) cannabis and other illicit drug use; (d) cannabis and psychotic symptoms; (e) other CHDS findings related to cannabis; and (f) the consequences of cannabis use for adults using cannabis regularly.
Findings In general, the findings of the CHDS suggest that individuals who use cannabis regularly, or who begin using cannabis at earlier ages, are at increased risk of a range of adverse outcomes, including: lower levels of educational attainment; welfare dependence and unemployment; using other, more dangerous illicit drugs; and psychotic symptomatology. It should also be noted, however, that there is a substantial proportion of regular adult users who do not experience harmful consequences as a result of cannabis use.
Conclusions Collectively, these findings suggest that cannabis policy needs to be further developed and evaluated in order to find the best way to regulate a widely-used, and increasingly legal substance.

Keywords Cannabis · Cannabis dependence · Education · Unemployment · Welfare dependence · Gateway theory · Psychosis

Introduction

Over the last two decades there have been ongoing debates about the extent to which the use of cannabis/marijuana has harmful effects upon users [1–4]. These debates have tended to polarize into two groups; first, those who tend of minimize the potential harmful effects of cannabis and argue strongly for the liberalization of cannabis laws and permitting access to legal cannabis [5–7]; and second, those who view cannabis as a harmful drug for which continued prohibition is the correct approach [8, 9].

One of the inevitable features of research into the harmful effects of cannabis is that research has been conducted in different settings, using different research designs and measurement methods. While this heterogeneity has benefits for examining the generality of findings about cannabis, it also has some limitations, as the results from different studies may make it difficult to provide a clear picture of the ways in which cannabis use may influence the health and wellbeing of a particular population.

Against this background the aims of this paper are to provide an overview of the findings of a large longitudinal study in which the use of cannabis has been studied from mid-adolescence (age 14) to mature adulthood (age 35). This study is the Christchurch Heath and Development Study, which is a longitudinal study of a birth 1265 cohort of children born in the Christchurch (New Zealand) area in

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Concurrent Life-course Trajectories of Employment and Marijuana-use: Exploring Interdependence of Longitudinal Outcomes

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Abstract

This study analyzes data on 7,661 individuals who participated in the 1979 National Longitudinal Survey of Youth (NLSY79) to estimate trajectories of employment and marijuana-use over a 17-year period. Bivariate random intercept and slope modeling is applied to examine concurrently the cross-correlation between the two concurrent longitudinal trajectories from age 23 to 39. Parameter estimates indicate baseline level (at age 23) of employment to be negatively correlated with marijuana, suggesting marijuana-use is associated with lower workforce productivity at age 23. The longitudinal employment slope is positively correlated with employment intercept for both males and females, indicating that survey participants with higher levels of employment at age 23 are more likely to have a positive impact on employment trajectory over time. For males, however, the employment slope is also significantly correlated with marijuana intercept ($r = -0.07$), indicating marijuana-use in early adulthood may uniquely lower workforce productivity over age.

Keywords

employment; marijuana-use; gender differences; life-course; multivariate longitudinal outcomes

1 Introduction

The adverse consequences of illicit drug use on users' physical (Mokdad et al., 2004) and psychological health (Brook et al., 2002) have been examined extensively. Substance abuse has been found to be associated with reduced cognitive abilities (Pope & Yurgelun-Todd,

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Impaired error awareness and anterior cingulate cortex hypoactivity in chronic cannabis users

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Abstract

Drug abuse and other psychiatric conditions (e.g., schizophrenia) have been associated with a diminished neural response to errors, particularly in the anterior cingulate cortex (ACC) thought critical to error processing. A diminished capacity for detecting errors has been linked to clinical symptoms including the loss of insight, delusions and perseverative behaviour. Sixteen active chronic cannabis users and 16 control participants were administered a Go/No-go response inhibition task during event-related fMRI data collection. The task provides measures of inhibitory control and error awareness. Cannabis users' inhibitory control performance was equivalent to that of the control group, but the former demonstrated a significant deficit in awareness of commission errors. Cannabis users demonstrated a diminished capacity for monitoring their behaviour that was associated with hypoactivity in the ACC and right insula. In addition, increased levels of hypoactivity in both the ACC and right insula regions were significantly correlated with error awareness rates in the cannabis group (but not controls). These difficulties are consistent with previous reports of hypoactivity in the neural systems underlying cognitive control and the monitoring of interoceptive awareness in chronic drug users, and highlight the potential relationship between cognitive dysfunction and behavioural deficits that have the potential to contribute to the maintenance of drug abuse.

Keywords

Performance monitoring; error-related; drug addiction; marijuana; insula; cognitive control

INTRODUCTION

Healthy adults are very good at detecting cognitive failures, whereas a common feature of many psychiatric and neurological conditions is a diminished capacity for performance monitoring (Ullsperger, 2006). Deficits in error detection have also been found to relate to

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Disclosures

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Cannabis use and educational achievement: Findings from three Australasian cohort studies

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ABSTRACT

Background: The associations between age of onset of cannabis use and educational achievement were examined using data from three Australasian cohort studies involving over 6000 participants. The research aims were to compare findings across studies and obtain pooled estimates of association using meta-analytic methods.
Methods: Data on age of onset of cannabis use (<15, 15–17, never before age 18) and three educational outcomes (high school completion, university enrolment, degree attainment) were common to all studies. Each study also assessed a broad range of confounding factors.
Results: There were significant ($p < .001$) associations between age of onset of cannabis use and all outcomes such that rates of attainment were highest for those who had not used cannabis by age 18 and lowest for those who first used cannabis before age 15. These findings were evident for each study and for the pooled data, and persisted after control for confounding. There was no consistent trend for cannabis use to have greater effect on the academic achievement of males but there was a significant gender by age of onset interaction for university enrolment. This interaction suggested that cannabis use by males had a greater detrimental effect on university participation than for females. Pooled estimates suggested that early use of cannabis may contribute up to 17% of the rate of failure to obtain the educational milestones of high school completion, university enrolment and degree attainment.
Conclusions: Findings suggest the presence of a robust association between age of onset of cannabis use and subsequent educational achievement.

1. Introduction

There has been increasing research into the relationships between cannabis use by young people and educational achievement. Findings suggests that young people who use cannabis early or heavily are at increased risks of educational under-achievement including: school dropout (Brook et al., 1999; Ellickson et al., 1998; Fergusson and Boden, 2008; Fergusson et al., 2003, 1996; Lynskey et al., 2003; Tanner et al., 1999; van Ours and Williams, 2009); failure to attend tertiary education (Fergusson and Boden, 2008; Fergusson et al., 2003; Newcomb and Bentler, 1988b; Tanner et al., 1999); and failure to attain university degrees (Fergusson and Boden, 2008; van Ours and Williams, 2009). These associations have been found to persist following control for confounding social, personal and related factors (Fergusson et al., 1996; Lynskey and Hall, 2000; Townsend et al., 2007; van Ours and Williams, 2009).

A limitation of this literature has been that different studies have used different samples, different methods of assessing cannabis use and differing assessments of educational outcomes, limiting the extent to which cross study comparisons can be made (Townsend et al., 2007). It has often been suggested that these limitations may be overcome by meta-analytic methods that combine findings from different studies (Curran and Hussong, 2009; Hofer and Piccinin, 2009; Mulrow, 1994). However, such analysis may be compromised by variations in study quality (Blettner et al., 1999; Egger et al., 1998). In this paper we attempt to overcome these limitations by conducting a meta-analysis of three Australasian longitudinal studies that have collected similar data on the development of cannabis use and educational achievement. Overlapping measures include: (a) the assessment of age of first use of cannabis; (b) the use of

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Reduced memory and attention performance in a population-based sample of young adults with a moderate lifetime use of cannabis, ecstasy and alcohol

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Abstract

Regular use of illegal drugs is suspected to cause cognitive impairments. Two substances have received heightened attention: 3,4-methylenedioxymethamphetamine (MDMA or 'ecstasy') and δ-9-tetrahydrocannabinol (THC or 'cannabis'). Preclinical evidence, as well as human studies examining regular ecstasy consumers, indicated that ecstasy use may have negative effects on learning, verbal memory and complex attentional functions. Cannabis has also been linked to symptoms of inattention and deficits in learning and memory. Most of the published studies in this field of research recruited participants by means of newspaper advertisements or by using word-of-mouth strategies. Because participants were usually aware that their drug use was critical to the research design, this awareness may have caused selection bias or created expectation effects. Focussing on attention and memory, this study aimed to assess cognitive functioning in a community-based representative sample that was derived from a large-scale epidemiological study. Available data concerning drug use history allowed sampling of subjects with varying degrees of lifetime drug experiences. Cognitive functioning was examined in 284 young participants, between 22 and 34 years. In general, their lifetime drug experience was moderate. Participants completed a neuropsychological test battery, including measures for verbal learning, memory and various attentional functions. Linear regression analysis was performed to investigate the relationship between cognitive functioning and lifetime experience of drug use. Ecstasy and cannabis use were significantly related to poorer episodic memory function in a dose-related manner. For attentional measures, decrements of small effect sizes were found. Error measures in tonic and phasic alertness tasks, selective attention task and vigilance showed small but significant effects, suggesting a stronger tendency to experience lapses of attention. No indication for differences in reaction time was found. The results are consistent with decrements of memory and attentional performance described in previous studies. These effects are relatively small; however, it must be kept in mind that this study focussed on assessing young adults with moderate drug use from a population-based study.

Key words

alcohol; alertness; cannabis; divided attention; ecstasy; flexibility; learning; memory; selective attention; vigilance

This article has been prepared in the context of the project F2 "*Targeted early interventions in ecstasy, regular cannabis and harmful alcohol users: utilizing individual neurocognitive and psychosocial problem profiles*." (CG Schuetz) of the Addiction Research Network ASAT (Allocating Substance Abuse Treatments to Patient Heterogeneity). Contact information: Email: asatkoordination@mpipsykl.mpg.de (http://www.asat-verband.de). ASAT is sponsored by a federal grant of the Federal Ministry of Education and Research (01 EB 0440 – 0441, 01 EB 0142).

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Effects of Cannabis on the Adolescent Brain

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Abstract

This article reviews neuroimaging, neurocognitive, and preclinical findings on the effects of cannabis on the adolescent brain. Marijuana is the second most widely used intoxicant in adolescence, and teens who engage in heavy marijuana use often show disadvantages in neurocognitive performance, macrostructural and microstructural brain development, and alterations in brain functioning. It remains unclear whether such disadvantages reflect pre-existing differences that lead to increased substances use and further changes in brain architecture and behavioral outcomes. Future work should focus on prospective investigations to help disentangle dose-dependent effects from pre-existing effects, and to better understand the interactive relationships with other commonly abused substances (e.g., alcohol) to better understand the role of regular cannabis use on neurodevelopmental trajectories.

Introduction

According to the 2011 Monitoring the Future Study, marijuana remains the most commonly used illicit drug in adolescence in the United States, one of few increasing in prevalence. In fact, marijuana has been the most commonly used illicit substance for almost 40 years, and presently 23% of 12th graders in the U.S. report using marijuana in the past month [1]. Marijuana use in adolescence could have implications for academic functioning, as well as social and occupational functioning extending into later life. Maturational brain changes, particularly myelination and synaptic pruning, are occurring throughout adolescence, well into early adulthood [2]. These remodeling processes are purportedly linked to efficient neural processing, and believed to underlie specialized cognitive processing necessary for optimal neurocognitive performance.

Cannabinoid receptors (CB1) are widely distributed throughout the brain (e.g., hippocampus, prefrontal cortex), and play a role in neurotransmitter release and concentrations across neural systems (excitatory and inhibitory). It has been suggested that these receptors increase during adolescence, have a role in genetic expression of neural development, and that alteration of the endocannabinoid system during adolescence may

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Cortical thickness in adolescent marijuana and alcohol users: A three-year prospective study from adolescence to young adulthood

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ABSTRACT

Studies suggest marijuana impacts gray and white matter neural tissue development, however few prospective studies have determined the relationship between cortical thickness and cannabis use spanning adolescence to young adulthood. This study aimed to understand how heavy marijuana use influences cortical thickness trajectories across adolescence. Subjects were adolescents with heavy marijuana use and concomitant alcohol use (MJ + ALC, $n = 30$) and controls (CON, $n = 38$) with limited substance use histories. Participants underwent magnetic resonance imaging and comprehensive substance use assessment at three independent time points. Repeated measures analysis of covariance was used to look at main effects of group, time, and Group × Time interactions on cortical thickness. MJ + ALC showed thicker cortical estimates across the brain (23 regions), particularly in frontal and parietal lobes ($ps < .05$). More cumulative marijuana use was associated with increased thickness estimates by 3-year follow-up ($ps < .05$). Heavy marijuana use during adolescence and into young adulthood may be associated with altered neural tissue development and interference with neuromaturation that can have neurobehavioral consequences. Continued follow-up of adolescent marijuana users will help understand ongoing neural changes that are associated with development of problematic use into adulthood, as well as potential for neural recovery with cessation of use.

1. Introduction

Adolescence is a unique developmental period characterized by major physiological, psychological, and neurodevelopmental changes. These changes typically coincide with escalation of alcohol and marijuana use (Brown et al., 2008), which continues into early adulthood (Sartor et al., 2007). The comorbid use of alcohol and marijuana among teens continues to subtly rise as perception of harm declines. Fifty-eight percent of alcohol drinking adolescents report using alcohol and marijuana simultaneously, (Agosti et al., 2002), 45% of youth endorse a lifetime prevalence of marijuana use by the 12th grade, and 22% of these youth endorse use in the past 30 days (Johnston et al., 2015).

The adolescent brain undergoes considerable maturation, including changes in cortical volume and refinement of cortical connections (Huttenlocher and Dabholkar, 1997). These neural transformations (e.g., maturing neural circuitry, cortical thinning and fiber projections) leave the adolescent brain more susceptible to potential neurotoxic effects of substances (Brown et al., 2000; Spear, 2000; Spear and Varlinskaya, 2005; Squeglia et al., 2009; Tapert et al., 2002). Although overall brain volume remains largely unchanged after puberty, ongoing synaptic refinement and myelination results in reduced gray matter and increased white matter volume by late adolescence (Casey et al., 2008; Giedd, 2004; Sowell et al., 2003; Yakovlev and Lecours, 1967).

Cortical gray matter follows an inverted U-shaped developmental course, with cortical volume peaking around ages 12–14 (Giedd, 2004; Giedd et al., 2009; Gogtay et al., 2004; Sowell et al., 2003). The mechanisms underlying the decline in cortical volume and thickness are suggested to involve pruning and elimination of weaker synaptic connections, decreases in neuropil, increases in intra-cortical myelination, or changes in the cellular organization of the cerebral cortex (Huttenlocher and Dabholkar, 1997; Paus et al.,

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A LONGITUDINAL STUDY OF THE ASSOCIATION OF ADOLESCENT POLYDRUG USE, ALCOHOL USE, AND HIGH SCHOOL NON-COMPLETION

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Abstract

Aims—Failure to complete high school predicts substantial economic and social disadvantage in adult life. The aim was to determine the longitudinal association of mid-adolescent polydrug use and high school non-completion, relative to other drug use profiles.

Design—A longitudinal analysis of the relationship between polydrug use in three cohorts at Grade 9 (age 14–15) and school non-completion (reported post high school).

Setting—A State-representative sample of students across Victoria, Australia.

Participants—2287 secondary school students from 152 high schools. The retention rate was 85%.

Measurements—The primary outcome was noncompletion of Grade 12 (assessed at age 19–23 years). At Grade 9, predictors included 30 day use of eight drugs, school commitment, academic failure, and peer drug use. Other controls included socioeconomic status, family relationship quality, depressive symptoms, gender, age, and cohort.

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DECLARATION: The authors declare that the material has not been published in whole or in part elsewhere, the paper is not currently being considered for publication elsewhere, all authors have been personally and actively involved in substantive work leading to the report and will hold themselves jointly and individually responsible for its content, and all relevant ethical safeguards have been met in relation to patient or subject protection. The authors declare that there are no potential conflicts of interest in relation to this study.

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STIMULANTS, CANNABIS, AND CLUB DRUGS (AJ BUDNEY, R VANDREY AND D LEE, SECTION EDITORS)

Considering Cannabis: The Effects of Regular Cannabis Use on Neurocognition in Adolescents and Young Adults

Krista M. Lisdahl · Natasha E. Wright · Christopher Medina-Kirchner · Kristin E. Maple · Skyler Shollenbarger

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Abstract Thirty-six percent of high-school seniors have used cannabis in the past year, and an alarming 6.5 % smoked cannabis daily, up from 2.4 % in 1993. Adolescents and emerging adults are undergoing significant neurodevelopment and animal studies suggest they may be particularly vulnerable to negative drug effects. In this review, we will provide a detailed overview of studies outlining the effects of regular (at least weekly) cannabis use on neurocognition, including studies outlining cognitive, structural, and functional findings. We will also explore the public health impact of this research.

Keywords Adolescence · Emerging Adult · Young Adult · Cannabis · Marijuana · MRI · fMRI · Diffusion Tensor Imaging · Neuropsychology · Cognition · Age of Onset · *FAAH* · *CNR1* · THC · Cannabidiol · Public health · Neurotoxic effects of cannabis

Introduction

Cannabis is the second most used drug after alcohol, with 22.9 % of high-school seniors and 20 % of college students using in the past month, and perhaps most alarmingly, one in every 15 seniors report using daily [1]. Research outlining the neurocognitive effects of chronic, regular (defined here as at least weekly) cannabis use in adolescents and young adults is of great public health concern. This review will summarize current findings regarding the neurocognitive consequences of cannabis use during the teenage and emerging adult years (focusing on ages 15–25 years). Studies utilizing neuropsychological assessment and structural and functional neuroimaging will be reviewed. Further, we will identify potential 'at-risk' groups who may experience more severe neurocognitive consequences of chronic cannabis use, such as those with early age of cannabis use onset and those with certain genotypic profiles, and will discuss the clinical and policy implications of this research.

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Adolescence: A Sensitive Period?

Worldwide, most people start experimenting with drugs during the teenage years [2]. Adolescence is also a dynamic time marked by significant neurodevelopmental changes; brain regions underlying higher-order thinking and executive functioning, especially the prefrontal (PFC) and parietal cortex, undergo synaptic pruning into the mid-20s (see [3–6]). Quality and volume of white matter increase into the early 30s, which are associated with increased neural efficiency [7, 8]. This period of ongoing neurodevelopment may be a sensitive period in which drugs can exert a greater impact on the brain compared with exposure during adulthood (see [9]).

Impacts of Regular Cannabis Use on Neurocognition in Teens and Young Adults

Cognition

Although controversy exists in the adult literature, evidence is building to suggest that regular cannabis use during the teenage or emerging adult years (typically ages 15–25 years) is associated with cognitive deficits [10•]. Two longitudinal studies that followed adolescents with substance use disorders over 8 years found that increased cannabis use during the follow-up period significantly predicted poorer attention

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Chronic cannabis use and ERP correlates of visual selective attention during the performance of a flanker go/nogo task

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ABSTRACT

The aim of the study was to investigate the relationship between chronic cannabis use and visual selective attention by examining event-related potentials (ERPs) during the performance of a flanker go/nogo task. Male participants were 15 chronic cannabis users (minimum two years use, at least once per week) and 15 drug naive controls. Cannabis users showed longer reaction times compared to controls with equivalent accuracy. Cannabis users also showed a reduction in the N2 'nogo effect' at frontal sites, particularly for incongruent stimuli, and particularly in the right hemisphere. This suggests differences between chronic cannabis users and controls in terms of inhibitory processing within the executive control network, and may implicate the right inferior frontal cortex. There was also preliminary evidence for differences in early selective attention, with controls but not cannabis users showing modulation of N1 amplitude by flanker congruency. Further investigation is required to examine the potential reversibility of these residual effects after long-term abstinence and to examine the role of early selective attention mechanisms in more detail.

1. Introduction

The acute effects of cannabis on cognitive processes are well documented, and include decrements in working memory, inhibitory processing, planning and decision making (see Crean, Crane, & Mason, 2011; Gonzalez, 2007). Chronic cannabis use, or repeated use over an extended period of time, is associated with differences in cognitive processing that persist beyond the period of acute intoxication (Crean et al., 2011). In a recent meta-analysis (Schreiner & Dunn, 2012), there was a small residual (non-acute) effect of cannabis use on overall cognitive function ($d = -.46$ to $-.12$), with similar small effects found for most cognitive domains including memory, attention and executive function. However, given that the active metabolites of cannabis can be stored in and subsequently released from adipose tissue for up to months after use (Grotenhermen, 2003; Huestis, 2007), the residual effects of cannabis on the CNS may not necessarily represent long-term neuro-adaptive changes (Schreiner & Dunn, 2012). While some recent reviews suggest that there may be neurocognitive adaptations which last beyond these residual effects (Crean et al., 2011; Solowij & Battisti, 2008), other research suggests that some effects are reversible with prolonged abstinence (Schreiner & Dunn, 2012). There is also evidence that adolescents may be particularly vulnerable to the long-term effects of cannabis on cognitive function (see Pattij, Wiskerke, & Schoffelmeer, 2008).

It has been suggested that altered cognitive processing in cannabis users is associated with functional changes in brain regions rich with cannabinoid CB1 receptors (Pattij et al., 2008). THC (the main psychoactive component in cannabis) acts on CB1 receptors and these are particularly concentrated in brain regions known to be involved in executive functioning, reward processing, attention and memory. These areas include the prefrontal cortex, anterior cingulate cortex, basal ganglia, hippocampus, and cerebellum (Burns et al., 2007; Herkenham et al., 1990). In a recent PET study, down-regulation of CB1 receptors was found in cortical but not subcortical areas among long-term daily cannabis users and these effects were found to reverse in most cortical areas after approximately 4 weeks of abstinence (Hirvonen et al., 2012).

Of particular interest to the present study are the residual effects of chronic cannabis use on selective attention. According to the attentional network model, the attention system of the brain is composed of distinct networks responsible for alerting, orienting and executive control (Petersen & Posner, 2012; Posner & Peterson, 1990). While the alerting network is most important for vigilance and sustained attention, the latter two networks are most relevant to selective attention. The orienting network involves the interaction between frontal and parietal areas and is argued to

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Cannabis Use and Memory Brain Function in Adolescent Boys: A Cross-Sectional Multicenter Functional Magnetic Resonance Imaging Study

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Objective: Early-onset cannabis use has been associated with later use/abuse, mental health problems (psychosis, depression), and abnormal development of cognition and brain function. During adolescence, ongoing neurodevelopmental maturation and experience shape the neural circuitry underlying complex cognitive functions such as memory and executive control. Prefrontal and temporal regions are critically involved in these functions. Maturational processes leave these brain areas prone to the potentially harmful effects of cannabis use. **Method:** We performed a two-site (United States and the Netherlands; pooled data) functional magnetic resonance imaging (MRI) study with a cross-sectional design, investigating the effects of adolescent cannabis use on working memory (WM) and associative memory (AM) brain function in 21 abstinent but frequent cannabis–using boys (13–19) years of age and compared them with 24 nonusing peers. Brain activity during WM was assessed before and after rule-based learning (automatization). AM was assessed using a pictorial hippocampal-dependent memory task. **Results:** Cannabis users performed normally on both memory tasks. During WM assessment, cannabis users showed excessive activity in prefrontal regions when a task was novel, whereas automatization of the task reduced activity to the same level in users and controls. No effect of cannabis use on AM-related brain function was found. **Conclusions:** In adolescent cannabis users, the WM system was overactive during a novel task, suggesting functional compensation. Inefficient WM recruitment was not related to a failure in automatization but became evident when processing continuously changing information. The results seem to confirm the vulnerability of still developing frontal lobe functioning for early-onset cannabis use. J. Am. Acad. Child Adolesc. Psychiatry, 2010;49(6):561–572. **Key Words:** cannabis, adolescence, early-onset, fMRI, memory

Early initiation of cannabis use increases the risk of later use/abuse of other drugs and drug dependence, and is associated with mental health problems such as psychosis and depression. The strength of this association appears to be dependent on the age when cannabis use begins.[1] A major concern that has only recently gained attention is the effect of early-onset cannabis use on adolescent brain function and neurodevelopment.

Supplemental material cited in this article is available online.

The still-developing adolescent brain differs anatomically and neurochemically from the adult brain[2,3] and is likely more susceptible to drug-induced adaptive neuronal plasticity.

Animal studies on the neural consequences of chronic cannabis exposure during the peri-adolescent period report changes in brain structure (predominantly limbic brain regions) and altered emotional and cognitive performance in later life.[4] However, these effects were mostly observed at relatively high doses of synthetic cannabinoids (Win 55,212-2; CP 55,940) and therefore may not be comparable to the human situation.

Studies in cannabis-using human adolescents

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Cannabis and social welfare assistance: a longitudinal study

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ABSTRACT

Aims To investigate associations between cannabis use and subsequent receipt of social welfare assistance. **Design, setting and participants** The Young in Norway Longitudinal Study. A population-based Norwegian sample ($n = 2606$) was followed-up from adolescence to late 20s. Self-report data were merged with data from national registers. **Measurements** Data were extracted on the use of alcohol, tobacco and cannabis and other illegal substances. Information was also retrieved on socio-demographic and family factors, academic achievement, conduct problems and mental health. National registers provided data on social welfare assistance, educational level and crime statistics. **Findings** We observed prospective bivariate associations between increasing levels of cannabis use and subsequent social welfare assistance ($P < 0.0001$). The associations were reduced after adjusting for a range of potentially confounding factors, but remained significant. Frequent cannabis users were at highly increased risk for subsequently receiving social welfare assistance. At 28 years, those with 50+ times cannabis use during the previous 12 months and had an odds ratio of 9.3 (95% confidence interval: 4.3–20.1) for receiving social welfare assistance in the following 2-year span. Users of cannabis also had longer periods of receiving social welfare assistance than others ($P < 0.0001$) and were less likely to leave the welfare assistance system ($P < 0.0001$). **Conclusions** In Norway the use of cannabis is linked with subsequent receipt of social welfare assistance whether the consequences are related to use of the substance per se, or to cultural factors and the illegal status of the cannabis. Future research should attempt to understand the interactions of factors behind these associations.

Keywords Alcohol, cannabis, illegal drugs, longitudinal, marijuana, welfare assistance.

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INTRODUCTION

A number of studies indicate that individuals with substance use-related problems are susceptible to repeat patterns of on-and-off welfare use, or 'welfare cycling' [1,2]. However, there are few population-based prospective studies in this area. At the same time, a growing body of evidence suggests that use of cannabis may have adverse social outcomes related to educational achievement [3,4], unemployment, reduced income and welfare dependency [5,6]. This study investigates the prospective associations between cannabis use and subsequent receipt of social welfare assistance in the context of a Nordic welfare state.

Many of the longitudinal reports on the consequences of cannabis use are based on populations with a high prevalence of cannabis use, such as the United States [5] and Australia [7]. The New Zealand Christchurch Study (CHDS) has formed the basis for the bulk of longitudinal reports [6,8,9]. However, in the CHDS, more than 70% of subjects had used cannabis before the age of 21, and many had a very high frequency of cannabis use [6]. In Norway, the prevalence of cannabis use is much lower, thereby making it an interesting case for contrast.

Furthermore, many studies of the consequences of substance use and abuse with regard to receipt of social welfare assistance have been conducted in areas with high levels of poverty and where welfare systems are not well developed [2,10]. By contrast, Norway is classified as a social democratic welfare regime, with currently the lowest unemployment rate in Europe [11], a high standard of living and a universal pension system [12]. The

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Marijuana use, craving, and academic motivation and performance among college students: An in-the-moment study

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HIGHLIGHTS

- Craving predicted use in college students who frequently use marijuana.
- Craving was negatively associated with academic effort and motivation.
- Average minutes spent smoking marijuana was negatively related to GPA.
- Greater academic self-efficacy positively predicted GPA.

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ABSTRACT

Introduction: Marijuana is the most commonly used illicit substance in the U.S., with high rates among young adults in the state of Colorado. Chronic, heavy marijuana use can impact cognitive functioning, which has the potential to influence academic performance of college students. It is possible that craving for marijuana may further contribute to diminished cognitive and affective functioning, thus leading to poor outcomes for students.
Methods: College student marijuana users ($n = 57$) were recruited based on heavy use and completed ecological momentary assessment (EMA) via text-messaging. The association between marijuana use and craving in a college setting was explored, as well as how these variables might relate to academic motivation, effort and success. The participants were sent text messages for two weeks, three times per day at random times.
Results: A temporal association between craving and marijuana use was found, where momentary craving positively predicted greater marijuana use. Similarly, as craving levels increased, the number of minutes spent studying decreased at the next assessment point. A negative association between momentary craving for marijuana and academic motivation was found in the same moment. Greater academic self-efficacy positively predicted cumulative GPA, while average minutes spent smoking marijuana was negatively related.
Conclusions: Using EMA, marijuana craving and use were significantly related. These findings provide further evidence that heavy marijuana use is negatively associated with academic outcomes.

1. Introduction

Marijuana is the most commonly used illicit drug in the U.S., with over 7% of the general population and 19% of 18–25 year olds reporting use of marijuana within the last month (Substance Abuse & Mental Health Services Administration [SAMHSA], 2014). In the state of Colorado, rates of marijuana use are among the highest in the nation, with 25% of 18–25 year olds reporting use within the last month (SAMHSA, 2012). Approximately one-third of college students report use of marijuana annually (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2014; Mohler-Kuo, Lee, & Wechsler, 2003) and a significant portion (25%) of past-year cannabis users meet criteria for a cannabis disorder (Caldeira, Arria, O'Grady, Vincent, & Wish, 2008).

Chronic marijuana users experience significant consequences as a result of their use, including a range of cognitive deficits. Acute intoxication effects include deficits in psychomotor functioning (e.g., speed, accuracy), attention (including sustained selective, focused and divided attention problems), pre-attentive sensory memory, and short-term/working memory (problems in verbal learning/memory, immediate and delayed free recall; see Solowij & Pesa, 2010 for a review). When examining long-term deficits, studies have consistently shown problems with attention, inhibition, working memory, executive functioning, verbal memory, and time estimation in heavy, chronic users (Solowij & Pesa, 2010). Of

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The Impact of Adolescent Exposure to Medical Marijuana Laws on High School Completion, College Enrollment and College Degree Completion*

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Abstract

Background—There is concern that medical marijuana laws (MMLs) could negatively affect adolescents. To better understand these policies, we assess how adolescent exposure to MMLs is related to educational attainment.

Methods—Data from the 2000 Census and 2001–2014 American Community Surveys were restricted to individuals who were of high school age (14–18) between 1990 to 2012 (n = 5,483,715). MML exposure was coded as: (i) a dichotomous "any MML" indicator, and (ii) number of years of high school age exposure. We used logistic regression to model whether MMLs affected: (a) completing high school by age 19; (b) beginning college, irrespective of completion; and (c) obtaining any degree after beginning college. A similar dataset based on the Youth Risk Behavior Survey (YRBS) was also constructed for confirmatory analyses assessing marijuana use.

Results—MMLs were associated with a 0.40 percentage point increase in the probability of not earning a high school diploma or GED after completing the 12th grade (from 3.99% to 4.39%). High school MML exposure was also associated with a 1.84 and 0.85 percentage point increase in the probability of college non-enrollment and degree non-completion, respectively (from 31.12% to 32.96% and 45.30% to 46.15%, respectively). Years of MML exposure exhibited a consistent

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Long lasting consequences of cannabis exposure in adolescence

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Abstract

Despite the increasing use of cannabis among adolescents, there are little and often contradictory studies on the long-term neurobiological consequences of cannabis consumption in juveniles. Adolescence is a critical phase for cerebral development, where the endocannabinoid system plays an important role influencing the release and action of different neurotransmitters. Therefore, a strong stimulation by the psychoactive component of marijuana, delta-9-tetrahydrocanabinol (THC), might lead to subtle but lasting neurobiological changes that can affect adult brain functions and behaviour.

The literature here summarized by use of experimental animal models, puts forward that heavy cannabis consumption in adolescence may induce subtle changes in the adult brain circuits ending in altered emotional and cognitive performance, enhanced vulnerability for the use of more harmful drugs of abuse in selected individuals, and may represent a risk factor for developing schizophrenia in adulthood.

Therefore, the potential problems arising in relation to marijuana consumption in adolescence suggest that this developmental phase is a vulnerable period for persistent adverse effects of cannabinoids.

Keywords: Cannabinoids; Adolescence; Emotional profile; Cognition; Psychosis; Gateway hypothesis

1. Introduction

Cannabis is the most commonly used illicit substance among adolescents and young adults. In 2004, 46% of 12th graders in the USA reported having tried cannabis at some point in their lifetime, 34% reported having used within the past month, and 5.6% reported having smoked cannabis daily (Johnston et al., 2004). Initiation into cannabis use typically begins in adolescence, as youths aged 12–17 constitute about two thirds of the new cannabis users (SAMHSA, 2004). Approximately 14% of adolescent-onset cannabis users develops cannabis dependence, a rate roughly twice that reported for adult-onset users (Chen et al., 1997; Chen and Anthony, 2003). Cannabis dependence is defined in the Diagnostic and Statistical Manual of Mental Disorder (4th edition, text revision, DSM-IVTR) as having at least three out of seven symptoms within one year. Moreover, very recently, record numbers of teenagers were requiring drug treatment as a result of smoking skunk, the highly potent cannabis strain containing 25 times more delta-9-tetrahydrocannabinol (THC, the psychoactive ingredient) than the resin sold a decade ago.

Despite the constantly spreading use of cannabis among adolescents, there is little information about its neurobiological long-term consequences. The adolescent brain is particularly sensitive to internal and external variables such as drug exposure, environment and gonadal hormones, since in this period several active neural changes take place (Spear, 2000). In fact, adolescence is characterized by strong neuronal plasticity, with sprouting and pruning of synapses, myelinization of nerve fibers, changes in neurotransmitter concentrations and their receptor levels in brain areas essential for behavioural and cognitive functions (Rice and Barone, 2000). The receptor for cannabinoids (CB1) belongs to the Gi/Go-protein coupled receptor family, and, in mammalian brain, is densely diffused in regions involved in the processing of emotional inputs, rewarding stimuli, habit formation, and higher cognitive functions (Herkenham et al., 1990). Endogenous cannabinoids modulate neurotransmitter release in many brain regions via CB1 receptors (Morisset and Urban, 2001; Wilson and Nicoll, 2001, 2002; Wilson et al., 2001). Accumulating evidence indicates that their peculiar mechanism of action as retrograde messengers is able to strongly influence both short-term and long-term forms of

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Young adult sequelae of adolescent cannabis use: an integrative analysis

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See **Comment** page 249

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Summary

Background Debate continues about the consequences of adolescent cannabis use. Existing data are limited in statistical power to examine rarer outcomes and less common, heavier patterns of cannabis use than those already investigated; furthermore, evidence has a piecemeal approach to reporting of young adult sequelae. We aimed to provide a broad picture of the psychosocial sequelae of adolescent cannabis use.

Methods We integrated participant-level data from three large, long-running longitudinal studies from Australia and New Zealand: the Australian Temperament Project, the Christchurch Health and Development Study, and the Victorian Adolescent Health Cohort Study. We investigated the association between the maximum frequency of cannabis use before age 17 years (never, less than monthly, monthly or more, weekly or more, or daily) and seven developmental outcomes assessed up to age 30 years (high-school completion, attainment of university degree, cannabis dependence, use of other illicit drugs, suicide attempt, depression, and welfare dependence). The number of participants varied by outcome (N=2537 to N=3765).

Findings We recorded clear and consistent associations and dose-response relations between the frequency of adolescent cannabis use and all adverse young adult outcomes. After covariate adjustment, compared with individuals who had never used cannabis, those who were daily users before age 17 years had clear reductions in the odds of high-school completion (adjusted odds ratio 0·37, 95% CI 0·20–0·66) and degree attainment (0·38, 0·22–0·66), and substantially increased odds of later cannabis dependence (17·95, 9·44–34·12), use of other illicit drugs (7·80, 4·46–13·63), and suicide attempt (6·83, 2·04–22·90).

Interpretation Adverse sequelae of adolescent cannabis use are wide ranging and extend into young adulthood. Prevention or delay of cannabis use in adolescence is likely to have broad health and social benefits. Efforts to reform cannabis legislation should be carefully assessed to ensure they reduce adolescent cannabis use and prevent potentially adverse developmental effects.

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Introduction

Marked shifts have taken place in attitudes to cannabis use.[1] Moves to decriminalise or legalise cannabis use in several US states and Latin American countries are a sign of such changes in public opinion.[2] These shifts have happened while debate continues about the long-term health and social sequelae of adolescent cannabis use.[3,4] Additionally, in some countries adolescents are initiating cannabis use earlier than have those in previous years[5] and more adolescents are using cannabis heavily.[6–8] In England, 4% of 11–15 year olds are past-month cannabis users;[7] about 7% of US high-school seniors are daily or near-daily cannabis users;[8] and in Australia, less than 1% of 14–19 year olds use daily and 4% use weekly.[6] This prevalence is particularly concerning because adolescence seems to be a vulnerable developmental period for the consequences of cannabis exposure,[9] and evidence suggests that early use of cannabis is associated with increased risk of adverse developmental outcomes.[10–14]

Persisting questions about the long-term effects of adolescent cannabis use have clouded debate.[12,15,16] The existing evidence has limitations, including limited statistical power to examine rarer outcomes and less common, more regular patterns of cannabis use than those already assessed; insufficient control for confounding; and a tendency to examine only one outcome or domain. As such, the picture of adolescent cannabis use and its putative health consequences is fractured. We address this issue through the integration of data from three large, long-running longitudinal studies from Australia and New Zealand: the Australian Temperament Project (ATP),[17] the Christchurch Health and Development Study (CHDS),[18] and the Victorian Adolescent Health Cohort Study (VAHCS).[19]

In this integrative meta-analysis, we examined the long-term sequelae of adolescent cannabis use on important domains of wellbeing during the transition to adulthood. Specifically, we aimed to develop similar measures of cannabis use and each outcome across all cohorts; examine the association between patterns of use before age 17 years and each outcome in combined data; and adjust the associations reported for a wide

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Adolescent substance use and educational attainment: An integrative data analysis comparing cannabis and alcohol from three Australasian cohorts

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ABSTRACT

Background: The relative contributions of cannabis and alcohol use to educational outcomes are unclear. We examined the extent to which adolescent cannabis or alcohol use predicts educational attainment in emerging adulthood.

Methods: Participant-level data were integrated from three longitudinal studies from Australia and New Zealand (Australian Temperament Project, Christchurch Health and Development Study, and Victorian Adolescent Health Cohort Study). The number of participants varied by analysis ($N = 2179–3678$) and were assessed on multiple occasions between ages 13 and 25. We described the association between frequency of cannabis or alcohol use prior to age 17 and high school non-completion, university non-enrolment, and degree non-attainment by age 25. Two other measures of alcohol use in adolescence were also examined.

Results: After covariate adjustment using a propensity score approach, adolescent cannabis use (weekly+) was associated with 1½ to two-fold increases in the odds of high school non-completion (OR = 1.60, 95% CI = 1.09–2.35), university non-enrolment (OR = 1.51, 95% CI = 1.06–2.13), and degree non-attainment (OR = 1.96, 95% CI = 1.36–2.81). In contrast, adjusted associations for all measures of adolescent alcohol use were inconsistent and weaker. Attributable risk estimates indicated adolescent cannabis use accounted for a greater proportion of the overall rate of non-progression with formal education than adolescent alcohol use.

Conclusions: Findings are important to the debate about the relative harms of cannabis and alcohol use. Adolescent cannabis use is a better marker of lower educational attainment than adolescent alcohol use and identifies an important target population for preventive intervention.

1. Introduction

Successfully completing high school and attaining a university degree are critical developmental milestones linked to better health (Cutler and Lleras-Muney, 2010) and greater economic productivity (US Bureau of Labor Statistics, 2014). Alcohol and cannabis are commonly used by young people in the school-age years.

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Cognitive Functioning of Long-term Heavy Cannabis Users Seeking Treatment

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Context Cognitive impairments are associated with long-term cannabis use, but the parameters of use that contribute to impairments and the nature and endurance of cognitive dysfunction remain uncertain.

Objective To examine the effects of duration of cannabis use on specific areas of cognitive functioning among users seeking treatment for cannabis dependence.

Design, Setting, and Participants Multisite retrospective cross-sectional neuropsychological study conducted in the United States (Seattle, Wash; Farmington, Conn; and Miami, Fla) between 1997 and 2000 among 102 near-daily cannabis users (51 long-term users: mean, 23.9 years of use; 51 shorter-term users: mean, 10.2 years of use) compared with 33 nonuser controls.

Main Outcome Measures Measures from 9 standard neuropsychological tests that assessed attention, memory, and executive functioning, and were administered prior to entry to a treatment program and following a median 17-hour abstinence.

Results Long-term cannabis users performed significantly less well than shorter-term users and controls on tests of memory and attention. On the Rey Auditory Verbal Learning Test, long-term users recalled significantly fewer words than either shorter-term users ($P=.001$) or controls ($P=.005$); there was no difference between shorter-term users and controls. Long-term users showed impaired learning ($P=.007$), retention ($P=.003$), and retrieval ($P=.002$) compared with controls. Both user groups performed poorly on a time estimation task ($P<.001$ vs controls). Performance measures often correlated significantly with the duration of cannabis use, being worse with increasing years of use, but were unrelated to withdrawal symptoms and persisted after controlling for recent cannabis use and other drug use.

Conclusions These results confirm that long-term heavy cannabis users show impairments in memory and attention that endure beyond the period of intoxication and worsen with increasing years of regular cannabis use.

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IN THE CURRENT CLIMATE OF DEBATE about marijuana laws and interest in marijuana as medicine,[1] one issue remains unresolved: Does heavy, frequent, or prolonged use of cannabis lead to a deterioration in cognitive function that persists well beyond any period of acute intoxication? Is the functioning of the brain altered in the long term? With over 7 million people using cannabis weekly or more often in the United States alone[2] and the potential for increased physician recommendations for select patients to use cannabis therapeutically,[1] answers to these questions are of significant public health concern.[3,4] Scientific evidence from past research clearly showed that gross impairment related to chronic cannabis use did not occur but was inconclusive with regard to the presence of more specific deficits.[5,6] Recent studies with improved methods have demonstrated changes in cognition and brain function associated with long-term or frequent use of cannabis. Specific impairments of attention, memory, and executive function have been found in cannabis users in the unintoxicated state (and in children exposed to cannabis in utero[7]) in controlled studies using brain event-related potential techniques[6,8-10] and neuropsychological assessments[11-15] including complex tasks.

Brain imaging studies of cannabis users have demonstrated altered function, blood flow, and metabolism in prefrontal and cerebellar regions.[16-19] Studies failing to detect cognitive decline associated with cannabis use[20] may reflect insufficient heavy or chronic use of cannabis in the sample or the use of insensitive assessment instruments. Impairments appear to increase with duration and frequency of cannabis use; however, the parameters of use that are associated with short- or long-lasting cognitive and brain dysfunction have not

For editorial comment see p 1172.

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ORIGINAL INVESTIGATION

Verbal learning and memory in adolescent cannabis users, alcohol users and non-users

Nadia Solowij · Katy A. Jones · Megan E. Rozman · Sasha M. Davis · Joseph Ciarrochi · Patrick C. L. Heaven · Dan I. Lubman · Murat Yücel

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Abstract
Rationale Long-term heavy cannabis use can result in memory impairment. Adolescent users may be especially vulnerable to the adverse neurocognitive effects of cannabis.
Objectives and methods In a cross-sectional and prospective neuropsychological study of 181 adolescents aged 16–20 (mean 18.3 years), we compared performance indices from one of the most widely used measures of learning and memory—the Rey Auditory Verbal Learning Test—between cannabis users (n=52; mean 2.4 years of use, 14 days/month, median abstinence 20.3 h), alcohol users (n=67) and non-user controls (n=62) matched for age, education and premorbid intellectual ability (assessed prospectively), and alcohol consumption for cannabis and alcohol users.
Results Cannabis users performed significantly worse than alcohol users and non-users on all performance indices. They recalled significantly fewer words overall (p<0.001), demonstrating impaired learning (p<0.001), retention (p<0.001) and retrieval (p<0.05) (Cohen's d 0.43–0.84). The degree of impairment was associated with the duration, quantity, frequency and age of onset of cannabis use, but was unrelated to alcohol exposure or other drug use. No gender effects were detected and the findings remained after controlling for premorbid intellectual ability. An earlier age of onset of regular cannabis use was associated with worse memory performance after controlling for extent of exposure to cannabis.
Conclusions Despite relatively brief exposure, adolescent cannabis users relative to their age-matched counterparts demonstrated similar memory deficits to those reported in adult long-term heavy users. The results indicate that cannabis adversely affects the developing brain and reinforce concerns regarding the impact of early exposure.

Electronic supplementary material The online version of this article (doi:10.1007/s00213-011-2203-x) contains supplementary material, which is available to authorized users.

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Adolescent cannabis and tobacco use and educational outcomes at age 16: birth cohort study

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ABSTRACT

Aims To investigate the relationship between cannabis and tobacco use by age 15 and subsequent educational outcomes. **Design** Birth cohort study. **Setting** England. **Participants** The sample was drawn from the Avon Longitudinal Study of Parents and Children; a core sample of 1155 individuals had complete information on all the variables. **Measurements** The main exposures were cannabis and tobacco use at age 15 assessed in clinic by computer-assisted questionnaire and serum cotinine. The main outcomes were performance in standardized assessments at 16 [Key Stage 4, General Certificate of Secondary Education (GCSE)] in English and mathematics (mean scores), completion of five or more assessments at grade C level or higher and leaving school having achieved no qualifications. Analyses were sequentially adjusted for multiple covariates using a hierarchical approach. Covariates considered were: maternal substance use (ever tobacco or cannabis use, alcohol use above recommended limits); life course socio-economic position (family occupational class, maternal education, family income); child sex; month and year of birth; child educational attainment prior to age 11 (Key Stage 2); child substance use (tobacco, alcohol and cannabis) prior to age 15 and child conduct disorder. **Findings** In fully adjusted models both cannabis and tobacco use at age 15 were associated with subsequent adverse educational outcomes. In general, the dose–response effect seen was consistent across all educational outcomes assessed. Weekly cannabis use was associated negatively with English GCSE results [grade point difference (GPD), −5.93, 95% confidence interval (CI) = −8.34, −3.53] and with mathematics GCSE results (GPD, −6.91, 95% CI = −9.92, −3.89). Daily tobacco smoking was associated negatively with English GCSE (GPD, −11.90, 95% CI = −13.47, −10.33) and with mathematics GCSE (GPD, −16.72, 95% CI = −18.57, −14.86). The greatest attenuation of these effects was seen on adjustment for other substance use and conduct disorder. Following adjustment, tobacco appeared to have a consistently stronger effect than cannabis. **Conclusions** Both cannabis and tobacco use in adolescence are associated strongly with subsequent adverse educational outcomes. Given the non-specific patterns of association seen and the attenuation of estimates on adjustment, it is possible that these effects arise through non-causal mechanisms, although a causal explanation cannot be discounted.

Keywords ALSPAC, cannabis use, cotinine, education, English, GCSE, mathematics, school dropout, smoking.

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INTRODUCTION

Cannabis use, particularly among young people, is still relatively common [1–3]. UK cannabis use has been reportedly declining since its peak, although 2012/13 figures estimate that 30.9% of 16-24 year olds have ever used cannabis and 13.5% have smoked cannabis in the last year [4]. Various adverse psychosocial outcomes have been reported to be associated with cannabis use; however, the causal basis for these associations is often unclear. Lower educational attainment, for example, is associated consistently with higher use of cannabis. Evidence that this association is causal, such that preventing cannabis use among young people would increase their educational attainment, would have important implications for policy. A recent co-twin control study found that cannabis does not cause adverse education outcomes, but both traits are influenced by the same family environmental factors [5]. The available

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Substance use and withdrawal: Neuropsychological functioning over 8 years in youth

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Abstract

This study prospectively examined neuropsychological (NP) functioning associated with adolescent substance use and withdrawal. Participants were youths with histories of substance use disorders ($n = 47$) and demographically comparable youths with no such lifetime histories ($n = 26$). They were followed with NP testing and substance involvement interviews at 7 time points spanning 8 years, from ages 16 to 24, on average. After controlling for recent use, age, education, practice effects, and baseline NP functioning, substance use over the 8-year follow-up period significantly predicted performances on tests of memory and attention at Year 8. Additionally, withdrawal symptoms during the follow-up predicted visuospatial and attention scores at Year 8. Findings suggest that use and withdrawal may differentially impact neurocognitive functioning during youth, with heavy use leading to learning, retention, and attentional difficulties, and withdrawal leading to problems with visuospatial functioning. (*JINS*, 2002, *8*, 873–883.)

Keywords: Adolescence, Young adulthood, Youth, Substance use disorders, Withdrawal, Visuospatial functioning, Memory, Attention, Alcohol, Marijuana, Stimulants

INTRODUCTION

In 2000, 32% of high school seniors reported getting drunk in the past month and 26% used another recreational drug (Johnston et al., 2001). An epidemiologic study reported that 9% of 14- to 18-year-old high school students met DSM–IV criteria for alcohol use disorders and 8% met criteria for abuse or dependence of other psychoactive substances (Rohde et al., 1996, 2001). Despite the high prevalence of substance use and related disorders, the long-term neurocognitive sequelae of alcohol and drug use during youth remain unclear.

Some studies have not found neuropsychological (NP) problems in adolescents with substance use disorders (SUD). For example, Brandt and Doyle (1983) studied adolescents in a psychiatric hospital. Half had used a variety of substances daily for the past year and half had rarely or never used alcohol or other drugs. Heavy users performed similarly to comparison youths on tests of cognitive flexibility (Trail Making Test) and concept formation (Category Test). In another study, no significant differences in cognitive performance were found between 38 adolescents with SUD and 321 adolescents without SUD, even though the substance involved youths were more likely to have repeated grades in school (Wilens et al., 1997). Similarly, 26 Colombian adolescents with SUD were compared to 38 controls, and no significant group differences were found in NP performance (Bernal et al., 1994).

Contrary to these results, other investigators have found significantly poorer NP functioning among adolescents with SUD relative to nonabusing youth. Giancola (Giancola et al., 1998) found poorer scores on visuospatial and inhibitory tasks among SUD girls than nonabusing controls. Moss et al. (1994) reported poorer language skills associated with alcohol use disorders in adolescents. Female adolescents with SUD performed worse than females without SUD on tests of intelligence, language skills, and sustained attention (Tarter et al., 1995). Another study reported that adolescents with SUD made more errors on an auditory continuous performance test and Paced Auditory Serial Addition Task than

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Chronic effects of cannabis use on the human reward system: An fMRI study

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KEYWORDS
Cannabis;
Reward;
Functional MRI;
Nicotine;
Nucleus accumbens

Abstract

Cannabis is one of the most used drugs of abuse. It affects the brain reward system in animals, and has proven rewarding and addictive potential in humans. We used functional MRI to measure brain activity during reward anticipation in a monetary reward task. Long-term cannabis users were compared to healthy controls. An additional control group consisting of nicotine users was included. Cannabis users showed attenuated brain activity during reward anticipation in the nucleus accumbens compared to non-smoking controls, but not compared to smoking controls. Cannabis users showed decreased reward anticipation activity in the caudate nucleus, compared to both non-smoking and smoking controls. These data suggest that nicotine may be responsible for attenuated reward anticipation activity in the accumbens, but that differences in the caudate are associated with the use of cannabis. Our findings imply that chronic cannabis use as well as nicotine, may cause an altered brain response to rewarding stimuli.

1. Introduction

Cannabis is one of the most widely used drugs since ancient times. Nowadays, it is commonly accepted that the drug has addictive potential. In the Dutch population cannabis use has increased in the past decade, and although daily use has become less frequent, a growing group of (daily) users seeks treatment to be able to deal with their heavy use (for a review see EMCDDA, 2007). This may be associated with the fact that the potency of cannabis has increased significantly in recent years (Pijlman et al., 2005; TNDM, 2006).

Cannabis has an effect on the reward system, as is clearly shown in animal studies (Gardner, 2002; Tanda and Goldberg, 2003; Wise, 1996). The rewarding effects of cannabis might be responsible for its addictive properties. Like most other drugs of abuse, prolonged cannabis exposure decreases

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Why parents worry: Initiation into cannabis use by youth and their educational attainment

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ABSTRACT

In this paper we use individual level data from the Australian National Drug Strategy Household Survey to study the relationship between initiation into cannabis use and educational attainment. Using bivariate duration analysis we find that those initiating into cannabis use are much more likely to dropout of school, and that the reduction in years of education depends on the age at which initiation into cannabis occurs. We also find that the impact of cannabis uptake is larger for females than males.

1. Introduction

One of parents' greatest fears is that their child will become involved with drugs. Underlying this fear is the belief that drug use could lead to poor educational attainment, subsequent failure in the labor market, and without a good job to anchor their lives, an unhappy future. Viewed within a human capital framework, this scenario may find resonance. For example, drug use could lead teenagers to substitute time spent under the influence of drugs for time spent studying, resulting in poor academic achievement and an early exit from education. This is particularly a concern with cannabis because initiation into its use typically occurs during the teenage years, coinciding with the timing of critical decisions about investment in formal education, both at the extensive and intensive margins. There is, therefore, potential for youthful cannabis use to have a long lasting affect through its impact on the individual's stock of human capital. This paper investigates the extent to which this is the case by examining how the age of initiation into cannabis use effects subsequent educational attainment.

There is substantial evidence that early cannabis use is associated with lower levels of education (Macleod et al., 2004). What is less well understood is the extent to which this association reflects the causal impact of cannabis use on education outcomes. Associations will not reflect causal effects if, for example, those who self-select into cannabis use differ from those who do not use cannabis in ways that also impact on their academic achievement (selection on unobservables). For

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Regional Brain Abnormalities Associated With Long-term Heavy Cannabis Use

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Context: Cannabis is the most widely used illicit drug in the developed world. Despite this, there is a paucity of research examining its long-term effect on the human brain.

Objective: To determine whether long-term heavy cannabis use is associated with gross anatomical abnormalities in 2 cannabinoid receptor–rich regions of the brain, the hippocampus and the amygdala.

Design: Cross-sectional design using high-resolution (3-T) structural magnetic resonance imaging.

Setting: Participants were recruited from the general community and underwent imaging at a hospital research facility.

Participants: Fifteen carefully selected long-term (>10 years) and heavy (>5 joints daily) cannabis-using men (mean age, 39.8 years; mean duration of regular use, 19.7 years) with no history of polydrug abuse or neurologic/mental disorder and 16 matched nonusing control subjects (mean age, 36.4 years).

Main Outcome Measures: Volumetric measures of the hippocampus and the amygdala combined with measures of cannabis use. Subthreshold psychotic symptoms and verbal learning ability were also measured.

Results: Cannabis users had bilaterally reduced hippocampal and amygdala volumes ($P=.001$), with a relatively (and significantly [$P=.02$]) greater magnitude of reduction in the former (12.0% vs 7.1%). Left hemisphere hippocampal volume was inversely associated with cumulative exposure to cannabis during the previous 10 years ($P=.01$) and subthreshold positive psychotic symptoms ($P<.001$). Positive symptom scores were also associated with cumulative exposure to cannabis ($P=.048$). Although cannabis users performed significantly worse than controls on verbal learning ($P<.001$), this did not correlate with regional brain volumes in either group.

Conclusions: These results provide new evidence of exposure-related structural abnormalities in the hippocampus and amygdala in long-term heavy cannabis users and corroborate similar findings in the animal literature. These findings indicate that heavy daily cannabis use across protracted periods exerts harmful effects on brain tissue and mental health.

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THERE IS CONFLICTING evidence regarding the long-term effects of regular cannabis use. Although growing literature suggests that long-term cannabis use is associated with a wide range of adverse health consequences,[1-4] many people in the community, as well as cannabis users themselves, believe that cannabis is relatively harmless and should be legally available. With nearly 15 million Americans using cannabis in a given month, 3.4 million using cannabis daily for 12 months or more, and 2.1 million commencing use every year,[5] there is a clear need to conduct robust investigations that elucidate the long-term sequelae of long-term cannabis use.

The strongest evidence against the notion that cannabis is harmless comes from the animal literature[6-9] in which long-term cannabinoid administration has been shown to induce neurotoxic changes in the hippocampus, including decreases in neuronal volume, neuronal and synaptic density, and dendritic length of CA3 pyramidal neurons. Although such work suggests that exposure to cannabinoids may be neurotoxic in animals, much less is known about the neurobiologic consequences of long-term cannabis exposure in humans.

Only a handful of brain imaging studies have been conducted in human cannabis users, with inconsistent findings reported. Early cannabis research using pneumoencephalography[10] reported cerebral atrophy in a small sample (N=10) of cannabis users, but further studies using computed tomography[11-13] did not detect any abnormalities, despite the potential confounds of polydrug use, comorbid neurologic/psychiatric diagnoses, and a lack of appropriate comparison groups. More

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Probability and predictors of the cannabis gateway effect: A national study

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Abstract

Background—While several studies have shown a high association between cannabis use and use of other illicit drugs, the predictors of progression from cannabis to other illicit drugs remain largely unknown. This study aims to estimate the cumulative probability of progression to illicit drug use among individuals with lifetime history of cannabis use, and to identify predictors of progression from cannabis use to other illicit drugs use.

Methods—Analyses were conducted on the sub-sample of participants in Wave 1of the National Epidemiological Survey on Alcohol and Related Conditions (NESARC) who started cannabis use before using any other drug (n= 6,624). Estimated projections of the cumulative probability of progression from cannabis use to use of any other illegal drug use in the general population were obtained by the standard actuarial method. Univariate and multivariable survival analyses with time-varying covariates were implemented to identify predictors of progression to any drug use.

Results—Lifetime cumulative probability estimates indicated that 44.7% of individuals with lifetime cannabis use progressed to other illicit drug use at some time in their lives. Several sociodemographic characteristics, internalizing and externalizing psychiatric disorders and indicators of substance use severity predicted progression from cannabis use to other illicit drugs use.

Conclusion—A large proportion of individuals who use cannabis go on to use other illegal drugs. The increased risk of progression from cannabis use to other illicit drugs use among individuals with mental disorders underscores the importance of considering the benefits and adverse effects of changes in cannabis regulations and of developing prevention and treatment strategies directed at curtailing cannabis use in these populations.

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The Problem with the Current High Potency THC Marijuana from the Perspective of an Addiction Psychiatrist

by Elizabeth Stuyt, MD

Advocates for the legalization of medical and retail marijuana are quick to point out all the possible benefits that a community might see from such a venture. These include increased jobs, increased tax revenue, possible medical benefits and they advertise it as "safe" and "healthy" and "organic." They utilize the words "cannabis" and "marijuana" for everything without differentiating between the different forms of cannabis that can have very different effects on the mind and body.

Many people who have voted for legalization thought they were talking about the marijuana of the 1960s to 1980s when the THC content was less than 2%. However, without any clear guidelines or regulations from government officials, the cannabis industry has taken a page from the tobacco and alcohol industries' play book and developed strains of marijuana and concentrated marijuana products with much higher concentrations of THC, the psychoactive component that causes addiction. The more potent a drug is, the stronger the possibility of addiction and the more likely the person will continue to purchase and use the product.

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The active component in marijuana that people find so desirable was not really known until the 1960s when a research team in Israel found that after injecting THC into aggressive rhesus monkeys, they became calm and sedate.[1] This team discovered that there was a receptor in the brain that fit THC like a glove so they named these receptors cannabinoid receptors. It was not until the 1990s that this same team discovered why we have these receptors in our brain.[1] They discovered compounds produced by our bodies that fit into these receptors which they named anandamides, a Sanskrit word for "supreme joy." These receptors are found all over the brain and are still called endocannabinoid receptors but that is not because they are meant for people to take in THC.

The primary problem with the current available cannabis in dispensaries in Colorado is that the THC content is not like it used to be. Prior to the 1990s it was less than 2%. In the 1990s it grew to 4%, and between 1995 and 2015 there has been a 212% increase in THC content in the marijuana flower. In 2017 the most popular strains found in dispensaries in Colorado had a range of THC content from 17-28% such as found in the popular strain named "Girl Scout Cookie."[2] Sadly these plants producing high levels of THC are incapable of producing much CBD, the protective component of the plant so these strains have minimal CBD. For example the Girl Scout Cookie strain has only 0.09-0.2% CBD.

The flower or leaves that are generally smoked or vaped are only one formulation. We now have concentrated THC products such as oil, shatter, dab, and edibles that have been able to get the THC concentration upwards of 95%. There is absolutely no research that indicates this level of THC is beneficial for any medical condition. The purpose of these products is to produce a high, and the increased potency makes them potentially more dangerous and more likely to result in addiction.

Because there was initially no regulation on the edibles they have been made to look very similar to regular products that people consume such as chocolates, gummy bears, PopTarts etc. As a result there has been a significant increase in the accidental exposure/overdoses of children younger than nine in Colorado compared with the US at large.[3] New regulations beginning in 2019 require that all cannabis packaging in the state of Colorado must have a universal "THC" symbol on the label with the written warning "Contains Marijuana. Keep away from Children." All marijuana-infused products must have the universal symbol marked on at least one side of the "Standard Serving of Marijuana."

According to the 2014 Monitoring the Future Study, marijuana is by far the number one drug abused by eighth and twelfth graders.[4] Since legalization in Colorado, marijuana use in adolescents and those 18-25 has steadily climbed, well outpacing the national average. Colorado leads the nation in first time marijuana use by those aged 12-17, representing a 65% increase in adolescent use since legalization.[5] According to the Colorado Department of Public Health and Environment in 2015 the county of Pueblo, Colorado, has the highest prevalence of reported past month marijuana use by high school students at 30.1%.[6] It is well documented that when drugs are perceived as harmful, drug use decreases as we have seen with adolescent use of tobacco.[7] There is significantly less perception of harm by marijuana primarily because Colorado has normalized it as a society and allowed the perception that it is "organic" and "healthy" and that there is nothing wrong with it.

However, there are significant consequences of long-term or heavy marijuana use beginning in adolescence. Adolescence is a time of significant brain development. Normally during this period there is a significant increase in dopaminergic and glutamatergic stimulatory neurotransmitters and a decrease in serotonergic and GABAergic suppressive neurotransmitters located in the pre-frontal motor cortex – the last part of the brain to fully develop.[8] The prefrontal motor cortex or the "seat of judgement" is the last to fully develop and can take up to 25 – 30 years to fully develop. This equates to a great deal of learning, exploring and doing during this period, similar to stepping on the gas pedal and problems with impulse control and judgement, similar to problems stepping on the brake.

The reasons why adolescents are at such great risk for developing an addiction to drugs or alcohol is because this is a period with increased neurobiological based tendencies for risk taking with decreased suppressive and regulatory control, and this is a period of decreased parental monitoring and increase in peer affiliations, a "perfect storm."

The marijuana of old used to be classified as a hallucinogen and was thought to not cause addiction because there was no identified withdrawal syndrome. This has changed and with the increased potency of THC there is a definite recognized withdrawal syndrome which includes increased anger, irritability, depression, restlessness, headache, loss of appetite, insomnia and severe cravings for marijuana.[9] It has been reported that 9% of those who experiment with marijuana will become addicted; 17% of those who start using marijuana as teenagers will become addicted; and 25-50% of those who use daily will become addicted.[10] A 2015 study carried out in the UK found that high-potency cannabis use is associated with increased severity of dependence, especially in young people.[11]

Addiction is a problem with the learning and memory part of the brain and all drugs of abuse work in the same "reward pathway" where we learn to do anything such as eat and procreate. All drugs of abuse cause a release of dopamine from the nucleus acumbens that signifies salience and starts the process of long term potentiation which reinforces the learning. At the same time, the hippocampus which is vitally important for new memory and learning is negatively impacted by the chronic use of any addictive substance. These substances decrease neurogenesis in the hippocampus and actually cause shrinkage of the hippocampus and impair the ability to learn new things. This is true for alcohol, cocaine, methamphetamine, heroin, nicotine, and THC.[12] Animal studies have demonstrated impaired learning with all of these substances but the good news is that recovery is possible. When the use of addictive drugs is stopped and the animals are allowed to be in a recovery environment where they are free to exercise (voluntary exercise being one thing that improves neurogenesis) they can again learn new things.[13]

Human studies have shown that long-term (>10 years) and heavy (>5 joints per day) cannabis use compared with age matched non-using controls resulted in bilaterally reduced hippocampal and amygdala volumes ($p=.001$) and significantly worse performance on measures of verbal learning ($p<.001$).[14] There is evidence that recovery is possible in humans as well. A study of 40 male and 34 female long-term (@15 years) cannabis users versus 37 non-users, healthy controls divided the marijuana users into three groups; those that smoked predominantly THC in the previous three months, those who smoked a combination

of THC and CBD in the previous three months and former uses with a sustained abstinence of 29 months.[15] They found that cannabis users had smaller hippocampal volumes compared to controls but the users not exposed to CBD had an even greater (11%) reduced volumes (CBD appears to be somewhat protective). In the former users the hippocampal integrity was comparable to controls. The only problem with this study is they did not test for functional deficits to see if function improved along with hippocampal volume.

There are other important neurotransmitters that are very active during adolescence and include acetylcholine receptors (ACH) and endocannabinergic receptors (CB1). ACH helps us focus and concentrate and ACH innervation of the pre-frontal motor cortex reaches mature levels during adolescence.[16] These receptors in the brain are called nicotinic or nACHRs to differentiate them from the muscarinic receptors in the body. They are called nicotinic simply because nicotine binds to these receptors – not because we are supposed to use tobacco products. These receptors are involved in promoting or preventing neuronal cell death depending on the stage of brain development. Putting an exogenous form of nicotine in the developing brain, as in consuming tobacco, can dysregulate these fine tuning mechanisms during adolescence.

CB1 receptors regulate the balance between excitatory and inhibitory neuronal activity utilizing our own natural anandamides. Exposure to cannabis during adolescence disrupts glutamate which plays an important role in synaptic pruning in the pre-frontal motor cortex; disrupting normal brain development.[17] This is most likely why there are many studies demonstrating the negative effect on cognition and IQ in people who are exposed to marijuana beginning in utero through adolescence. In spite of this, nearly 70% of dispensaries in Denver, Colorado, recommend cannabis products to treat nausea in the first trimester of pregnancy.[18] This is basically bud-tenders practicing medicine without a license.

A study in New Zealand with a 20-year follow-up showed an average loss of 8 IQ points with early persistent teen use of marijuana.[19] If you already have a high IQ, a drop in 8 points may mean the difference between making As and making Bs, however for the person with an average IQ of 100 (50th percentile), a loss of 8 points can put that person in the 29th percentile with significant difficulty in functioning. A study out of Yale University tracked 1,142 students who achieved similar SAT scores and were enrolled in college.[20] They found that those who used minimal alcohol or cannabis had an average GPA of 3.1 at the end of the semester. Those who drank alcohol without using marijuana had an average GPA of 3.03 and those who used both alcohol and marijuana had an average GPA of 2.66.

Marijuana use is also correlated with creating or worsening many mental health problems including anxiety, depression, psychosis, and suicidal ideation. A prospective study in Australia followed 1,600 girls for seven years starting before they expressed symptoms of mental illness or substance abuse.[21] They found that girls who used marijuana at least once a week were twice as likely to develop depression than those who did not use, and those who used marijuana every day were five times more likely to suffer from depression and anxiety than non-users. A study of 307 adults with depression assessed symptoms, functioning and marijuana use at baseline, and three- and six-month intervals.[22] Researchers found that marijuana use was associated with poor recovery. Those aged 50+ increased their marijuana use compared to the youngest age group ($p<.001$) and the marijuana use worsened depression ($p<.001$) and anxiety ($p=.025$) symptoms. Marijuana use led to poorer mental health functioning compared to those who did not use marijuana ($p=.01$).

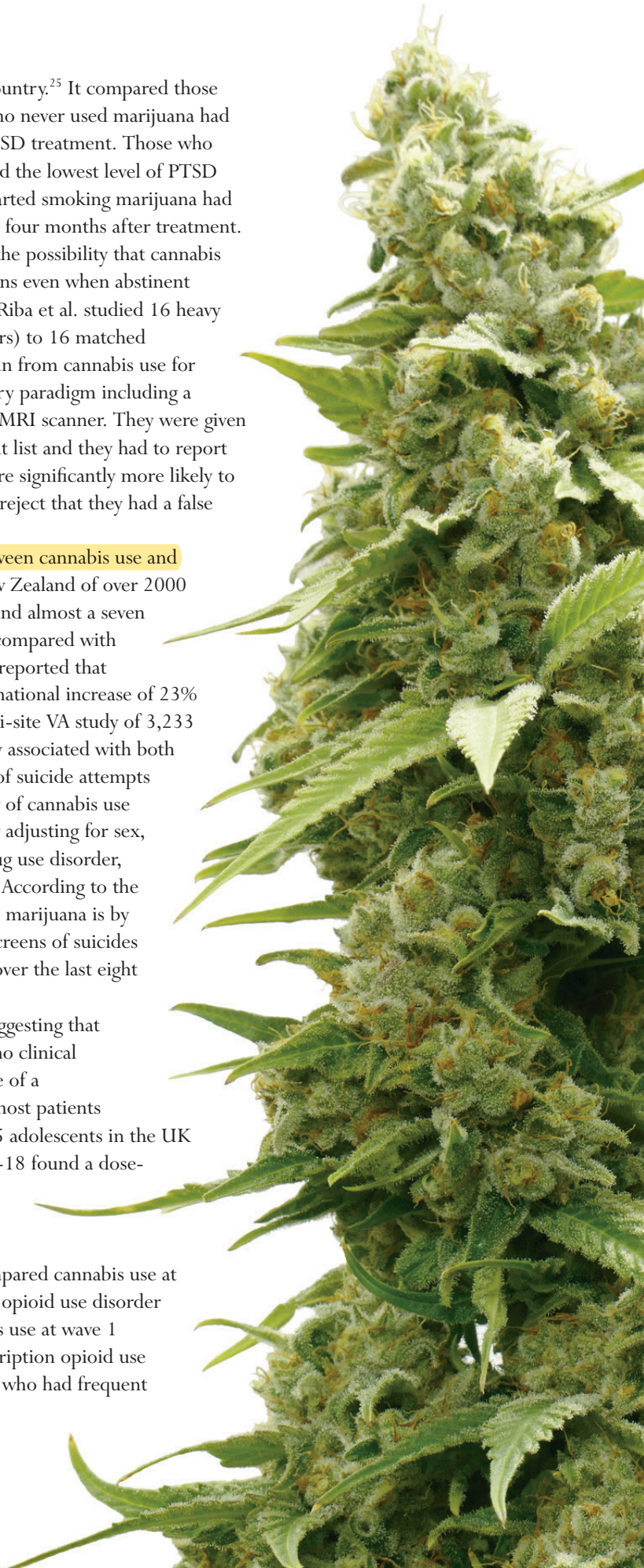
Numerous studies have demonstrated that using cannabis prior to the age of 15-18 significantly increases the risk of developing psychotic symptoms.[23] The risk is dose dependent and increases with greater frequency of use and with higher potency THC. A landmark study out of the UK analyzed 780 adults, ages 18-65, 410 with their first psychotic episode versus 370 matched healthy controls.[24] They found that use of high potency THC >15% resulted in a three times increased risk of psychosis, and if the use was daily there was a five times increased risk. Those using hash with <5% THC did not exhibit psychotic symptoms.

A growing number of states have identified PTSD as an approved condition for medical marijuana. However, this is not based on any research. There is no evidence that marijuana successfully treats PTSD and there is evidence that it can make it worse. Marijuana is not the answer for PTSD similar to the reason why benzodiazepines or alcohol are not the answer for PTSD. All these compounds do is provide temporary relief by numbing the individual and disconnecting them from the traumatic emotion. It does not resolve the trauma, and they have to continue to use multiple times a day in order to continue with the benefit. This can lead to increased addiction potential and withdrawal symptoms, cognitive impairment, a-motivational syndrome, and the potential for psychosis or worsening psychosis from the PTSD. An observational study done by the VA followed 2,276 Veterans who were treated for PTSD

in one of the VA PTSD treatment programs around the country.[25] It compared those using marijuana and those not using it and found those who never used marijuana had significantly lower symptom severity four months after PTSD treatment. Those who were using marijuana but stopped using it in treatment had the lowest level of PTSD symptoms four months after treatment, and those who started smoking marijuana had the highest levels of violent behavior and PTSD symptoms four months after treatment. Another conundrum that impacts treatment for PTSD is the possibility that cannabis users have an increased susceptibility to memory distortions even when abstinent and drug free which can compromise reality monitoring. Riba et al. studied 16 heavy cannabis users (daily for last two years – average of 21 years) to 16 matched cannabis naïve controls.[26] The cannabis users had to abstain from cannabis use for four weeks prior to the study. The study involved a memory paradigm including a study phase and a testing phase with the participant in an MRI scanner. They were given lists of four words to memorize and then shown a different list and they had to report if the words were on the previous list. Marijuana users were significantly more likely to have false recognition of the words and were less likely to reject that they had a false memory compared with the non-users.

Multiple studies have documented a relationship between cannabis use and suicidality. A large, longitudinal study in Australia and New Zealand of over 2000 adolescents and maximum frequency of marijuana use found almost a seven fold increase in suicide attempts in daily marijuana users compared with non-users.[27] A Congressional Hearing on April 27, 2017, reported that Veteran suicides were up 32% since 2001 compared to a national increase of 23% during the same time period. A 2017 cross-sectional multi-site VA study of 3,233 Veterans found that cannabis use disorder was significantly associated with both current suicidal ideation ($p<.0001$) and lifetime history of suicide attempts ($p<.0001$) compared to Veterans with no lifetime history of cannabis use disorder.[28] This significant difference continued even after adjusting for sex, PTSD, depression, alcohol use disorder, non-cannabis drug use disorder, history of childhood sexual abuse, and combat exposure. According to the Colorado Department of Public Health and Environment, marijuana is by far the most frequently encountered drug on toxicology screens of suicides among adolescents ages 10 – 19 and has been increasing over the last eight years.[29]

Misguided marijuana advocates have recently been suggesting that marijuana is a solution for the opioid epidemic. There is no clinical evidence of this and in fact, marijuana is found to be more of a "companion" drug rather than an "alternative" drug for most patients seeking addiction treatment in Colorado. A study of 5,315 adolescents in the UK with three or more measures of cannabis use from age 13-18 found a dose-response relationship between cannabis use trajectories in adolescence and nicotine dependence, harmful alcohol consumption, and other illicit drug use by age 21.[30] A large study of 34,653 individuals using NESARC data compared cannabis use at wave 1 (2001-2002 – 81% response rate) to prescription opioid use disorder at wave 2 (2004-2005 – 70.2% response rate).[31] Cannabis use at wave 1 was associated with a significant increase of having a prescription opioid use disorder at wave 2, with over four times the risk for those who had frequent use of marijuana.



There is evidence that prenatal exposure of cannabis can alter opioid gene function in humans. Fetal brains obtained from aborted fetuses from women who were using marijuana during their pregnancy were compared to those from women not using marijuana during pregnancy.[32] The researchers discovered impaired opioid-related genes in distinct brain circuits that they hypothesized may have long term effects on cognitive and emotional behavior. These findings are comparable to findings with animals. One study of prenatal cannabis exposure in rats found that the THC exposed rats exhibited shorter latency to first active lever press for heroin and had higher heroin-seeking during mild stress and drug extinction than animals not exposed to THC.[33] The THC exposed animals exhibited allostatic changes in the limbic encephalin systems in adulthood.

Another interesting study that supports the idea that cannabis use and opioid use are linked was in a randomized, double-blind, placebo controlled trial of naltrexone in non-treatment seeking cannabis smokers.[34] In a laboratory setting those receiving a placebo had 7.6 times the odds of self-administering active cannabis compared with those receiving daily naltrexone, an opioid receptor blocker.

If states continue to commercialize marijuana as has been done in Colorado we are destined to see many more people requiring treatment for addiction, depression, anxiety, suicidal ideation, and psychosis. We need to continually educate every one of the risks and increase prevention efforts to prevent children and adolescents from initiating marijuana use. This should include a strong ban on any advertising that appears to be directed toward youth – for all drugs including marijuana, tobacco, and alcohol. States will need to commit to increased funding for and availability of treatment options. The strongest recommendation would be to initiate regulations to limit the concentration of THC. Ideally this would be to less than 10% as there is no good research on concentrations greater than this for any medical condition and there is significant literature on the negative effects of high potency THC.

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REVIEW

WHY NOT POT?
A Review of the Brain-based Risks of Cannabis

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ABSTRACT

In this review, we provide a historical perspective on marijuana, and survey contemporary research investigating its potential negative effects on the brain. We discuss the evidence regarding cannabis dependence, driving under the influence of cannabis, underachievement, inducing (or worsening) certain psychiatric conditions, and the potential for progression to use of more dangerous drugs—summarized by the acronym DDUMB, a cognitive tool that may help healthcare providers in their risk/benefit discussions with patients who use cannabis. We also review and discuss the impact of marijuana use on target populations, including adolescents (who are at increased risk of harm); heavy users; and people suffering from—or at high risk of—mental illness. While cannabis presents certain subjective, health-related, and pecuniary benefits to users, growers, and other entities, it is also associated with several brain-based risks. Understanding these risks aids clinicians and their patients in making informed and balanced decisions regarding the initiation or continuance of marijuana use.

INTRODUCTION

"I have argued that every human being is born with an innate drive to experience altered states of consciousness periodically . . . this drive is a most important factor in our evolution, both as individuals and as a species."

Andrew Weil
The Natural Mind: A Revolutionary Approach to the Drug Problem

Marijuana, also known as cannabis or pot, is the most commonly used drug worldwide and is a fraught topic in contemporary society.[1] A variety of forces—economic,[2] legislative,[3] technological,[4] and even horticultural[5]—have markedly changed the politics, polemics, and public perception of pot. The resultant upsurge of cannabis use in some parts of the United States has already had a collateral impact on individual and societal health,[6] similar to that seen with the prescription opiate epidemic.[7] Balancing these myriad forces—all of which drive greater societal acceptance of marijuana and increased use—a growing body of

scientific research provides a clearer understanding of pot's potential harms.

The aim of this paper is to review the brain-based harms of cannabis. Awareness of the supporting evidence of marijuana's downsides can help augment the risk-benefit discussions clinicians may have with patients in a motivational interviewing model, the preferred therapeutic frame for approaching substance-use discussions.[8] To facilitate this end, we introduce a mnemonic, DDUMB, to help remind us of the five brain-based harms associated with marijuana use: dependence, driving impairment, underachievement, mental illness, and bad to worse (i.e., marijuana serving as a "gateway" function for other more dangerous drugs of abuse). Before reviewing the science behind these five dangers, we will provide a brief summary of several important aspects of marijuana's history, politics, chemistry, and psychopharmacology.

THE HISTORY OF HEMP AND POLITICS OF POT

The terms *marijuana* and *cannabis* are often used interchangeably. Strictly speaking, however, *cannabis* is a botanical term for the hemp plant, while *marijuana* denotes the psychoactive drug derived from it. Though research on the central effects of cannabis is relatively new, its medicinal use can be traced back to the Chinese Han dynasty, circa AD 25 to AD 220, when it was used to treat rheumatic pain, constipation, malaria, and female reproductive disorders.[9] Medical cannabis was introduced to the Western world in the 1800s, and was used as such until the 1900s, when its popularity diminished with the rise of pharmaceuticals that could be used for the same conditions (e.g., aspirin, barbiturates).[10] Legislation enacted in 1937 (the Marijuana Tax Act) decreased accessibility and pushed the drug further out of the public eye. A sterling demonstration of the swings of public opinion toward marijuana use is the pulp-propaganda film "Reefer Madness,"[11] released shortly after the enactment of this legislation. Originally titled "Tell Your Children," this short film comically overdramatized marijuana's harms, describing cannabis as "the burning weed with its roots in Hell," and warning about the potential for pot-induced manslaughter, suicide, hallucinations, and "the ultimate end of the marijuana addict: hopeless insanity!"

In the present day, more tolerant state-based legislation has led to decriminalization, legalization, and medicalization of cannabis in many states and the likelihood for more cannabis use. In turn, more frequent use by current users and more new users may lead to a greater frequency of cannabis-related harms. Specifically, in December of 2012, Washington state and Colorado both legalized marijuana; Washington DC, Alaska, and Oregon followed suit, with at least 23 states now allowing for its medical use. Importantly, this large cultural and legal pro-pot shift has already been shown to increase a variety of cannabis-related collateral harms,[6] and likely has contributed to an increase of adolescent-onset use.[12] This trend is especially worrisome, since adolescent-onset use is associated with greater cumulative negative consequences than later-onset use.[13] Bachman et al[13] demonstrated an inverse relationship between perceived risks/social disapproval and the prevalence of marijuana use among youth.[13] Data from a 2010 national survey on drug use and health have shown a correlation between adolescent cannabis use and lower levels of parental disapproval.[14] Additionally, "vaping," a term used to describe a popular method of smoking via an electronic device such as an e-cigarette, may encourage more illicit and dangerous use of marijuana: Vaping produces less smoke than marijuana or tobacco cigarettes, making its use harder to detect by smell (e.g., in a school bathroom) and implies that the person is vaping nicotine-related products (not illicit substances).[15] These relationships suggest a continuing trend toward public approval and, possibly, risk-minimization of marijuana use, which may lead more at-risk youth and young adults to initiate use.

Unfettered by more permissive laws and attitudes, capitalism has embraced cannabis as the newest cash crop.[16,17] Commercialization of cannabis has been shown to increase the number of medical marijuana licenses purchased.[21] Therewith, powerful economic forces have and likely will continue to add to legal and attitudinal shifts that elevate the role of cannabis in public and individual health.[23] Market research suggests that widespread legalization of marijuana has the potential to create a 35-billion dollar marijuana market.[18] Comparatively, this would make the marijuana industry as big as the United States National Football League (NFL), 10 times more profitable than the opioid drug OxyContin, and about a fifth the size of the United States alcohol market.[18,19] As witnessed in recent years in the United States, where a surge in opiate-related mortality has been partly attributed to high-dollar opiate sales, the promise of profits in the burgeoning industry of marijuana production— the "green" industry— may inform how the drug is marketed and researched.[7,20] And as more states move to legalize marijuana, we may see an increase in both anticipated and unanticipated cannabis-related harms in those who use it, as was observed on a smaller scale in Colorado.[6,21]

As societal, legislative, and economic forces move toward the legalization of marijuana, there are three challenges that confront its scientific study. First, advances in cultivation techniques and grower knowledge have produced vastly more potent marijuana than was seen in previous decades. Tetrahydrocannabinol (THC), one of the main psychoactive components of marijuana (and the component associated with some of its brain-

based harms[74]) has increased in concentration from three percent in the 1980s to 12 percent in 2014, whereas the concentrations of cannabidiol (CBD), one of marijuana's calming components, has fallen.[7] This horticultural reality makes older literature on the effects of marijuana less applicable to current use, and is frequently cited as a reason for a relative increase in cannabis-related harms.[6,23]

Aside from differences in the chemical composition of the plant, a second, related challenge in marijuana research is that precise quantification of cannabis use (compared to a drug like nicotine found in tobacco) is difficult, due to differing potencies and variable delivery systems (e.g., smoking, ingestion). A third and final factor that creates challenges for cannabis research is its United States Drug Enforcement Agency (DEA) scheduling. Because marijuana is grouped with cocaine, heroin, and 3,4-Methylenedioxymethamphetamine (MDMA) in the most restrictive drug schedule (Schedule 1), access to the drug for scientific study is more difficult. From the perspective of advancing scientific knowledge, many researchers have suggested moving marijuana to a lower schedule to reduce barriers to research.[24,25]

CANNABIS CHEMISTRY AND PHARMACOLOGY

Unlike drugs that contain a single, specific, active chemical compound (e.g., lithium), different strains of the cannabis plant contain produce a variable array of centrally active substances. One of the main chemical groups in the several dozen constituents of marijuana are the cannabinoids, which become active by binding at cannabinoid receptors in the human brain. The three primary cannabinoids—found in varying ratios in different strains of cannabis—are cannabinol (CBN), cannabidiol (CBD), and Delta-9-tetrahydrocannabinol (THC). Importantly, CBD and THC often have opposing effects. CBD has anxiolytic and antipsychotic properties, and is often marketed as such, while THC has been shown to be anxiogenic and can induce transient psychosis.[5] From this chemical complexity follows the clinical reality discussed above: different strains of the cannabis plant, since they contain different ratios of centrally active chemicals, yield different central effects. This "blending"—rooted in the inherently variable chemistry of plant-based drugs—yields a compound that has different effects and potential harms in each of its permutations. These factors add additional challenge to the scientific study of marijuana, given that the actual drug one is studying may vary depending on the several variables (e.g., when it was grown, where it was grown).

Though marijuana has been around for millennia, our understanding of its mechanism of action in the brain is relatively recent. This understanding was propelled forward in the late 1980s by the discovery of central cannabinoid receptors, which bind both marijuana-derived cannabinoids as well as the brain-made substances called endogenous cannabinoids (or endocannabinoids).[5] Two sets of cannabinoid receptors, called CB1R and CB2R, exist. CB1R is located in widespread brain regions (i.e., hippocampus, cerebral cortex, limbic system, cerebellum), but is also found in the periphery (i.e., in liver, thyroid, uterus, bones, and testicular tissue). CB2R, on the other hand, is mainly peripheral, found mostly in immune cells, the spleen, and gastrointestinal system.[5]

Comparing endogenous and exogenous cannabinoids is informative. The primary endogenous endocannabinoid, anandamide, was named from the Sanskrit word for "supreme joy."[10] Unlike THC, which has a half-life that spans hours to days,[26] anandamide has a short half-life, being quickly removed from the synapse and degraded.[10] The difference in half-lives between anandamide and THC may contribute to some of the different central effects of these two molecules, including the potential for dependence.[27]

DEPENDENCE

The first cannabis-related harm captured in the DDUMB mnemonic is dependence. Substance dependence is a debilitating, brain-based disorder characterized by compulsive use, inability to desist in the face of negative consequences, and withdrawal symptoms upon cessation.[28] Although commonly believed to be nonaddictive, marijuana dependence has been clearly documented,[29] and a large percentage of global substance use admissions are related to cannabis.[30] Very recent prevalence data in the United States indicate that past-year prevalence of marijuana use doubled between the years 2001 and 2013 to nearly 10 percent, with a corresponding increase in marijuana use disorders to nearly three percent.[31] Though neurobiological responses are not yet used to validate substance dependence, THC has been shown to stimulate mesolimbic dopamine release, a brain phenomenon common to all addictive substances,[28] and many other experiments indicate that cannabis affects key parts of the brain's addiction centers.[32–34]

The misperception that cannabis is not addictive has at least three sources. First, the percentage of first-time cannabis users who develop dependence is relatively low compared to other commonly abused drugs. Specifically, nine percent of first-time cannabis users get hooked versus higher percentages of first-time stimulant (11%), alcohol (15%), cocaine (17%), heroin (23%), and nicotine (32%) users.[35] That said, though the percentage of first-time cannabis users who develop dependence is lowest among users of the other drugs mentioned, the overall number of people who will develop cannabis addiction is still large.

A second factor supporting the non-addiction myth is that although chronic cannabis users typically

"dose" multiple times a day, the long half-life of THC (25–57 hours)[26] means that the time intervals that mark its "compulsive use" can be spaced out longer than other shorter-acting drugs, such as nicotine, creating more of an illusion of control. The addicted marijuana user may only use pot at breakfast, lunch, and in the evening, whereas a person addicted to nicotine may need to smoke a cigarette every hour or two.

A third factor supporting the myth of non-addiction is that marijuana withdrawal is often relatively mild.[27,29] Moreover, marijuana withdrawal presents without clear, "signature" physical symptoms, at least compared to the often-dramatic physical symptoms of withdrawal from depressants like alcohol and benzodiazepines (i.e., tremors, seizures, agitation) and opiates (i.e., sweating, gooseflesh, diarrhea). Instead, marijuana withdrawal symptoms are more occult: anorexia, irritability, anxiety, anger, restlessness, and sleep disruption.[13] En toto, this delayed, nondramatic withdrawal syndrome adds support to the misperception that cannabis addiction does not exist.

For clinicians treating marijuana-addicted patients, it is important to be aware that cannabis withdrawal is both consequential and treatable.[2,37] In terms of its consequence, cannabis withdrawal symptoms clearly contribute to ongoing use, making cessation efforts aversive,[28,38,39] and to impairing both motivation and executive functions critical in decision making and treatment retention.[40,41] In terms of treatment, a seminal study by Mason et al[37] showed that in marijuana-dependent subjects, the commonly used calcium channel/GABA-modulating agent gabapentin—dosed 1200mg daily in divided doses—reduced both cannabis withdrawal symptoms and cannabis use. Though sustained recovery from cannabis addiction requires long-term, multimodal solutions, clinicians can help the process by utilizing available pharmacotherapies to attenuate withdrawal.

It is important to highlight that the risk of negative effects from marijuana use—including dependence—have been shown to be related to the age of first exposure.[42,43] Specifically, compared to people who start marijuana use in adulthood, adolescent initiators are 2 to 4 times more likely to exhibit dependence within two years of their first use.[42] This is not surprising, given that key stress, reward, and executive/regulatory circuits that underlie addiction continue to develop during the teenage and early adult years of human growth.[28,44] Moreover, studies indicate that early exposure to THC may 1) potentiate the future effects of THC, increasing risk of dependence; 2) cause impaired regional connectivity, decreasing the moderating influence of regulatory brain regions; and 3) lead to lower dopaminergic activity in addiction-related circuits.[23,35,46] Coming from the perspective of harm reduction, then, a tractable goal to reduce the risk of future marijuana dependence is to delay the age of onset of first use.

DRIVING

Standing alongside the misconception that marijuana is not addictive is the misconception that driving while under the influence of marijuana is safe. Several factors make this latter untruth more challenging to refute than the former. Until very recently, drivers involved in accidents or infractions were rarely tested for THC levels, whereas assessing blood alcohol content via the less invasive breathalyzer has been routine for years. This situation will likely change over time as marijuana use increases, allowing more THC-related auto morbidity studies to be conducted and compared with those in other countries. A second factor complicating the THC-driving research is that, based on studies from driving fatalities, drivers frequently use marijuana and alcohol simultaneously.[45] This combination makes assigning causality to a single drug complex, and their different mechanisms of action lead to additive impairments.[47]

Despite the abovementioned challenges to studying the topic, epidemiological and laboratory studies of the acute effects of marijuana on driving has demonstrated that drivers under the influence of marijuana are impaired. In fact, driving while under the influence of marijuana doubles or triples the risk of a crash.[47] Though people driving under the influence of marijuana tend to compensate by driving more slowly, as task intensity of driving increases, the person becomes more impaired.[48,49] Specifically, cannabis use increases lane weaving and impairs critical-tracking tasks, reaction time, and divided attention.[48,49]

Though a discussion of the ethical issues of driving while impaired is beyond the scope of this article, it bears mentioning that collateral damages result from individual choice—every time an impaired motorist decides to get behind the wheel, he or she extends the risk of potential harms to other drivers, passengers, pedestrians, and cyclists.

UNDERACHIEVEMENT

Despite marijuana's known risks, the scientific reality is that marijuana is in many ways the least deadly drug of abuse. In meteorological terms, if methamphetamine—with its capacity for brain damage and strokes[50]—is a tsunami, and opioids—with their morbid respiratory depressive effects[7]—are an earthquake, marijuana can be likened to a heavy fog. Disruptive, yes. Deadly, no. Partly due to the lack of activity in vital brainstem areas controlling respiration, there has never been a reported lethal overdose of marijuana in humans.[51] In animals, the deadly dose of cannabis is extremely high: about 12,500 times the amount needed to cause subjective effects.[52] Though risks of marijuana use are real and consequential, it is neither deadly nor overly dramatic. In the pot polemic, the lack of direct organ

toxicity, clearly consequent mortality, and extreme withdrawal symptoms likely contribute to the growing acceptance of marijuana use among the American population. And as argued in a recent editorial by a pediatrician in the *New York Times,* support for marijuana use may come from the perspective, "Since people are going to use something, why not the least toxic something?"[53]

From a wider social perspective of harm and risk reduction, this "low bar" argument has obvious merits: it is better to be alive and stoned than dead from a heroin or alprazolam overdose. That said, conscious of Weil's opening observation about our species' "innate drive to experience altered states of consciousness," we suggest that when considering effects on vulnerable future adults, professionals should focus not on what is the least toxic and not on merely accepting morbidity over mortality, but rather on the maximization and optimal development of human potential. From this vantage, the risk of cannabis promoting broad-spectrum underachievement (especially in teens) becomes more prominent. In point of fact, a large body of convergent data suggest that long-term use of marijuana may cause significant abridgement of one's potential.[33,44,54–59,60–67]

Underachievement may be the most well-supported correlate of regular marijuana use. Though direct causality is challenging to ascribe due to the correlative nature of this research (random assignment of daily cannabis use to adolescents is unethical), the association of daily marijuana use with the pruning of human potential appears across a breadth of contemporary research. For example, earlier studies have already demonstrated that marijuana use during adolescence is associated with low academic achievement and increased rates of school drop-out.[54,55] More recently, several very large examinations of the issue have reinforced not only these academic consequences, but a broader swath of negative outcomes. In one of these studies, Fergusson et al[56] performed a longitudinal study of over 1,000 New Zealanders from birth to age 25 years, and found that elevated marijuana use between ages 14 and 21 years was associated with the lower likelihood of getting a bachelor's degree, lower income, higher unemployment and welfare dependence, and lower levels of relationship and life satisfaction. These correlations survived adjustments for a number of important covariates, including family socioeconomic status, maltreatment, academic achievement, and comorbid mental disorders. In a similar study, Meier et al[57] followed a cohort of 1,037 subjects from birth until age 38 years, performing neuropsychological assessments at ages 13 and 38 years, as well as ascertaining cannabis use at ages 18, 21, 26, 32, and 38 years. In this cohort, persistent cannabis use was associated with a decline in neuropsychological performance across domains, which survived controlling for years of education. Importantly, these results were the most prominent among participants with adolescent-onset cannabis use, and showed a dose effect: more persistent use was associated with a more severe performance decline. Adolescent-onset cannabis use was correlated with a 10-point decrease in measured IQ. Moreover, people who had discontinued cannabis use did not achieve a full return to their baseline level of performance, a finding which suggests that heavy adolescent-onset cannabis use may have a cumulative neurotoxic effect. One group of detractors argued that certain brain-based personality traits that bias people toward marijuana use as well as school dropout may explain these results,[58] but the original authors' results survived a control for such personality factors.[59]

What are the putative mechanisms wherein adolescent cannabis use causes this pervasive underachievement and even cognitive decline? Adolescence, we know, is a neurodevelopmental stage of significant import in which neurobiological circuits critical to adult function develop, are pruned, and reinforced.[60] Moreover, adolescent brains have a stage-dependent hypersensitivity to rewards[23] and underdeveloped prefrontal inhibitory structures.[44] Chronic cannabis use through this sensitive window of development may cause persistent disruptions in these developing prefrontal and reward pathways, impacting important intellectual functions like working memory, sustained attention, verbal memory, and general intellectual functioning.[61–63] These disruptions may persist longer—and the person may not fully recover—when experienced in the developmental window of adolescence rather than in adulthood. Aside from prefrontal cortex disruptions, chronic marijuana use has also been correlated with changes in the hippocampus, a vital brain structure involved with short-term memory, long-term memory, and spatial navigation.[64]

Recent research on the effects of marijuana on brain function and structure (in both adolescents and adults) have shown other negative changes in the brain among chronic marijuana users.[65–67,35] In a study that compared chronic marijuana users with non-using adults (mean age 22–23 years), the chronic user group demonstrated poorer learning from errors, due in particular to lower levels of brain activity in the dorsal anterior cingulate cortex and hippocampus.[65] In another study, investigators found microscopic disturbances in the neural fibers that communicate between brain hemispheres (the corpus callosum) in heavy cannabis users (mean age 30 years) who started using at the age of 16 years.[66] In a 25-year follow-up study, investigators compared three domains of cognitive function (verbal memory, processing speed, and executive function) in three groups (aged 18–30 years at baseline): 1) current cannabis users, 2) individuals who used marijuana but stopped, and 3) individuals who never used marijuana. The researchers found that

current marijuana users demonstrated lower verbal memory and processing speed compared to the other groups, and even when current users were excluded, cumulative exposure was associated with worse verbal memory.[67] And in a study that examined brain functioning among chronic marijuana users (aged 21–33 years), investigators found impairments in dopamine release in the striatum that correlates with deficits in neurocognitive performance (memory, attention).[35.]

In summary, broad-spectrum, lasting underachievement—perhaps mediated by disruptions of critical developmental brain circuits—is a third potential harm from cannabis. Convergent evidence from several fields, including epidemiology and functional brain imaging, supports the idea that one of the more occult (but consequential) downsides of adolescent-onset marijuana use is a broad-spectrum abridgement of human potential.

MENTAL ILLNESS

Marijuana use has been associated with several specific brain-based illnesses. Much of this research has focused on the role of cannabis in psychotic illness. Though the details of this research arena are beyond the scope of this article (see references 64, 68, and 69 for more comprehensive treatment of this issue), the emerging theory follows a stress-diathesis model and posits that in genetically "at risk" individuals, marijuana use serves as a biological trigger that influences the full expression of what otherwise may have been a latent disorder. This body of research suffers the same shortcomings noted in the underachievement section: random assignment to the experimental condition—heavy cannabis use—is unethical. That said, a raft of studies have found strong support for a pot-psychosis link, indicating that cannabis use can increase the risk for the development of psychotic disorders[69] and worsen clinical outcomes in those at risk.[70] In a 35-year longitudinal study of more than 50,000 enlisted men, Manrique-Garcia et al[68] found that individuals who used cannabis frequently had an increased long-term risk for developing schizophrenia, whereas the risk declined for moderate users. Assessing the genetics of at-risk individuals, Caspi et al[71] reported that adolescent cannabis users carrying a permutation of the catechol-O-methyltransferase (COMT) gene were at highest risk of developing psychotic illness. Mechanistically, THC increases task-irrelevant neural "noise," which is associated with its psychosis-promoting effects[66] and has been implicated in brain maturation processes (marijuana users showed thinner cortices) in those at risk for schizophrenia.[72] Notable here is that the potential kindling effect of cannabis on psychotic illness is likely affected by the abovementioned changes in cannabis chemistry. As previously discussed, cannabidiol (CBD)—the component of marijuana that demonstrates antipsychotic properties—is found in smaller concentrations in many recent strains, whereas the percentage of the psychosis-prone component—THC—has increased.[73,74]

Not only can early, heavy cannabis use potentially contribute to the development and expression of psychotic illness, but ongoing exposure after developing a psychotic disorder can make it worse. In people already suffering with schizophrenia, exposure to THC may lead to an increase in latent psychotic symptoms or relapse back into a psychotic episode.[64,73] Specifically, patients with psychotic illness who use marijuana, compared to those who do not, tend to have 1) earlier onset of symptoms, 2) more severe and persistent psychotic symptoms, 3) higher relapse rates, and 4) a worse prognosis due to poor treatment adherence.[70,73] Summarizing the research, Hall et al[36] document that cannabis use doubles the risk of developing psychosis from 7 in 1,000 to 14 in 1,000. Therapeutically, however, cessation is salutary: young people with psychosis who desist from pot have better outcomes, including fewer psychotic symptoms and better social functioning.[36]

Although the bulk of research on the role of cannabis in severe mental illness is in psychotic disorders, recent research on patients with bipolar illness and posttraumatic stress disorder (PTSD) yields similar findings. Specifically, patients with bipolar disorder who used and then ceased use of marijuana have similar outcomes to those who never used, whereas continued use is associated with greater recurrence risk and functional impairments.[75] Veterans with PTSD who use marijuana have greater symptom severity of their disorder, use alcohol and other drugs more often, and exhibit more violent behavior than never-users.[76] Finally, growing evidence of the role of cannabis in other substance use disorders (SUDs) indicates that people with SUDs or who are at risk for developing them are uniquely vulnerable to developing negative effects of cannabis.

Overall, this research suggests that healthcare providers should have targeted risk discussions about cannabis use with adolescents, who are at a higher risk of developing dependence, and individuals at risk for (or suffering from) psychotic illness, bipolar disorder, PTSD, or SUDs.

What about the data on the role of cannabis in other common brain-based disorders (e.g., anxiety, depression), many of which are used by card-carrying medical marijuana users as the reason for their use? Here, unfortunately, research is limited. A few research groups have shown lower perceived quality of life among cannabis users, as well as finding a heightened occurrence of anxiety disorders among cannabis-dependent adults.[77–79] That said, these studies and others generally indicate that people who only use occasionally to moderately (i.e., who do not qualify for cannabis dependence, or as regular users) generally have the same mental health outcomes as non-users.[77,78,80]

BAD TO WORSE

Both Aldous Huxley and Jim Morrison famously opined that certain drugs open "the doors of perception." Does cannabis open the gates of addiction? In short, the "gateway drug" theory posits that the recreational use of "softer" drugs like alcohol, tobacco, and marijuana serves as an easy port of entry into later use of "harder" drugs such as cocaine, heroin, or methamphetamine. The empirical support for this theory largely rests on the observation that most people who develop problems with the latter first experimented with the former. An examination of dairy use, however, exposes this argument's logical flaw. That is, though many people with opiate dependence have used cannabis prior to developing their heroin habit, a significant majority also ingested milk prior to the onset of their addiction, and yet no one posits a causal connection in this latter case.

Rigorously proving that use of cannabis is consistently associated with a "bad to worse" progression-of-use phenomenon turns out to be methodologically challenging.[81] That said, efforts have been made to answer this question. For example, Olthius et al[82] looked at the actual circumstances under which people first experimented with a hard drug. This study showed that subjects tended to mix psychoactive substances the first time that they used a new drug. For example, people frequently reported that first-time use of cocaine, heroin, methamphetamine, or a hallucinogen like LSD was in conjunction with marijuana, alcohol, or tobacco, rather than experimenting with the hard drug by itself for the first time.

Additional evidence in support of bad-to-worse causality comes from Agrawal et al,[46] who performed a twin study examining early cannabis use and later illicit drug use. This study showed a strong association between early cannabis use and later abuse/dependence of other illicit drugs, and—though a large percentage of the variance in illicit drug use was due to genetic and environmental factors—there was also evidence of a causal influence of early cannabis use. Finally, in a very recent, prospective study (which overcomes methodological limitations inherent in other examinations of this issue), cannabis use during the first sampling period was significantly associated with substance use disorders in a second sampling period three years later.[83] In sum, though empirical validation of a direct, causal role of early cannabis use in later addiction to harder drugs is methodologically challenging, and though correlation does not equal causation, several lines of evidence support that the association between early cannabis use and later problems with harder drugs is at least partly due to a causal relationship.[36,83,84]

How would a gateway process actually work? At a behavioral and interpersonal level, cannabis use likely follows principles of the so-called social contagion seen with alcohol and tobacco,[85,86] creating "birds of a feather" networks of people with similar behaviors and greater likelihood of exposure to other drug use. At a neurobiological level, animal research points to THC's ability to change reward circuits in the brain.[32,33,86] Panlilio et al,[87] for example, found that exposing rats to THC increased likelihood of self-administration of the most highly addictive drug in humans: nicotine. This effect persisted even when the process to receive the nicotine became more arduous. Interestingly, this effect was not found when a similar experiment was performed with cocaine or heroin in place of nicotine. More recently, Volkow et al[32] examined 24 marijuana abusers using a methylphenidate challenge to probe the reactivity of the brain's dopamine system. They found that compared to normals, marijuana abusers (average 5 joints a day) displayed blunted dopamine responses in key brain areas associated with addiction (i.e., ventral striatum). In a very recent study using an amphetamine challenge, lower levels of dopamine release in key addiction areas (the striatum) were found in heavy cannabis users; these changes were correlated with inattention, negative symptoms, and poorer working memory.[35] These neurobiological differences, researchers hypothesize, may contribute to marijuana abusers' tendencies to negative emotionality (increased reactivity to stress and irritability) and addictive behaviors.[32] Research like this raises the possibility that part of the etiology of marijuana's bad-to-worse phenomenon is explained by its role in altering brain reward circuits in a way that increases the risk of future addiction.

CONCLUSION

Evaluating the potential harms of a commonly used drug—especially a complex substance like marijuana—is a challenging but vital task. Fully informed awareness of both the potential and proven benefits and the potential and proven harms of marijuana are necessary in order to have rational discussions with patients, teens, and decision makers regarding marijuana use. Based on a review of the current literature, we suggest the mnemonic DDUMB (dependence, driving, underachievement, mental illness, and "bad to worse") as a tool that captures several of the more well-supported, brain-based risks associated with marijuana. Using this mnemonic, we reviewed five research-supported harms related to marijuana use. First, cannabis dependence (addiction) is real. Second, driving while under the influence of marijuana is unsafe. Third, marijuana use has a strong association with global underachievement. Fourth, marijuana elevates the risk of developing a psychotic illness and worsens the course of several serious mental health conditions in certain individuals. Fifth, though proving causality is complex, evidence supports a "bad to worse" or "gateway" role of cannabis in the

development of other substance use disorders. Important to note, most of these harms are more likely to be present when marijuana use is frequent and starts early (i.e., in adolescence).

Though we don't always heed George Santayana's aphorism about learning from (and therefore being doomed to repeat) our past, a chapter of recent history informs the cannabis conversation. Like a string of white crosses on the shoulder of a dangerous stretch of road, deaths from the recent prescription opiate epidemic stand out as stark examples of the collateral damage from widespread availability of addicting substances and the powerful impact of market forces, medical culture, and societal mores on drug use. Though cannabis is less directly deadly than opiates, all of the factors that buoyed the recent opiate epidemic—availability, economic forces, changing cultural norms—inform the cannabis debate. Healthcare providers, educators, policy leaders, and parents will be well-served by keeping abreast of the burgeoning research on the potential harms of this version of "going green."

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MD Judiciary - Testimony SB 708.pdf
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MARYLAND JUDICIAL CONFERENCE
GOVERNMENT RELATIONS AND PUBLIC AFFAIRS

Hon. Mary Ellen Barbera
Chief Judge

187 Harry S. Truman Parkway
Annapolis, MD 21401

MEMORANDUM

TO:	Senate Finance Committee Senate Budget and Taxation Committee
FROM:	Legislative Committee Suzanne D. Pelz, Esq. 410-260-1523
RE:	Senate Bill 708 Cannabis – Legalization and Regulation
DATE:	February 11, 2021 (3/4)
POSITION:	Oppose

The Maryland Judiciary opposes Senate Bill 708. This comprehensive legislation substitutes the term "cannabis" for "marijuana" throughout various sections of the Annotated Code of MD and governs a wide array of subject areas wherein cannabis would be regulated.

This bill also establishes that all court records and police records relating to any disposition of a charge of possession of cannabis under § 5–601 of the Criminal Law Article involving a quantity of cannabis that did not exceed the personal use amount entered before October 1, 2022, where possession of cannabis is the only charge in the case shall be automatically expunged on or before October 1, 2023. All court records and police records relating to any disposition of a charge of possession of marijuana under § 5–601 of the Criminal Law Article involving a quantity of cannabis that did not exceed the personal use amount entered before October 1, 2022, where the defendant was also charged with one or more other crimes in the same case, regardless of the disposition of the other charge or charges, shall be automatically expunged on or before October 1, 2030. With regard to any disposition of a charge of possession of cannabis under CR § 5–601 involving a quantity of cannabis that did not exceed the personal use amount entered on or after October 1, 2020: 1) the court with jurisdiction over the case shall initiate efforts to automatically expunge all court records and police records relating to the charge 4 years after disposition of the charge; 2) expungement of court records and police records relating to the charge shall be completed on or before 4 years and 90 days after disposition.

The Judiciary reiterates its concerns expressed relative to other bills requiring automatic expungement. The Judiciary does not have the data, nor is there currently a mechanism in place in any court to search for and investigate automatic expungement of any charge. The bill also imposes an insurmountable burden on the court and clerks of the court to

determine which cases are eligible for expungement. There is often no way to determine from a review of the court file the amount of marijuana (cannabis) involved for purposes of determining eligibility for automatic expungement. This is especially problematic for cases that were filed or adjudicated prior to the date when the legislature decriminalized possession of less than 10 grams of marijuana.

The expungement process is a long, labor-intensive, and expensive process involving the determination of eligibility; the use of multiple NCR forms; postage costs for mailing petitions and orders to State's Attorneys, law enforcement agencies, defendants, defendant's attorneys; copying expenses; holding periods for pending expungements, physical redaction, and storage costs for the expunged records for three years. Court records that need to be redacted include all official records maintained by the clerk or other personnel pertaining to any criminal action or proceeding for expungement, including indices, docket entries, charging documents, pleadings, orders, memoranda, assignment schedules, disposition sheets, transcriptions of proceedings, electronic recordings, orders, judgments, exhibits, and decrees. Some circuit courts do not have indexes of old cases. Searching for marijuana charges would involve manually going through docket books and microfilm to review each case to determine if a charge exists. In cases where there are multiple charges in a case but only one charge needs to be expunged, clerks would need to read through all aspects of the court record to properly redact references to the expungable charge. The appellate court process would be similar to the circuit court process, with a significant number of paper records needing to be researched. In addition, the bill does not cover the removal of "published" opinions of a court. Part of the expungement process for paper and electronic files is identifying all the custodians of the records that must expunge their files and then respond to the court with a Certificate of Compliance. Not all custodians are readily apparent by looking in a computer. Court commissioners can be a custodian of a record when a defendant applies for Public Defender eligibility determination. The entire file needs to be checked.

The bill is also retroactive and involves any charges involving the use and possession marijuana in an amount that is considered less than personal use filed in the District Court since it was established in 1971, as well as charges filed in the circuit court going back even further. All District Court records prior to 1981 are archived and having to retrieve them would be burdensome for the Judiciary and the State Archives. Locating old cases can take up a significant amount of clerk time. If a case is not in the electronic case management system, it is sometimes difficult to locate or obtain a case number. Some old cases are referenced in index books, if there is an index, that clerks can look through to locate a case. If a case number is located, clerks can look through warehouse listings to see if the box that houses that case file may be located. The case file may be on microfilm or may be located at the Maryland State Archives. Sometimes it takes several tries to find the correct case file location. The process varies for the circuit courts. Some courts have no index of cases with paper records, or the index does not indicate the charges. Unless the legislation specifically directs the Archives to redact the expunged information, courts would have to retrieve files from storage and manually review *every* criminal case to determine if there were any marijuana possession (less than a personal amount) charges. Even in cases with the lead charges listed, subsequent charges or

violations of probation would not be listed in the index, necessitating a thorough review of all criminal cases. While some circuit courts have older records (approximately 1986 and older) with State Archives, others have maintained all their court records on-site or in warehouses. In addition to the paper files, many older circuit court files are on microfilm or microfiche with no obvious way to expunge a case or charge within a case. In courts where the paper record was lost due to flood or fire, the microfilm may be the only record remaining of cases for a given timeframe.

Senate Bill 708 also requires the court to expunge charges of possession of marijuana in an amount that is considered less than personal use, where the defendant was also charged with one or more other crimes in the same case, regardless of the disposition of the other charge or charges. This type of expungement is called a partial expungement. Currently charges in a "unit" cannot be expunged. (CP § 10-107)

The Judiciary maintains we are not able to effectively expunge one charge in a unit. There is no functionality currently within CaseSearch to remove records at the charge level without displaying a space for a missing charge(s). When a person is charged with multiple offenses, the charges are numbered and reported to the Criminal Justice Information System (CJIS) in the order presented on the charging document. For instance, if there are three charges, and charge 2 is expunged, the system will still reflect charges 1 and 3. They are not and cannot be renumbered because the case information reported to CJIS must align with the same charge numbers initially reported. A missing numbered charge may raise questions and red flags, thereby, nullifying the purpose of the expungement.

The clerk would need to review the file, page by page to remove any information pertaining to the expunged charge. Charge information is repeated throughout the case many times and the charging document outlines what the alleged events are that occurred. There may not be a clear way to obliterate all information in a charging document related to a specific charge.

In addition, there is currently no functionality to build programmatic relationships between CaseSearch and the six case management systems that process criminal information to remove any reference to the existence of specific charges that may exist in any of the various components within those systems as required by the proposed legislation. As explained in the current and prior legislative sessions, the Judiciary anticipates that the implementation of CaseSearch Version 2 will provide the needed functionality to enable the removal of case information at a more granular level such as individual charges and will parallel the final rollout of MDEC. The CaseSearch rebuild is estimated to cost at a minimum $1.14 million.

Costs will increase in direct relation to the higher number of expungements. Clerical positions will be necessary due to the expansive amount of charges that would become eligible and the retroactive nature of this bill.

Clerk Need in Fiscal Years 2022 to 2023 to Expunge Existing/Historical

Charges for Possession of Marijuana with Electronic Records

	Single Charge	Single Charge		Multiple Charges	Multiple Charges
	DC	**CC**		**DC**	**CC**
No. of Electronic Cases	188,988	23,913		286,578	77,389
Hours to Complete Expungement Process	1.5	1.5		3	5
No. of Cases x Time to Complete the Process	283,476	35,819		859,734	386,945
No. of Clerks Needed*	235	30		122	131
*Number of clerks needed accounts for the time allotted in the bill to complete expungement at 1 years for single charge cases and 2 years for multiple charge cases.					

The total number of new clerks needed to accomplish the existing expungements for cases in an electronic format is:
District Court: 357
Circuit Court: 161

Please note that the above numbers do not account for cases that are still in paper.

Additional Clerk Need for Current and Incoming Possession of Marijuana Charges Starting in Fiscal Year 2022

	Single Charge	Single Charge		Multiple Charges	Multiple Charges
	DC	**CC**		**DC**	**CC**
No. of Cases*	11,247	173		3,366	1,945
Hours to Complete Expungement Process	1.5	1.5		3	5
No. of Cases x Time to Complete the Process	16,870.5	259.5		10,098	9,725
No. of Clerks Needed	14	-		8	8
* Number of cases is based on the three-year average filings for Fiscal Years 2017-2019 * FY2020 data not used due to vast differences in data based on COVID-19 shutdown.					

The total number of new clerks needed to accomplish the expungement of current and incoming cases is:

District Court: 22
Circuit Court: 8

The cost for the estimated additional personnel and operating costs in the first full fiscal year is **$36,390,339.00**. The number of clerks needed is in direct relation to the lack of time available to complete the required expungements of historical cases as well as handling the automatic expungement of current and incoming cases involving the use and possession of cannabis.

As indicated below, the initial cost to implement SB 708 is estimated to be approximately **$37,769,791** million. That total includes the above mentioned 546 judicial clerks. The aforementioned costs do not include expungement of charges that were never entered in any of the Judiciary's case management systems, which is indeterminable at this time.

The Administrative Office of the Courts is in the process of analyzing clerk workload and the amount of time required to effectively and efficiently process the same, which will result in the development of a sound methodology by which to determine clerk need, similar to how judgeship need is determined. The estimated number of clerks needed to perform expungements indicated above was derived from that preliminary analysis, using the number of hours clerks have available to perform their duties and responsibilities. The time a clerk has available to perform their duties accounts for weekends, holidays, leave, judicial support, training, and general office work.

This bill will have a significant fiscal and operational impact on the Judiciary. See below.

SB 708 Initial Cost of Implementation	
Case Search 2.0	1,140,000
Clerks (1st Full Year)	36,390,339
Programming, including Reports	208,452
Brochure	6,000
Civil Citation	25,000
TOTAL	**$37,769,791**

The Judiciary is currently researching redaction software. There may be additional costs if a decision is made to purchase the software to assist the clerks with the time-consuming searching and redaction of records or case information within the records. Cost estimates are not available at this time.

For all the reasons stated above, the Judiciary opposes Senate Bill 708.

cc. Hon. Brian Feldman
Judicial Council
Legislative Committee
Kelley O'Connor

2021 MD SB 0708.pdf
Uploaded by: Finn, Kenneth
Position: UNF

Testimony in **Opposition** to SB-0708, March 2021

Submission by:

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Editor: Cannabis in Medicine: An Evidence-Based Approach

https://www.amazon.com/Cannabis-Medicine-Evidence-Based-Kenneth-Finn/dp/3030459675

Board Certified, Physical Medicine and Rehabilitation
Board Certified, Pain Medicine
Board Certified, Pain Management

President, American Board of Pain Medicine (2021)
Member, American Board of Pain Medicine, Exam Council (2001-present)
Member, Colorado Governor's Task Force on Amendment 64, Consumer Safety and Social Issues Work Group
Member, Colorado Medical Marijuana Scientific Advisory Council

Expansion of marijuana programs has failed every single public health and safety metric

1. Expanded marijuana programs will not improve the state or national drug crisis.

2020 was yet another year with over 81,000 people nationally dying from drug overdoses

Colorado has had medical marijuana for 20 years, 90% of medical marijuana recommendations are for pain, and 2020 was a record number of drug overdoses, including prescription opioids

Maryland overdoses are not improving over time (see attached graphic)

https://health.maryland.gov/vsa/Documents/Overdose/2020_Q1_Drug_Intox_Report.pdf)

Since legalization in Colorado (2014) drug overdoses have skyrocketed

Prescription opioid deaths:	increased 90%
Fentanyl deaths:	increased 690%
Methamphetamine deaths:	increased 280%
Cocaine deaths:	increased 160%
Heroin deaths:	increased 15%

2. **Marijuana is the most prevalent substance found in completed teen suicide in Colorado**

https://cohealthviz.dphe.state.co.us/t/HSEBPublic/views/CoVDRS_12_1_17/Story1?:embed=y&:showAppBanner=false&:showShareOptions=true&:display_count=no&:showVizHome=no#4

3. **Marijuana-related driving fatalities have been increasing, far faster than population growth, since legalization**

https://jamanetwork.com/journals/jamainternalmedicine/article-abstract/2767647

4. **The black market in Colorado has worsened since legalization**

https://www.pbs.org/newshour/show/how-colorados-marijuana-legalization-strengthened-the-drugs-black-market

5. **Marijuana is not profitable, just like alcohol, tobacco, and opioids. For every dollar generated, it costs $4.50 to regulate**

https://centennial.ccu.edu/policy-briefs/marijuana-costs/

6. **Currently "regulated" markets are failing**

https://sos.oregon.gov/audits/Documents/2019-04.pdf

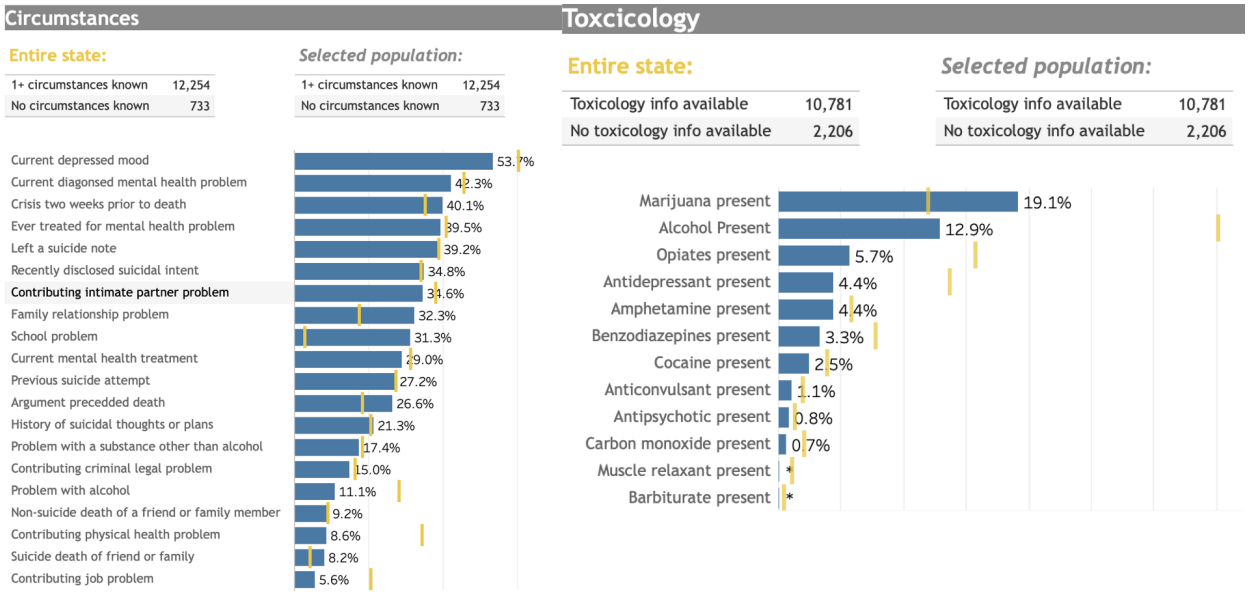
7. **Increased health care utilization and health care costs**

https://www.researchgate.net/publication/314140400_The_Hidden_Costs_of_Marijuana_Use_in_Colorado_One_Emergency_Department%27s_Experience

8. **Increased homelessness, increased crime, decreased property values**

9. Negative environmental impacts

There are more harms but not enough time to discuss
Need to evaluate profit and loss before putting to the public consideration
.

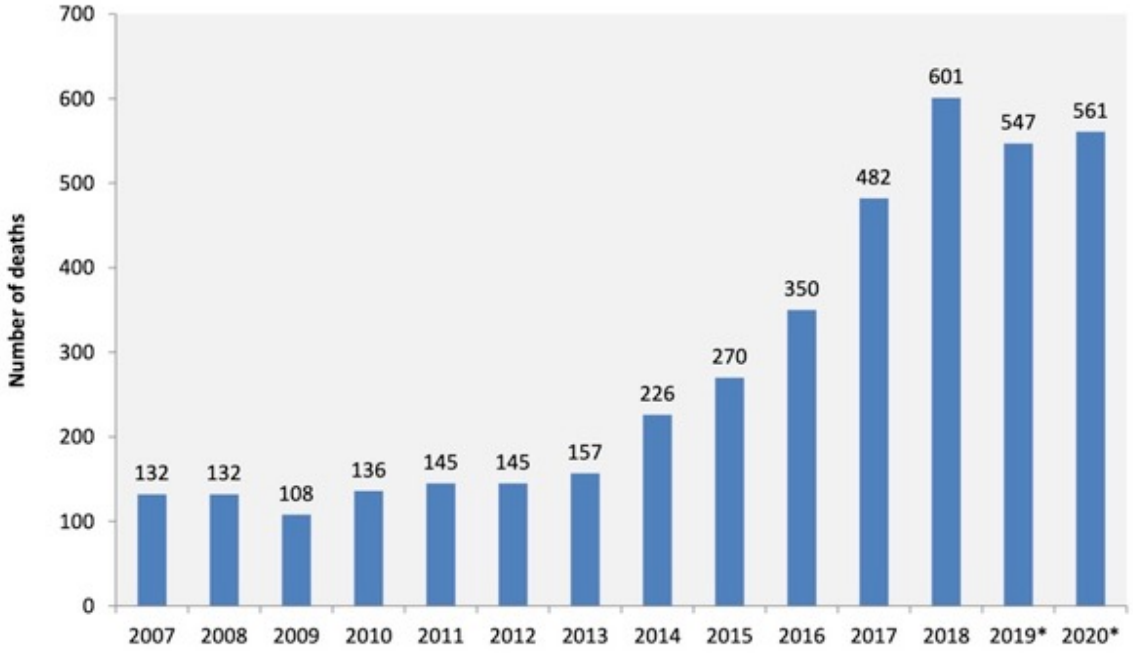


Trend **began 2012** and has **remained #1** since then

https://cohealthviz.dphe.state.co.us/t/HSEBPublic/views/CoVDRS_12_1_17/Story1?:embed=y&:showAppBanner=false&:showShareOptions=true&:display_count=no&:showVizHome=no#4

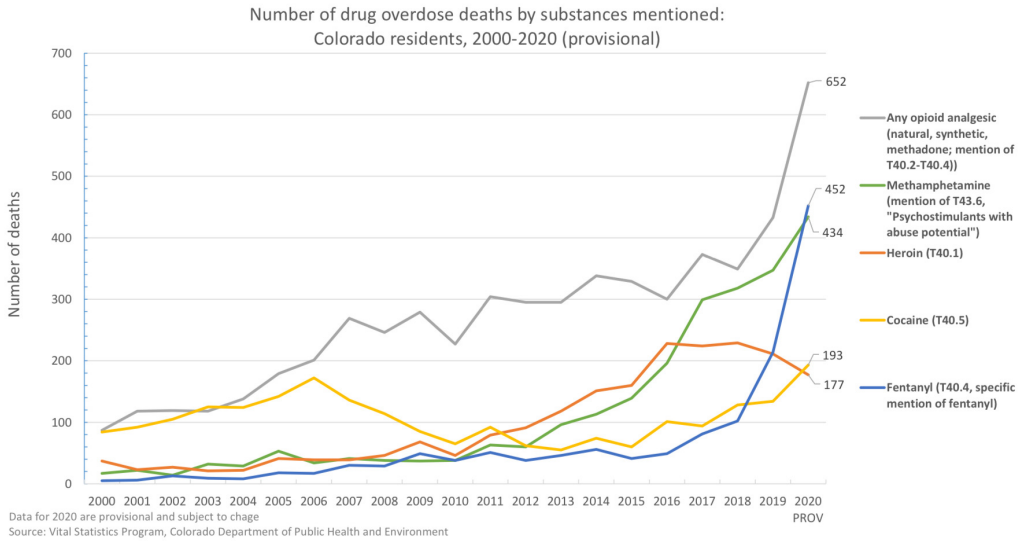
There is currently no data on improved public health metrics related to expanded marijuana programs

Figure 2. Number of Opioid-Related Deaths Occurring in Maryland from January through March of Each Year.*



*2019, 2020 counts are preliminary.

3



MD Testimony_SB0708_Smart_Approaches_to_Marijuana.
Uploaded by: Jones, Will
Position: UNF

Written Testimony for Senate Bill 0708 **Opposed**

March 2, 2021

Will Jones III, MPA
Communication and Outreach Associate, Smart Approaches to Marijuana (SAM)

http://www.learnaboutsam.org

First, I would like to say that I appreciate the opportunity to submit testimony to the committee. I represent Smart Approaches to Marijuana (SAM), the leading non-partisan national organization offering a science-based approach to marijuana policy. SAM was founded by former Congressman Patrick Kennedy, senior editor of The Atlantic David Frum, and Dr. Kevin Sabet, a former White House advisor to the Obama Administration as well as two other U.S. Administrations.
I serve as the Communications and Outreach Associate at SAM and have had the privilege to work as a community activist on issues of social justice at the local and national level. I started the campaign against marijuana legalization and commercialization in D.C. I am a proud husband, father and also serve as a DC Firefighter/EMT.

In discussions of legalization, many proponents have touted the impact of legalization on social justice reform. They cite the prevalence of minority groups jailed for minor possession charges as reason enough to legalize recreational marijuana. They charge that legalizing marijuana would, in part, reduce the number of people in color who are jailed for what the marijuana proponents assert are minor possessions. The arguments are predicated on a mythology that woefully misrepresents the reality of the impact of marijuana through the lens of social justice.

Marijuana Arrest Rates – Common Misconceptions

Many believe that marijuana legalization will reduce the number of minorities imprisoned or arrested for marijuana-related offenses. Big Marijuana has worked diligently to ensure that legalization is perceived as a social justice issue, arguing that without full legalization, minority populations will continue to be targeted inappropriately by law enforcement officials. Proponents of legalization legislature argue that the legalization of marijuana is vital to the decriminalization of the drug.
As is evidenced by New York state's recent legislation, decriminalization and legalization are not inextricably linked in the way that marijuana industry proponents have claimed they are. In June of 2019, New York passed legislation to decriminalize the drug without legalizing it for recreational use.[1] In perpetuating the false dichotomy that social justice cannot be addressed without full- scale legalization, proponents have ensured confusion around the underlying issue

[1] https://spectrumlocalnews.com/nys/central-ny/news/2019/06/20/marijuana-decriminalization-bill-passes-state- senate-

of social justice, seeking to legitimize legalization and commercialization by tacking it on to an entirely separate issue**.**

We have worked diligently to encourage and aid other states in creating decriminalization legislature to begin to address the socio-economic disparities in marijuana-related arrests. Yet Big Marijuana is not interested in social justice. In New Jersey, decriminalization legislation that did not include the commercialization of marijuana failed to pass despite widespread outcry among state legislators regarding the impact of marijuana-related offenses on minority communities.[2]

Even still, in states that have legalized recreational marijuana under the premise of reducing social injustice, arrest rates for marijuana-related offenses have increased, particularly for minority groups.

In Washington D.C. for example, between 2015 and 2017 (the years immediately following legalization), although total marijuana-related arrests have gone down, distribution and public consumption arrests more than tripled. Among adults, 89% of marijuana distribution or public consumption arrestees were African Americans.[3]

Additionally, the 2017 marijuana-related African American arrest rate in Colorado is nearly twice that of Caucasians (233 in 100,000 versus 118 in 100,000).[3] In Colorado, 39% of African American marijuana-related arrests in 2017 were made without a warrant, while only 18% of Caucasians were arrested without one.[4] In Denver, the average number of annual Hispanic arrests for marijuana increased by 98% since legalization (107 average annual arrests prelegalization vs
212.25 post-legalization); the average number of arrests for African Americans increased 100.3% from 82.5 per year to 165.25 per year.[5] As pro-marijuana lobbyists argue that

legalization will improve social justice in legalized states, disparities among use and criminal offense rates persist across race, ethnicity, and income levels.

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[2] https://www.app.com/story/news/local/new-jersey/marijuana/2019/05/22/nj-weed-sweeney-marijuana-decriminalization/3747328002/ [3] DC Metropolitan Police Department. (2018). Marijuana Arrest Data. Washington, District of Columbia. Retrieved February 2019, from https://mpdc. Dc.gov/node/1347766

[3] Colorado Department of Public Safety. (2018). Impacts of Marijuana Legalization in Colorado: A Report Pursuant to Senate Bill 13-283. Division of Criminal Justice.

[4] Colorado Department of Public Safety. (2018). Impacts of Marijuana Legalization in Colorado: A Report Pursuant to Senate Bill 13-283. Division of Criminal Justice.

[5] Colorado Department of Public Safety. (2018). Impacts of Marijuana Legalization in Colorado: A Report Pursuant to Senate Bill 13-283. Division of Criminal Justice.

Arrests of people of color have risen, contrary to what legalization proponents suggest. The evidence only bolsters the reality that the system itself is what warrants further investigation, not the legality of the drug. The charge that marijuana legalization will eliminate racial bias in the justice system is unfounded. The opposite has been proven.

The effect on young people of color in states that have legalized marijuana further exemplifies the alarming misconception that legalization reduces the number of minorities being charged with violations of marijuana laws. Across Colorado, minority juveniles suffered. The average number of marijuana-related arrests among Hispanic juveniles increased 7.3% (770/year to 825/year), and the average number of marijuana-related arrests among African-American juveniles increased 5.9% (230/year to 243.5/year).[6] Additionally, drug suspension rates in Colorado schools with 76% or more students of color are over two times higher compared to Colorado schools with fewer than 25% students of color.[7] Colorado schools that had 25% or fewer youth of color had 313 marijuana-related suspensions per 100,000 students compared to 658 marijuana-related suspensions per 100,000 students for schools comprised of populations with 76% or more youth of color.[8] Between 2012 and 2014, the percentage of Hispanic and African American arrests for teens under 18 years old increased 29% and 58%, respectively.[9] In Washington D.C. juvenile marijuana-related arrests increased 114% between the three years before and after marijuana legalization.[10][11] The legalization of marijuana has served to further incriminate minority youth.

Big Marijuana – Economic Impact on Communities of Color

Big Marijuana has increasingly exploited minority communities to disastrous effects. Several consequences are borne of this.

First, higher crime rates follow areas in which dispensaries set up shop. In 2017, the number of court filings charged with the Colorado Organized Crime Control Act that were linked to a marijuana charges increased 284% since 2012.[12] A study funded by the National Institutes of Health (NIH) showed that the density of marijuana dispensaries was linked to increased property crimes in nearby areas. Researchers found that in Denver, Colorado, neighborhoods adjacent to

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[6] Colorado Department of Public Safety. (2018). Impacts of Marijuana Legalization in Colorado: A Report Pursuant to Senate Bill 13-283. Division of Criminal Justice.

[7] Colorado Department of Public Safety. (2016). Marijuana Legalization in Colorado: Early Findings - A Report Pursuant to Senate Bill 13-283.

[8] Colorado Department of Public Safety. (2016). Marijuana Legalization in Colorado: Early Findings - A Report Pursuant to Senate Bill 13-283.

[9] Colorado Department of Public Safety. (2016). Marijuana Legalization in Colorado: Early Findings - A Report Pursuant to Senate Bill 13-283.

[10] Marijuana legalization impact report SAM https://learnaboutsam.org/wp-content/uploads/2019/06/Lessons- Learned-2019-Final1-

[11] .pdf

[12] Colorado Department of Public Safety. (2018). Impacts of Marijuana Legalization in Colorado: A Report Pursuant to Senate Bill 13-283. Division of
Criminal Justice

marijuana businesses saw 84.8 more property crimes each year than neighborhoods without a marijuana shop nearby.[13]

Second, the dispensaries seek out lower income and minority communities as prime locations for their shops. Just as Big Tobacco has targeted lower income communities as an important consumer-base,[14] Big Marijuana seeks a similar base to establish addiction-for-profit businesses. As reported by the Truth Initiative, an organization committed to exposing the truth about Big Tobacco, tobacco companies historically have targeted and advertised to lower-income communities and communities of color.[15] Big Marijuana has done the same. In Los Angeles, the majority of dispensaries have opened in predominately African-American communities.[16] Additionally, an overlay of socioeconomic data with the geographic location of pot shops in Denver shows marijuana stores are located disproportionately in disadvantaged neighborhoods.[17] In Oregon, the state conducted an analysis on the distribution of statesanctioned dispensaries and found that sites were disproportionately concentrated among lowincome and historically disenfranchised communities.[18][19]

Yet these stores do not employ the members of community nor do they establish economic opportunities for the communities they target. In fact, nationally, less than 20% of all pot shops are owned by minorities of any community.[20][21] In Massachusetts, the phenomenon is further

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[13] Freisthler, B., Gaidus, A., Tam, C., Ponicki, W. R., & Gruenewald, P. J. (2017). From Medical to Recreational Marijuana Sales: Marijuana Outlets and Crime in an Era of Changing Marijuana Legislation. The Journal of Primary Prevention, 38(3), 249-263.

[14] http://archive.boston.com/news/health/articles/2010/08/30/tobacco_signs_still_target_citys_poorer_areas/?p ag e=2

[15] https://truthinitiative.org/research-resources/targeted-communities/tobacco-social-justice-issue-low-income- communities

[16] Thomas, C., & Feisthler, B. (2017). Evaluating theChange in Medical MarijuanaDispensary Locations inLos Angeles Following the Passage of Local Legislation. The Journal of Primary Prevention, 38(3), 265-277.

[17] Hamm, K. (2016, January 2). Marijuana in Denver: Map of pot-related businesses by neighborhood with income data,school locations. Retrieved from The Daily Post: https://www.denverpost.com/2016/01/02/marijuana- indenver-map-of-pot-related-businesses-by-neighborhood-with-incomedataschool-locations/

[18] McVey, E. (2017, July 31). Chart: Recreational marijuana stores are clustered in low-income areas of Denver, Seattle. Marijuana Business Daily.
Retrieved February 2019, from https://mjbizdaily.com/chart- recreationalmarijuana-stores-clustered-low-income-areas-denver-seattle/

[19] Smith, P. (2017, August 9). Why Are Pot Shops Mainly in Poor Neighborhoods? The Daily Chronic. Retrieved February 2019, from http://www.thedailychronic.net/2017/75557/pot-shops-mainly-poorneighborhoods/

[20] https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwj3- OD-

[21] qbjAhXCLc0KHdziA0gQFjAAegQIAhAB&url=https%3A%2F%2Fmjbizdaily.com%2Fchart-19-cannabis- businesses-owned-founded-racialminorities%2F&usg=AOvVaw0u0zBULTs21pB3zHe9RdgF

exemplified. Massachusetts requires that all "Marijuana Agents," persons who work at marijuana businesses must register with the state. Demographic analysis revealed that of 1,306 agents who applied in the city of Boston, 73% were white, 6% were Hispanic, and 4% were black.[22] This is unrepresentative of the city's population. According to census estimates, whites comprise 44.9% of the population of Boston; Hispanics 19.4%; blacks 25.3%.[23] The economic opportunities touted by the industry are missing in practice.

Furthermore, in efforts to curb the marketing practices of Big Tobacco, state governments acted to ensure that advertisements were limited, and the reach of tobacco companies was curbed.

States like Massachusetts and New York imposed barrier rules restricting the ability of Big Tobacco to set up shop within a certain distance from schools, community centers, and churches.[24] The governments not only recognized that their youth were at risk, but that in particular, their minority youth were at risk.[25] Still, as communities attempt to impose barriers and distance marijuana from young people and young minority people, marijuana companies have expressed outrage. When the Kansas City government moved to restrict marijuana dispensaries from setting up shop within 750 feet of schools, churches, and childcare centers, cannabis advocates were dismayed and promised to push back on the initiative.[26] Elsewhere, local governments have given Big Marijuana even greater leniency that is contradictory to the efforts that were initiated to curb the tobacco industry years ago.

The Impact of Marijuana on the Health of Lower Income Communities

In addition to the financial consequences for minority groups, minority women and children face a new risk. A study by the American College of Obstetricians and Gynecologists reported that young, urban women from lower income levels have a 15–28% rate of marijuana use during pregnancy. Between 34 and 60% of marijuana users continue marijuana use throughout pregnancy due to a decreased perception of risk and stigma.[27] The misrepresentation of marijuana effects has disproportionately impacted pregnant women in lower income communities. The American Academy of Pediatrics tells us that pregnant women should not use marijuana due to widely established health harms associated.

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[22] https://www.masslive.com/politics/2018/12/boston_grapples_with_lack_of_d.html

[23] https://www.census.gov/quickfacts/fact/table/bostoncitymassachusetts/RHI225218#RHI225218

[24] http://archive.boston.com/news/health/articles/2010/08/30/tobacco_signs_still_target_citys_poorer_areas/?pag e=2

[25] http://archive.boston.com/news/health/articles/2010/08/30/tobacco_signs_still_target_citys_poorer_areas/?pag e=2

[26] https://fox4kc.com/2019/06/27/not-everyone-happy-with-kcs-proposed-rules-for-medical-marijuana- dispensaries/

[27] TheAmerican College of Obstetricians and Gynecologists. (2017, October). Marijuana Use During Pregnancy and Lactation. ACOG Committee Opinions, 722.

Another myth perpetuated by Big Marijuana is that marijuana-legal states have seen a decrease in opioid deaths. This claim is based loosely on a study that has been recently shown to be false.[28] The opioid epidemic has disproportionately impacted lower income communities.[29] According to the Brookings Institution, that the opioid epidemic has impacted lower income communities at a higher rate is owed in part to the lack of education and treatment centers in these communities.[39] By taking over the messaging, Big Marijuana capitalizes on the vulnerability of the communities hit hardest by the epidemic. This is evidenced, in part, by Weedmaps, a company that recently advertised and misrepresented the correlation between marijuana legalization and a decrease in opioid deaths, suggesting that states that had legalized marijuana witnessed a 25% decrease in opioid deaths.[30]

The truth is, marijuana reforms can and should center on alternatives to incarceration, such as drug courts, and more research. Full legalization of marijuana will spawn Big Tobacco 2.0 and far worse public health and social justice harms.

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[28] http://med.stanford.edu/news/all-news/2019/06/medical-marijuana-does-not-reduce-opioid-deaths.html

[29] https://www.brookings.edu/research/pinpointing-opioid-in-most-impacted-communities/ [39] brookings

[30] https://www.newburyportnews.com/news/local_news/limits-considered-for-marijuana- advertising/article_216f6a7d-0e3d-5b4d-ac33-a0bc8a9e0076.html

SB 708_Cannabis - Legalization and Regulation_Oppo
Uploaded by: Mansfield, Andrea
Position: UNF

MARYLAND CHIEFS OF POLICE ASSOCIATION
MARYLAND SHERIFFS' ASSOCIATION

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MEMORANDUM

TO: The Honorable Delores Kelley, Chairman and
Members of the Finance Committee

FROM: Chief David Morris, Co-Chair, MCPA, Joint Legislative Committee
Sheriff Darren Popkin, Co-Chair, MSA, Joint Legislative Committee
Andrea Mansfield, Representative, MCPA-MSA Joint Legislative Committee

DATE: March 4, 2021

RE: **SB 708- Cannabis – Legalization and Regulation**

POSITION: OPPOSE

The Maryland Chiefs of Police Association (MCPA) and the Maryland Sheriffs' Association (MSA) OPPOSE SB 708. These bills would legalize the use of cannabis in Maryland.

For years, we have told our young people, with good reason, that marijuana is a harmful and dangerous drug. Expecting our youth to understand the finer distinctions in this ongoing debate is unrealistic and conveys inconsistent and dangerous messages to them. MCPA and MSA are very concerned about the mixed signals this bill will send to our youth. By enacting this type of legislation, the State of Maryland will be giving authority for people to use marijuana should the voters support it. Our young people will not understand the finer nuances involved in the discussion involving marijuana and that of an illegal drug substance and one that is decriminalized. We believe they will simply hear that Maryland's legislators support the use of marijuana. This is inconsistent with the message that has been sent, and the one that should continue to be sent, to our children.

- The **American Academy of Pediatrics (AAP)** believes that "[a]ny change in the legal status of marijuana, even if limited to adults, could affect the prevalence of use among adolescents." While it supports scientific research on the possible medical use of cannabinoids as opposed to smoked marijuana, it opposes the legalization of marijuana.
- Marijuana is properly categorized as a Schedule I drug under the Controlled Substances Act. According to the CSA, Marijuana is a Schedule I drug. Schedule I drugs have: 1) A high potential for abuse 2) No recognized medical use in treatment in the U.S. and 3) There is a lack of accepted safety protocols for use of the drug even under medical supervision.
- Marijuana is not as harmless as some would have you believe—it has serious physical and psychological side effects that can make marijuana very dangerous.

- Today's marijuana is not your father's marijuana: Over the last 20 years the potency of marijuana (as measured by THC content) has nearly tripled, from 3.7 percent to more than 10 percent. Some marijuana has been tested as containing more than 37 percent THC.
- The Supreme Court has repeatedly agreed that the scheduling of drugs, including marijuana, is the responsibility of the federal government. The process used by the federal government to schedule marijuana has been repeatedly reviewed and upheld by the courts.

Marijuana is the most commonly abused drug in the United States- nearly 98 million Americans over the age of 12 have tried marijuana at least once. According to the National Forensic Laboratory information system, Cannabis/THC has been for many years the most frequently identified drug item by far. The cost of liberalizing our drug laws is enormous, with incalculable long and short-term cost to both the users and our nation.

The Supreme Court in the past few years has reaffirmed DEA's authority to investigate the growing, selling, and possessing marijuana, irrespective of state law. Cases include *The United States v. Oakland Cannabis Buyers' Cooperative* (no exception for the distribution of marijuana on the basis of "medical necessity") and *Gonzales v. Raich* (reaffirmed DEA's ability to prohibit the intrastate and noncommercial manufacture and possession of marijuana for claimed medical purposes pursuant to state law).

DEA will continue to make major seizures of marijuana, and we are committed to enforcing the Controlled Substances Act in all states. As a matter of resource allocation, DEA focuses on criminal organizations, violent offenders, and serious drug traffickers, particularly illegal dispensaries and commercial operations that violate state and federal laws. For example 2010's *Project Deliverance* was the largest coordinated drug trafficking law enforcement operation along the Southwest Border in American history. Of the 74 tons of drugs seized, more than 69 tons were marijuana.

For these and other reasons, MCPA and MSA OPPOSE both SB 708 and urge an UNFAVORABLE committee report.

UNfavorable for SB0708.pdf
Uploaded by: mcavoy, vince
Position: UNF

UNfavorable for SB0708

Vince McAvoy po box 41075 baltimore md

Dear Committee,
I've transcribed those who opposed and gave MEDICAL TESTIMONY about the harm MARIJUANA is causing.
My interest and the reason for using caps– IT'S DAMAGING OUR YOUTH !
I highlight the link here, beginning at 3:44:49
https://mgaleg.maryland.gov/mgawebsite/Committees/Media/false?cmte=jud&clip=JUD_2_16_2021_meeting_1&ys=2021rs

I insist you watch it several times and view the LEGALIZATION OF MARIJUANA as well as he MEDICAL MARIJUANA INDUSTRY through this testimony.

All these doctors/professionals are opposed to marijuana, marijuana use, mothers using marijuana, medical marijuana.
Maryland needs to admit it made a mistake and observe how this drug is permanently damaging youth, their brains, their engagement, their economic damage and the ADDICTION.

Dr. Karen Randall, EMERGENCY ROOM PHYSICIAN, southern Colorado
OPPOSED
"..Youth usage are using more, high potency products...last shit had 3 kids under 15 addicted suicidal ideation...she has already started selling herself to get marijuana for her addiction... has implications for their brain got it from their parent or got it from someone legally.."

Amelia Arria, PROFESSOR AT Maryland School for Public Health
OPPOSED
".....negative impact on brain function and academic achievement...
based on 10 of our own published studies, 54 of which I have attached....
substantially higher risk for mental health problems, addiction and blunted achievement...
making cannabis has increased youth use...increases chances that they will disengage from school and other responsibilities ... cascade of social and economic losses across society...
urge you to listen to science...workplace productivity..."

Dr. Christine Miller, NEUROSCIENTIST
"... marijuana increases the risk of psychosis...
rate of use 25% higher in states where legal in states....now 55%
psychosis in 1 of 20 users....drug-induced mental illness...homelessness in states that have legalized 2 and a half times greater...increased risk of suicide.
will develop psychotic symptoms...cannot predict who...
large carbon footprint...much larger than any food grown for food."

George Spica, Former Marijuana Addict / Psychosis patient
"...health issue are still there...PREGNANT WOMEN SHOULD STAY AWAY FROM MARIJUANA...affects the PREFORONTAL CORTEX of infants..."

Ragina Ali, Triple A Automotive AAA Opposes Recreational Cannabis
"....crash claims also increased in states where marijuana was legal..
250% increase in auto fatalities after legalization...dangerous ...urges unfavorable"

Aubree Adams, mother of child drug addict
"predatory profit…[Aubrree now sobbing] used edibles in the 8th grade, soon after legalization, then began
self-harming..irrational, paranoid…psychotic break…attempted suicide…ER told her 'it's just marijuana'….
Dabs are designed to appeal to teens…pediatric addiction…using meth and heroin…marijuana is a gateway drug…suicide, depression and addiction….
the science proves ….[this is] dangerous…
[the marijuana industry sees] those users are the youth of Maryland.."

Christopher Hammond, MD, pHD, child & adolescent psychology and addiction medicine
"worked for over 10 years providing clinical…teens with addiction….direct clinical research and education programs at Johns Hopkins…unbiased scientific background…risks related to cannabis use on young people and those with mental health problems….
Marijuana is the most commonly used drug by US youth and is the main
drug teen's present for teen addiction…
immediate and long-term impairment…increased suicidal thoughts and behaviors worse for earlier onset use…."

Maryland needs to admit it made a mistake and observe how this drug is
permanently damaging youth, their brains, their engagement, their economic damage
and the ADDICTION

Testimony, SB0708 CL Miller, 2021.pdf
Uploaded by: Miller, Christine
Position: UNF

Testimony in opposition to SB0708: Cannabis legalization and regulation

Submitted by Christine L. Miller, Ph.D., 6508 Beverly Rd, Idlewylde, MD 21239 CMiller@millerbio.com; Neuroscientist and Science Advisor for Smart Approaches to Marijuana www.learnaboutsam.org and Moms Strong www.momsstrong.org; author of: "The Impact of Marijuana on Mental Health, in: Contemporary Health Issues on Marijuana, Oxford University Press, 2018" and "Marijuana and Suicide: Case-control Studies, Population Data, and Potential Neurochemical Mechanisms, in: Cannabis in Medicine. An Evidence Based Approach, Springer Press, 2020.

Mental Health and Societal Impacts

- **Youth use has increased in states that legalized marijuana** for recreational purposes relative to other states and they are using more potent products (refs. and data, p.2-8).

- **Marijuana use leads to psychosis** in about one out of twenty daily users, an outcome more likely than from any other recreational drug (amphetamine, cocaine, LSD, PCP, opiates, alcohol). Warning labels would enable safer use of medical marijuana, but will not discourage unsafe use by most recreational users. The mental health impacts are greatest for youth, but can also occur in young adults and later in life (p. 9-11).

- **Psychosis is expensive $$$$**, for the individual, their family and society. The marijuana taxes are unlikely to cover this plus other social costs (e.g. p.12-13; see also p.19-20).

- **Drug-induced mental disorders are associated with becoming homeless**; homelessness now plagues major cities in states with recreational marijuana and the per capita homeless rate is over 2.5-times higher in those states (pages 14-15).

- **Marijuana is associated with increased risk for suicide** (p. 16).

- **A more unpredictable risk profile than two legal recreational drugs** (alcohol and nicotine):
    - Effects of alcohol can be predicted based on body weight and gender, but marijuana's effect is unpredictable; even those without a family history of psychosis can be vulnerable to its psychosis-inducing effects (pages 9-10)
    - The cancer risks from cigarette smoking usually take decades to occur, leaving time for the user to reverse youthful mistakes; marijuana-induced chronic psychotic disorders, can occur in the teen years and be lifelong (pages 9-10)

Environmental Impact

- **Marijuana cultivation in greenhouses and indoor grows is associated with a huge carbon footprint**, more than other types of industrial products on a standardized shipment value basis and more than any plant or animal grown for food (Mills, 2012; page 17)

Research published in a leading journal found youth use 25% higher in states that had legalized by 2015, as compared to states without legal recreational marijuana

Research

JAMA Psychiatry | Original Investigation

Association Between Recreational Marijuana Legalization in the United States and Changes in Marijuana Use and Cannabis Use Disorder From 2008 to 2016

Magdalena Cerdá, DrPH; Christine Mauro, PhD; Ava Hamilton, BA; Natalie S. Levy, MPH; Julián Santaella-Tenorio, DrPH; Deborah Hasin, PhD; Melanie M. Wall, PhD; Katherine M. Keyes, PhD; Silvia S. Martins, MD, PhD

IMPORTANCE Little is known about changes in marijuana use and cannabis use disorder (CUD) after recreational marijuana legalization (RML).

OBJECTIVES To examine the associations between RML enactment and changes in marijuana use, frequent use, and CUD in the United States from 2008 to 2016.

DESIGN, SETTING, AND PARTICIPANTS This survey study used repeated cross-sectional survey data from the National Survey on Drug Use and Health (2008-2016) conducted in the United States among participants in the age groups of 12 to 17, 18 to 25, and 26 years or older.

INTERVENTIONS Multilevel logistic regression models were fit to obtain estimates of before-vs-after changes in marijuana use among respondents in states enacting RML compared to changes in other states.

MAIN OUTCOMES AND MEASURES Self-reported past-month marijuana use, past-month frequent marijuana use, past-month frequent use among past-month users, past-year CUD, and past-year CUD among past-year users.

RESULTS The study included 505 796 respondents consisting of 51.51% females and 77.24% participants 26 years or older. Among the total, 65.43% were white, 11.90% black, 15.36% Hispanic, and 7.31% of other race/ethnicity. Among respondents aged 12 to 17 years, past-year CUD increased from 2.18% to 2.72% after RML enactment, a 25% higher increase than that for the same age group in states that did not enact RML (odds ratio [OR], 1.25; 95% CI, 1.01-1.55). Among past-year marijuana users in this age group, CUD increased from 22.80% to 27.20% (OR, 1.27; 95% CI, 1.01-1.59). Unmeasured confounders would need to be more prevalent in RML states and increase the risk of cannabis use by 1.08 to 1.11 times to explain observed results, indicating results that are sensitive to omitted variables. No associations were found among the respondents aged 18 to 25 years. Among respondents 26 years or older, past-month marijuana use after RML enactment increased from 5.65% to 7.10% (OR, 1.28; 95% CI, 1.16-1.40), past-month frequent use from 2.13% to 2.62% (OR, 1.24; 95% CI, 1.08-1.41), and past-year CUD from 0.90% to 1.23% (OR, 1.36; 95% CI, 1.08-1.71); these results were more robust to unmeasured confounding. Among marijuana users in this age group, past-month frequent marijuana use and past-year CUD did not increase after RML enactment.

CONCLUSIONS AND RELEVANCE This study's findings suggest that although marijuana legalization advanced social justice goals, the small post-RML increase in risk for CUD among respondents aged 12 to 17 years and increased frequent use and CUD among adults 26 years or older in this study are a potential public health concern. To undertake prevention efforts, further studies are warranted to assess how these increases occur and to identify subpopulations that may be especially vulnerable.

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Editorial
Author Audio Interview
Supplemental content

Author Affiliations: Author affiliations are listed at the end of this article.

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Results from one state (CA) mirrored what was seen in the aggregate of other states early during their post legalization period (youth use rose 23% in CA after legalization, but also found greatest impact on Asians and African Americans)

Recreational Marijuana Legalization and Use Among California Adolescents: Findings From a Statewide Survey

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[a]*Prevention Research Center, Pacific Institute for Research and Evaluation, Berkeley, California*

ABSTRACT. Objective: The legalization of recreational marijuana use and retail sales raises concerns about possible effects on marijuana use among adolescents. We evaluated the effects of recreational marijuana legalization (RML) in California in November 2016 on use among adolescents and investigated subgroup differences in these effects. **Method:** We analyzed data from successive cross-sectional samples of 7th, 9th, and 11th grade students (N = 3,330,912) who participated in the California Healthy Kids Survey from 2010–2011 to 2018–2019. Participants reported grade, sex, ethnicity, race, and lifetime and past-30-day marijuana use. **Results:** Multilevel analyses showed that RML was associated with increases in the likelihood of lifetime (odds ratio = 1.18, 95% CI [1.15, 1.21], $p < .01$) and past-30-day marijuana use (odds ratio = 1.23, 95% CI [1.20, 1.26], $p < .01$) relative to previous downward trends. RML was more strongly associated with increases in prevalence of marijuana use among 7th versus 9th and 11th graders, females versus males, non-Hispanic versus Hispanic youth, and White versus African American, American Indian/Native Alaskan, and multiracial youth. Overall, RML was not significantly associated with frequency of past-30-day use among users, although stronger positive associations between RML and frequency of use were found for 11th graders, Asian Americans, and African Americans. The association was weaker for females. **Conclusions:** RML in California was associated with an increase in adolescent marijuana use in 2017–2018 and 2018–2019. Demographic subgroup differences in these associations were observed. Evidence-based prevention programs and greater local control on retail marijuana sales may help to reduce marijuana availability and use among adolescents. (*J. Stud. Alcohol Drugs, 82,* 103–111, 2021)

IN RECENT YEARS there has been a move toward liberalization of marijuana laws in the United States. As of January 2021, recreational marijuana use is legal for adults who are at least 21 years old in 15 states (AK, AZ, CA, CO, IL, OR, MA, ME, MI, MO, NJ, NV, SD, VT, WA) and Washington, D.C., and recreational marijuana sales are legal in 10 of those 15 states (Alcohol Policy Information System, 2020). California legalized adult possession and recreational use of marijuana through ballot Proposition 64 on November 9, 2016, and retail sales of recreational marijuana beginning on January 1, 2018 (California Bureau of Cannabis Control, 2019a). Additional states have bills pending that would legalize adult recreational use of marijuana. This liberalization of marijuana laws raises public health concerns, especially about potential effects on marijuana use by adolescents, as marijuana use during adolescence has been associated with a range of adverse consequences (National Academies of Science, Engineering, and Medicine, 2017).

Research on the effects of recreational marijuana legalization (RML) on marijuana use among adolescents is relatively limited and results are mixed. A recent national study with Youth Risk Behavior Survey data found evidence of an 8% decrease in the likelihood of any past-30-day marijuana use and a 9% decrease in the likelihood of frequent past-30-day use among high school students after RML (Anderson et al., 2019). The authors conjectured that these counter-intuitive effects may, in part, reflect the closer regulation of the legal market, which made it more difficult for teens to obtain marijuana. A study by Cerdá et al. (2017) with national Monitoring the Future data found 2.0% and 4.1% increases in past-30-day marijuana use from pre-RML years (2010–2012) to post-RML years (2013–2015) among 8th and 10th graders, respectively, in Washington State, but decreases in marijuana use among 8th and 10th graders in states that did not legalize recreational marijuana use. However, no significant differences were observed for 12th graders in Washington State or among youth in all three grades in Colorado compared with those in non-RML states from 2010–2012 to 2013–2015. However, in a more recent study with data from the Washington Healthy Youth Survey, legalization of recreational marijuana in Washington State was associated with decreases in use among 8th and 10th graders, and no changes in use among 12th graders (Dilley et al., 2019). Also, in contrast to the study by Cerdá et al. (2017), results of the National Survey on Drug Use and Health indicated a significant increase in the prevalence of past-30-day marijuana use among 12- to 17-year-olds in Colorado, from 7.6% in 2006 to 12.6% in 2014 (after RML in 2012), compared with a smaller increase from 6.7% to 7.2% for adolescents in the United States as a whole (Colorado Department of Public Safety, 2016). A more recent study based on data from the Healthy Kids Colorado Survey

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Youth Use Trending Up More in Legalized States According to Most Recent Data (2019)

States with legalized recreational marijuana by 2018 are highlighted.
https://www.samhsa.gov/data/sites/default/files/reports/rpt32806/2019NSDUHsaeShortTermCHG/2019NSDUHsaeShortTermCHG/2019NSDUHsaeShortTermCHG.pdf

Youth use in 2018-2019 for the states with legal recreational marijuana now 55% higher than the states without legalization ($p < 0.0001$). *90% of states (9 plus DC) with recreational marijuana, experienced an increase in youth use from 2017-2018 to 2018-2019 ($p = 0.004$, significant, paired t-test of 10), in contrast to 63% of states without recreational marijuana (non-significant increase, paired t-test of 41).*

NSDUH Tables www.samhsa.gov

200925

Table 3 *Marijuana Use in the Past Month*, by Age Group and State: Percentages, Annual Averages, and *P* Values from Tests of Differences between Percentages, 2017-2018 and 2018-2019 NSDUHs

State	12+ (2017-2018)	12+ (2018-2019)	12+ (*P* Value)	12-17 (2017-2018)	12-17 (2018-2019)	12-17 (*P* Value)	18-25 (2017-2018)	18-25 (2018-2019)	18-25 (*P* Value)	26+ (2017-2018)	26+ (2018-2019)	26+ (*P* Value)	18+ (2017-2018)	18+ (2018-2019)	18+ (*P* Value)
Total U.S.	9.83[a]	10.80	0.000	6.56[a]	7.02	0.012	22.12	22.54	0.187	8.25[a]	9.39	0.000	10.16[a]	11.17	0.000
Northeast	10.25[a]	11.42	0.000	6.82[b]	7.37	0.065	24.74	24.88	0.834	8.35[a]	9.78	0.000	10.56[a]	11.79	0.000
Midwest	9.39[a]	10.28	0.000	6.47	6.64	0.507	21.85	22.47	0.293	7.70[a]	8.74	0.000	9.69[a]	10.65	0.000
South	7.96[a]	8.87	0.000	5.89	6.13	0.313	18.89	18.97	0.874	6.47[a]	7.62	0.000	8.17[a]	9.15	0.000
West	12.89[a]	13.87	0.000	7.55[a]	8.54	0.003	25.51	26.53	0.142	11.48[a]	12.49	0.003	13.44[a]	14.41	0.001
Alabama	8.31	8.67	0.467	6.18	5.80	0.520	18.67	18.34	0.798	6.91	7.49	0.341	8.53	8.96	0.424
Alaska	16.56	17.25	0.392	7.88	8.54	0.395	26.27[a]	30.71	0.015	16.10	16.25	0.882	17.51	18.20	0.444
Arizona	10.93	11.00	0.903	6.28	6.04	0.717	21.07	20.80	0.857	9.83	10.01	0.818	11.41	11.51	0.882
Arkansas	8.60	8.46	0.807	5.62	5.82	0.753	16.20	15.80	0.747	7.73	7.60	0.860	8.91	8.73	0.782
California	11.97[a]	13.47	0.000	7.05[a]	8.85	0.000	25.06	26.48	0.150	10.39[a]	11.91	0.002	12.46[a]	13.93	0.001
Colorado	17.33	17.39	0.941	9.39	9.75	0.692	33.21	34.39	0.521	15.73	15.62	0.913	18.12	18.15	0.978
Connecticut	12.06	12.34	0.691	8.35	7.46	0.239	30.08[b]	27.22	0.088	9.58	10.52	0.264	12.42	12.81	0.613
Delaware	11.16	12.26	0.106	8.19	8.26	0.924	26.72	27.58	0.615	9.22	10.53	0.102	11.44	12.63	0.106
District of Columbia	16.63	16.39	0.793	8.47	8.99	0.521	32.49	30.73	0.379	14.25	14.30	0.967	17.09	16.80	0.771
Florida	9.28[a]	10.11	0.035	7.06	6.47	0.241	22.88	21.45	0.157	7.67[a]	8.96	0.007	9.47[a]	10.42	0.027
Georgia	8.23[a]	9.20	0.026	6.05	6.04	0.991	20.18	19.56	0.595	6.53[a]	7.91	0.011	8.47[a]	9.55	0.026
Hawaii	8.80[a]	10.12	0.043	5.31	6.29	0.190	16.70	18.77	0.131	8.09[b]	9.38	0.099	9.11[b]	10.47	0.055
Idaho	8.21	8.57	0.458	6.28	5.90	0.530	16.49	18.21	0.188	7.11	7.36	0.677	8.45	8.89	0.407
Illinois	9.64[b]	10.38	0.072	6.86	7.01	0.781	22.59	21.74	0.463	7.92[a]	9.00	0.028	9.93[b]	10.72	0.080
Indiana	10.20[a]	11.56	0.022	6.77	7.52	0.308	22.85[b]	25.63	0.061	8.46[b]	9.66	0.091	10.57[a]	11.98	0.029
Iowa	7.04	6.70	0.437	5.36	5.71	0.559	17.54	16.16	0.294	5.39	5.18	0.677	7.21	6.80	0.390
Kansas	6.34[a]	7.48	0.021	4.53	5.00	0.349	14.54	15.39	0.513	5.13[a]	6.42	0.034	6.54[a]	7.75	0.026
Kentucky	8.19[a]	9.75	0.005	5.93	6.18	0.694	17.42	18.96	0.255	6.98[a]	8.71	0.010	8.42[a]	10.11	0.005
Louisiana	7.69	7.74	0.919	5.12	4.99	0.809	18.83	18.47	0.788	6.22	6.39	0.765	7.96	8.03	0.899
Maine	16.57	17.58	0.248	10.31	10.93	0.526	35.17	35.12	0.980	14.75	15.97	0.250	17.09	18.13	0.275
Maryland	9.90[b]	10.99	0.084	6.96	7.07	0.872	24.71	26.37	0.296	8.01	9.16	0.128	10.19[b]	11.37	0.086
Massachusetts	13.60[b]	14.91	0.086	9.33	9.72	0.663	31.39	31.01	0.834	11.02[b]	12.73	0.067	13.98[b]	15.36	0.093
Michigan	12.61[a]	13.80	0.021	7.87	7.42	0.453	27.50	29.30	0.131	10.70[a]	12.02	0.040	13.08[a]	14.42	0.017
Minnesota	9.48	9.96	0.357	6.25	6.53	0.655	22.09	22.47	0.798	7.89	8.44	0.379	9.81	10.31	0.380
Mississippi	6.98[b]	7.88	0.076	4.96	5.68	0.201	15.26	16.99	0.164	5.83	6.65	0.178	7.21[b]	8.12	0.099
Missouri	8.57	8.99	0.409	6.21	5.88	0.597	19.96	20.73	0.584	7.03	7.52	0.428	8.81	9.30	0.375
Montana	14.46	14.92	0.544	9.65	9.77	0.886	27.30	29.85	0.127	12.96	13.18	0.819	14.91	15.40	0.551

See notes at end of table. (continued)

Continued.....

200925

Table 3 *Marijuana Use in the Past Month*, **by Age Group and State: Percentages, Annual Averages, and *P* Values from Tests of Differences between Percentages, 2017-2018 and 2018-2019 NSDUHs (continued)**

State	12+ (2017-2018)	12+ (2018-2019)	12+ (*P* Value)	12-17 (2017-2018)	12-17 (2018-2019)	12-17 (*P* Value)	18-25 (2017-2018)	18-25 (2018-2019)	18-25 (*P* Value)	26+ (2017-2018)	26+ (2018-2019)	26+ (*P* Value)	18+ (2017-2018)	18+ (2018-2019)	18+ (*P* Value)
Nebraska	8.21	8.43	0.624	6.16	6.75	0.357	20.54	21.24	0.605	6.30	6.43	0.825	8.43	8.62	0.712
Nevada	15.05	16.10	0.215	9.17	9.67	0.584	32.09	31.49	0.736	13.31	14.69	0.188	15.64	16.74	0.234
New Hampshire	14.24	14.05	0.793	8.84	8.18	0.400	29.95	30.16	0.908	12.41	12.25	0.853	14.72	14.56	0.838
New Jersey	7.89[a]	8.99	0.015	5.61[a]	6.69	0.050	21.08	22.50	0.324	6.21[a]	7.30	0.042	8.11[a]	9.22	0.025
New Mexico	12.98	12.43	0.448	9.58	9.83	0.790	23.96	23.48	0.775	11.62	10.99	0.475	13.34	12.70	0.423
New York	9.77[a]	11.02	0.002	6.62	7.20	0.260	24.22	24.45	0.831	7.81[a]	9.35	0.002	10.05[a]	11.36	0.002
North Carolina	7.79[a]	9.16	0.003	6.66	6.87	0.726	19.24	19.41	0.892	6.13[a]	7.83	0.002	7.91[a]	9.39	0.003
North Dakota	7.62	7.67	0.906	4.93	4.76	0.769	17.12	17.10	0.986	6.03	6.19	0.772	7.87	7.95	0.873
Ohio	8.34[a]	10.22	0.000	6.16	6.45	0.588	20.67	22.02	0.231	6.66[a]	8.82	0.000	8.56[a]	10.60	0.000
Oklahoma	7.51[a]	10.07	0.000	5.31	5.84	0.382	17.57	19.22	0.268	6.09[a]	9.09	0.000	7.75[a]	10.54	0.000
Oregon	18.83	18.69	0.876	9.71	10.74	0.313	33.11	32.64	0.786	17.68	17.49	0.863	19.65	19.40	0.794
Pennsylvania	8.38[a]	9.83	0.001	5.31[b]	6.11	0.086	19.71	19.80	0.931	6.98[a]	8.73	0.001	8.66[a]	10.17	0.001
Rhode Island	14.65	15.37	0.362	8.61	8.30	0.700	29.26	31.00	0.307	12.70	13.40	0.459	15.17	15.98	0.344
South Carolina	8.32	9.17	0.121	6.34	6.56	0.717	19.18	18.34	0.525	6.89[b]	8.09	0.073	8.51	9.42	0.129
South Dakota	7.12[b]	6.35	0.084	5.26	5.10	0.779	17.70[a]	14.74	0.019	5.58	5.13	0.394	7.31[b]	6.49	0.088
Tennessee	8.55	8.75	0.692	6.11	5.70	0.508	19.88	18.22	0.237	7.07	7.65	0.339	8.79	9.05	0.639
Texas	6.06[a]	7.19	0.000	4.82[a]	5.94	0.010	14.67	15.51	0.308	4.72[a]	5.92	0.001	6.21[a]	7.34	0.001
Utah	6.06	6.42	0.366	4.46	4.58	0.803	13.81	14.50	0.561	4.62	4.96	0.491	6.28	6.68	0.379
Vermont	19.30	19.74	0.626	12.67	12.84	0.875	37.67	38.99	0.514	16.76	17.11	0.757	19.84	20.30	0.641
Virginia	7.27	7.89	0.133	5.64	5.41	0.664	19.50	20.26	0.545	5.53	6.25	0.140	7.43	8.13	0.120
Washington	16.39	17.75	0.119	9.94	9.92	0.984	30.44	31.80	0.442	15.01	16.54	0.148	17.01	18.49	0.117
West Virginia	9.42	9.48	0.910	6.25	7.05	0.212	18.91	20.88	0.189	8.37	8.12	0.704	9.70	9.69	0.998
Wisconsin	8.89	9.05	0.773	6.09	6.58	0.414	21.24	20.67	0.675	7.22	7.48	0.684	9.17	9.29	0.838
Wyoming	7.73	7.38	0.447	6.34	5.88	0.445	17.57	17.73	0.909	6.38	5.98	0.466	7.88	7.53	0.503

NOTE: State and census region estimates are based on a survey-weighted hierarchical Bayes estimation approach, with their *p* values being the Bayes significance levels for the null hypothesis of no change between the 2017-2018 and 2018-2019 population percentages. The "Total U.S." estimates, along with the *p* values, are based on design-based (direct) estimation methods.

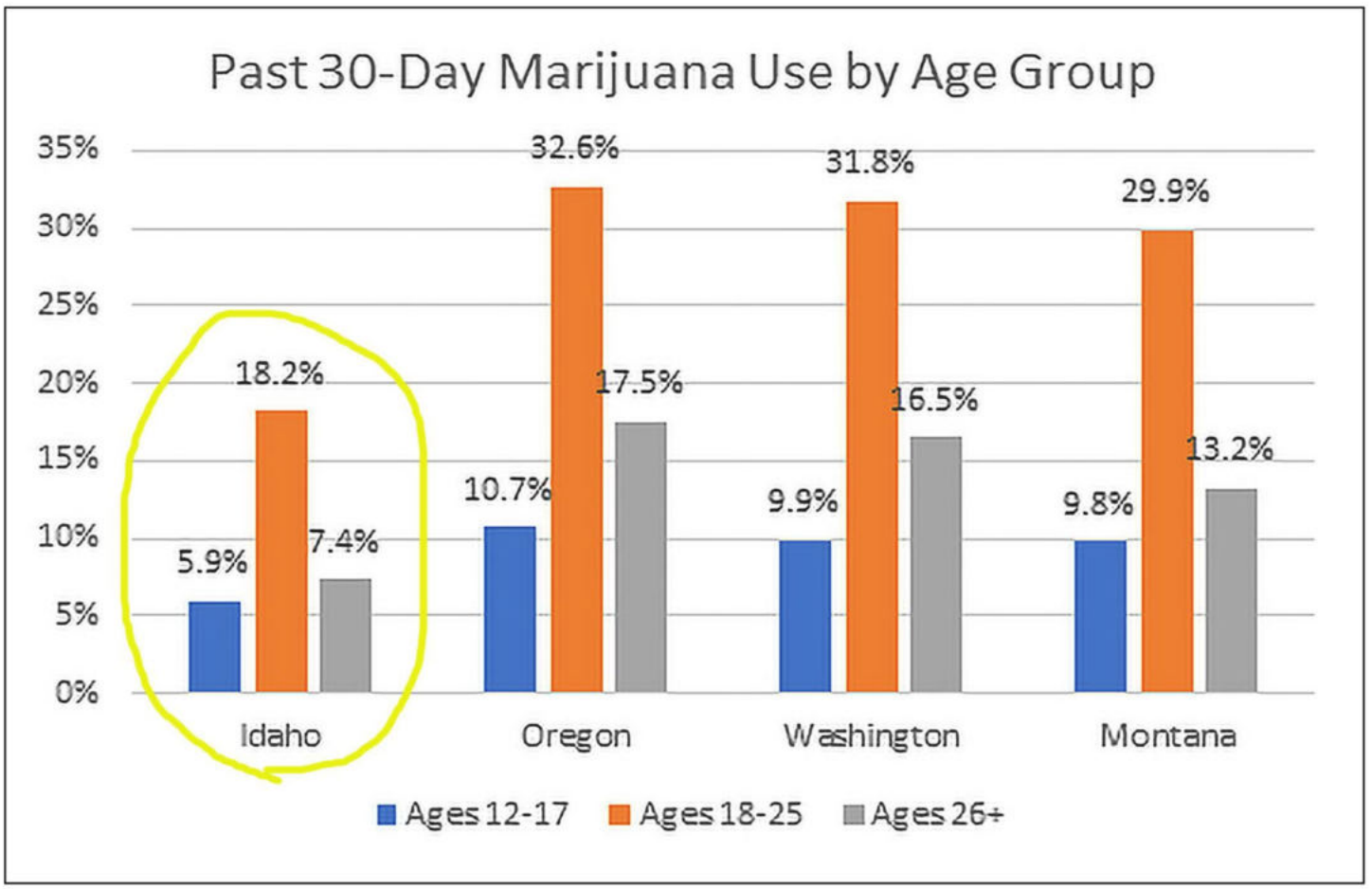
[a] Difference between the 2017-2018 and 2018-2019 population percentages is statistically significant at the 0.05 level.

[b] Difference between the 2017-2018 and 2018-2019 population percentages is statistically significant at the 0.10 level.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2017, 2018, and 2019.

Idaho, with no legal marijuana, is adjacent to states with recreational marijuana, but has managed to maintain much lower marijuana use rates than its neighbors

Figure provided by the Idaho Department of Health, 2020, based on NSDUH data for 2019, www.SAMHSA.org



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U.S. cannabis legalization and use of vaping and edible products among youth (vaping of concentrates, potent THC products)

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Background—Alternative methods for consuming cannabis (e.g., vaping and edibles) have become more popular in the wake of U.S. cannabis legalization. Specific provisions of legal cannabis laws (LCL) (e.g., dispensary regulations) may impact the likelihood that youth will use alternative methods and the age at which they first try the method - potentially magnifying or mitigating the developmental harms of cannabis use.

Results—Longer LCL duration (OR_{vaping}: 2.82, 95% CI: 2.24, 3.55; $OR_{edibles}$: 3.82, 95% CI: 2.96, 4.94), and higher dispensary density (OR_{vaping}: 2.68, 95% CI: 2.12, 3.38; $OR_{edibles}$: 3.31, 95% CI: 2.56, 4.26), were related to higher likelihood of trying vaping and edibles. Permitting home cultivation was related to higher likelihood (OR: 1.93, 95% CI: 1.50, 2.48) and younger age of onset (β: −0.30, 95% CI: −0.45, −0.15) of edibles.

Discussion

This study examined relations among specific provisions of LCL and cannabis vaping and use of edibles in youth ages 14–18. Consistent with our previous study of adult cannabis users recruited via Facebook, the present analyses indicated that longer LCL duration and higher dispensary density were related to a higher likelihood of lifetime vaping and edible use. The current study extended those findings by showing that provisions for recreational cannabis use and for permitting home cultivation were also related to a higher likelihood of lifetime vaping and edible use. Some of these increased likelihoods were substantial. For example, living in a high dispensary density state doubled the likelihood of trying vaping and tripled the likelihood of trying edibles.

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Youth admitted for marijuana-related psychiatric episodes in Colorado more than doubled by the 3rd year of legalization

Journal of Adolescent Health 63 (2018) 239–241

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Adolescent health brief

Impact of Marijuana Legalization in Colorado on Adolescent Emergency and Urgent Care Visits

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A B S T R A C T

Purpose: Approximately 6%–8% of U.S. adolescents are daily/past-month users of marijuana. However, survey data may not reliably reflect the impact of legalization on adolescents. The objective was to evaluate the impact of marijuana legalization on adolescent emergency department and urgent cares visits to a children's hospital in Colorado, a state that has allowed both medical and recreational marijuana.
Methods: Retrospective review of marijuana-related visits by International Classification of Diseases codes and urine drug screens, from 2005 through 2015, for patients ≥ 13 and < 21 years old.
Results: From 2005 to 2015, 4,202 marijuana-related visits were identified. Behavioral health evaluation was obtained for 2,813 (67%); a psychiatric diagnosis was made for the majority (71%) of these visits. Coingestants were common; the most common was ethanol (12%). Marijuana-related visits increased from 1.8 per 1,000 visits in 2009 to 4.9 in 2015. ($p = < .0001$)
Conclusions: Despite national survey data suggesting no appreciable difference in adolescent marijuana use, our data demonstrate a significant increase in adolescent marijuana-associated emergency department and urgent cares visits in Colorado.

IMPLICATIONS AND CONTRIBUTION

Adolescent marijuana-associated emergency department and urgent cares visits increased in a state that has legalized medical and recreational marijuana. As more states begin to legalize marijuana, it is critical that multiple modalities of surveillance are used to fully evaluate the health impact on the adolescent population.

According to national survey data, 6%–8% of adolescents in the U.S. are daily or past-month users of marijuana and their risk perception of use has decreased [1,2]. Although over 50% of states have legalized marijuana, usage rates have remained similar [3,4].

In one of the first states to legalize recreational marijuana use, subanalyses from national data sources have suggested increased adolescent marijuana use in Washington [5]. On the contrary, Colorado, another state that has legalized medical and recreational marijuana, has not confirmed these findings [5,6]. However, survey data may not reliably reflect the impact of legalization on adolescent health, in part due to the heterogeneity of decriminalization practices across the United States [7]. Futhermore, the impact of legalization on other comorbid aspects of adolescent health, such as drug use and behavioral health, needs to be better understood [8,9]. The Drug Abuse Warning Network reported a 61% increase of marijuana-related emergency

Conflict of Interest: Dr. Wang receives royalties from UpToDate for authorship contributions to related topics. He also has a Colorado Department of Public Health and Environment grant evaluating the pharmacokinetics of CBD in pediatric epilepsy.

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Marijuana Use and Psychotic Disorders: Proof of Causation

(links to cited references on following page, p.7)

- **Dose-response effect**: the stronger the marijuana, the more frequent its use, the more likely a psychotic outcome (Zammit et al., 2002; van Os et al., 2002; DiForti et al., 2015). On average, the effect is a 4-fold to 5-fold increased risk for heavy use of moderate to high strength product (Marconi et al., 2016; Di Forti et al., 2019), meaning one out of twenty heavy users develop some type of psychotic disorder over time.

- **Marijuana use generally precedes the psychosis, not vice-versa**: well controlled, prospective studies of thousands of teenagers (Arseneault et al., 2002; Henquet et al., 2005; Kuepper et al., 2011)

- **Administration of purified THC in the clinic elicits psychotic symptoms in subjects who lack a family history of psychosis** (D'Souza et al., 2004; Morrison et al., 2011; Freeman et al., 2015), specifically, in about 40% of subjects (Morrison et al., 2011; Bhattacharyya et al., 2012).

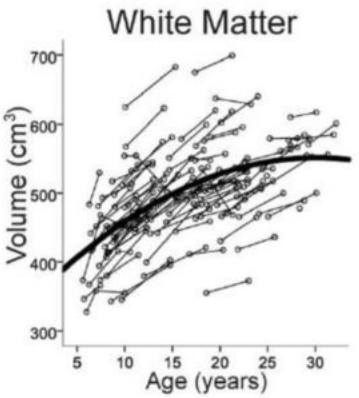
- **Those who experience psychotic symptoms from marijuana use and who quit are more likely to recover** than those who persist in using (Gonzalez-Pinto et al., 2009; Kuepper et al., 2011; Schoeler et al., 2016)

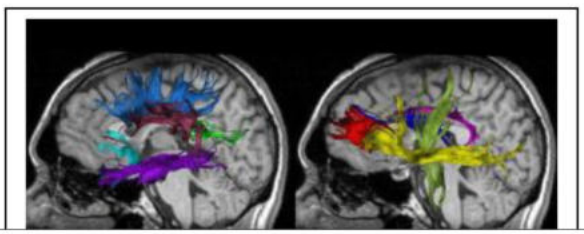
- **Of all the recreational drugs of abuse, it is marijuana that leads to a chronic psychotic disorder in the highest percentage of users** (Nielsen et al., 2017); of those who experience a drug-induced psychotic break, approximately 50% of the marijuana users do not recover (Arendt et al., 2008; Niemi-Pynttari et al., 2013), a higher risk than for amphetamines, cocaine, or hallucinogens like PCP and LSD (Niemi-Pynttari et al., 2013; Starzer et al., 2017).

- **As marijuana use disorders have increased, the incidence of marijuana-induced schizophrenia** has increased in a country that tracks both disorders (Hjorthoj et al., 2020). The U.S. does not track psychotic disorders, although hospitalizations for marijuana-induced psychosis have noticably increased in Colorado https://www.uchealth.org/today/marijuana-related-er-visits-rising-dramatically-edibles-spraking-particular-concerns/

- **All of these effects are more pronounced in (but not limited to) the developing brain, where structural changes from marijuana use have been observed in longitudinal studies**: decreased functional connectivity between the anterior cingulate cortex and the superior frontal gyrus (Camchong et al., 2017); it should be noted that data from representative controls show the brain continues to develop until the late twenties (Lebel and Beaulieu, 2011, figures below).

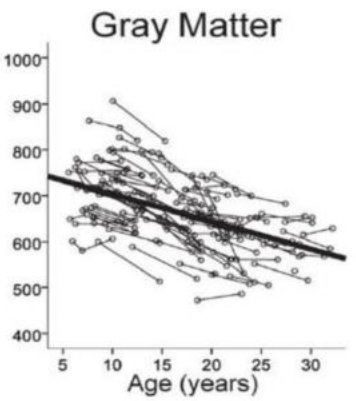
Wiring of cortical and subcortical white matter continues through late 20's; healthy controls





Key fiber tracts in a 22 year old representative male: lavender=cingulum; limegreen=corticospinal; yellow=inf.-fronto-occipital; red=genu-CC; darkerblue=sup.-fronto-occipital; royal-purple=inf.longitudinal; turquoise=uncinate; kelly-green=spleniumCC; crimson=sup.-longitudinal; lighterblue=body-of-CC; where CC is corpus collosum

"Pruning" of unnecessary gray matter also continues through late 20's; thought to be important for proper brain function; healthy controls



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Note: You can copy and paste links into your browser if necessary to access articles

https://www.cbc.ca/news/canada/nova-scotia/covid-19-mental-health-substance-use-1.5829149

Study looks at link between substance use and psychosis during pandemic

In-patient admissions in Halifax increased for the 35-44 age group during early days of COVID

Michael Gorman · CBC News · Posted: Dec 05, 2020 6:00 AM AT | Last Updated: December 5, 2020

Dr. Jason Morrison is interim chief of psychiatry for Nova Scotia Health's Central Zone. (CBC)

In the months after a state of emergency was declared in Nova Scotia and widespread lockdowns were initiated, the interim chief of psychiatry for Nova Scotia Health's central zone said in-patient doctors started noticing changes in who was coming to hospital.

The frequency where substance use was thought to be a contributing factor was also higher than usual.

"Typically, we see someone with the first episode of psychosis in their teens or their 20s, so to see previously well people with no psychiatric history developing a first psychosis in their 30s and 40s was very unusual," said Morrison.

It was that finding and the increased association with drug use — in particular cannabis and cocaine — that caused Morrison's team at the hospital to decide to take a closer look.

Morrison said there is lots of research when it comes to substance-related psychosis in young people who use daily, but the surprise was the findings for patients between 35 and 44 years old.

"We typically say if you're going to start smoking cannabis a lot, wait until you're after 25 at least, and I think this study kind of made us pause a little bit about that," he said.

If people are going to be using cannabis daily, Morrison recommends they consider products with lower THC levels.

$91 billion dollars annual cost to U.S. in 2021 dollars

The Economic Burden of Schizophrenia in the United States in 2002

Eric Q. Wu, Ph.D.; Howard G. Birnbaum, Ph.D.; Lizheng Shi, Ph.D.; Daniel E. Ball, M.B.A.; Ronald C. Kessler, Ph.D.; Matthew Moulis, B.A.; and Jyoti Aggarwal, M.H.S.

Objective: This study quantifies excess annual costs associated with schizophrenia patients in the United States in 2002 from a societal perspective.

Method: Annual direct medical costs associated with schizophrenia were estimated separately for privately (N = 1090) and publicly (Medicaid; N = 14,074) insured patients based on administrative claims data, including a large private claims database and the California Medicaid program (Medi-Cal) database, and compared separately to demographically/geographically matched control samples (1 case:3 controls). Medicare costs of patients over age 65 years were imputed using the Medicare/Medi-Cal dual-eligible patients (N = 1491) and published statistics. Excess annual direct non–health care costs were estimated for law enforcement, homeless shelters, and research/training related to schizophrenia. Excess annual indirect costs were estimated for 4 components of productivity loss: unemployment, reduced workplace productivity, premature mortality from suicide, and family caregiving using a human capital approach based on market wages. All costs were adjusted to 2002 dollars using the Medical Care Consumer Price Index and were based on the reported prevalence in the National Comorbidity Survey Replication.

Results: The overall U.S. 2002 cost of schizophrenia was estimated to be $62.7 billion, with $22.7 billion excess direct health care cost ($7.0 billion outpatient, $5.0 billion drugs, $2.8 billion inpatient, $8.0 billion long-term care). The total direct non–health care excess costs, including living cost offsets, were estimated to be $7.6 billion. The total indirect excess costs were estimated to be $32.4 billion.

Conclusion: Schizophrenia is a debilitating illness resulting in significant costs. The indirect excess cost due to unemployment is the largest component of overall schizophrenia excess annual costs.

(J Clin Psychiatry 2005;66:1122–1129)

Received March 14, 2005; accepted June 20, 2005. From Analysis Group, Inc., Boston, Mass. (Drs. Wu and Birnbaum, Mr. Moulis, and Ms. Aggarwal); Eli Lilly and Company, Indianapolis, Ind. (Dr. Shi and Mr. Ball); the Departments of Health System Management and Psychiatry and Neurology, Tulane University, New Orleans, La. (Dr. Shi); and the Department of Health Care Policy, Harvard Medical School, Boston, Mass. (Dr. Kessler).

Research was funded by an unrestricted research grant from Eli Lilly and Company, Indianapolis, Ind.

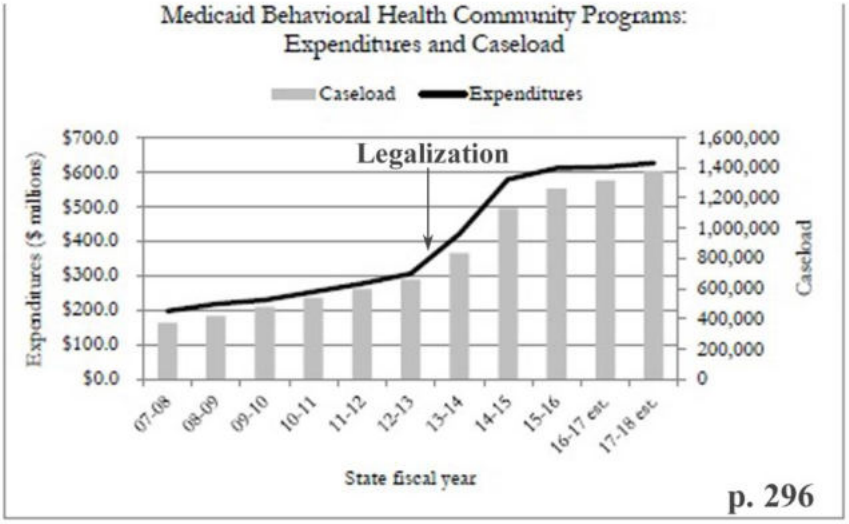
Drs. Wu, Birnbaum, and Kessler and Mr. Moulis and Ms. Aggarwal have served as consultants for Lilly. Dr. Shi is no longer an employee of Lilly. Mr. Ball is an employee and stockholder of Lilly.

Corresponding author and reprints: Eric Q. Wu, Ph.D., Analysis Group, Inc., 111 Huntington Ave., 10th Floor, Boston, MA 02199 (e-mail: ewu@analysisgroup.com).

The American Psychiatric Association (APA) Guidelines[1] define schizophrenia as a chronic and debilitating mental illness in which patients often have a diminished capacity for learning, working, self-care, interpersonal relationships, and maintaining general living skills. Crown et al.[2] estimate that 40% to 60% of schizophrenia patients are likely to suffer from lifelong impairments. Kessler et al.[3] state that schizophrenia affects a minimum of 0.5% (range, 0.3%–1.6%) of the U.S. population, although they note that this survey-based prevalence estimate is a lower bound due to the underrepresentation of schizophrenia patients in epidemiologic surveys.

Previous U.S. cost-of-illness studies have documented that schizophrenia is a costly disease. Cost-of-schizophrenia studies in the early 1990s by Wyatt et al.[4] and Rice and Miller[5] estimated the annual costs of schizophrenia to be $65 billion and $33 billion, respectively. These estimates should be considered as measures of the economic impact of the disease to society, i.e., excess costs of patients with schizophrenia compared to their costs had they never had schizophrenia. The 2 studies' estimates of total direct costs were similar, in the range of $18 billion to $19 billion. The discrepancy between their total cost estimates arises mainly from differences in estimated indirect costs due to inclusion of different cost components, application of different methodologies, and use of different data sources. For example, to estimate lost earnings from premature mortality, Wyatt et al.[4] applied a steady-state methodology, whereas Rice and Miller[5] projected the earnings for the duration of the patient's life, had that person not committed suicide, and discounted the results to 1990 values.

Medicaid Behavioral Health Caseload Increased Substantially in Colorado after Legalization



https://leg.colorado.gov/publications/fy-2017-18-appropriations-report

Proportion of homeless individuals who have mental Illness from a study in California, very many with a substance abuse disorder (note, marijuana is leading drug for triggering chronic psychosis, Niemi-Pynttari et al., 2013; Starzer et al., 2017):

https://www.capolicylab.org/wp-content/uploads/2019/10/Health-Conditions-Among-Unsheltered-Adults-in-the-U.S.pdf

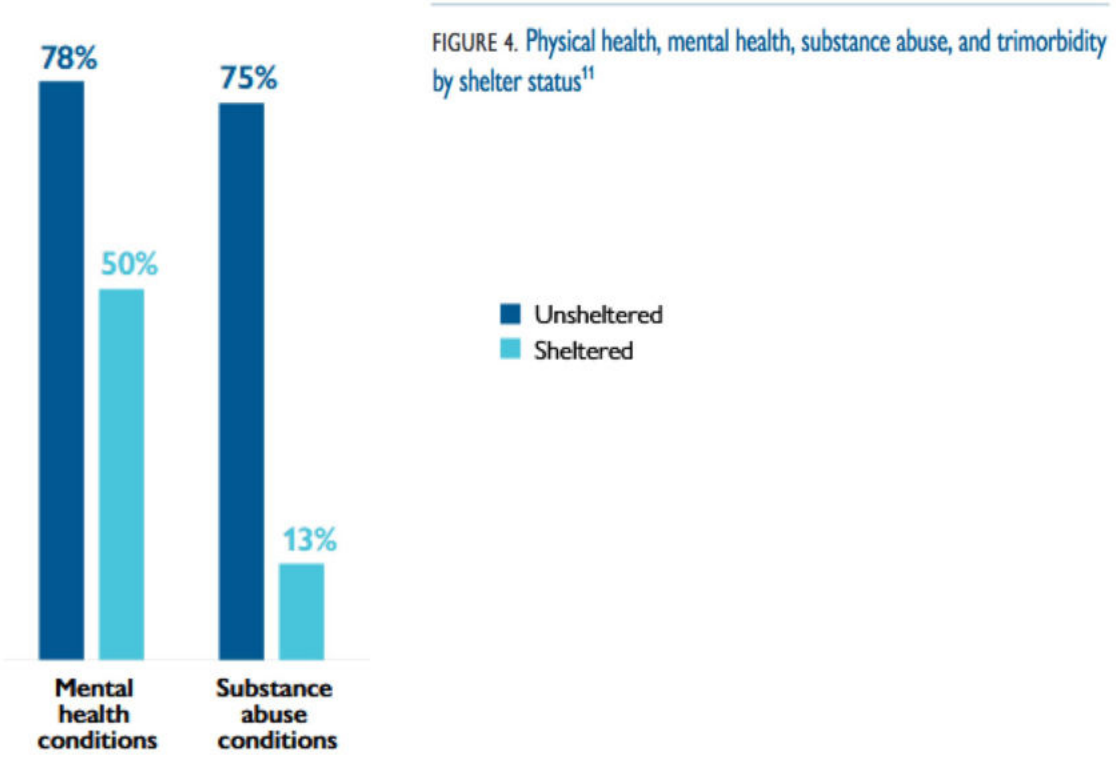


FIGURE 4. Physical health, mental health, substance abuse, and trimorbidity by shelter status[11]

And 68% of the mentally-ill homeless are reported to have a schizophrenia spectrum disorder: https://pubmed.ncbi.nlm.nih.gov/23703373/

Relaxing drug laws, starting with marijuana, has been paralleled by a growth in homelessness for cities in legalized states:

Seattle: https://www.youtube.com/watch?v=WijoL3Hy_Bw

San Francisco: https://www.city-journal.org/san-francisco-homelessness

Los Angeles: https://www.bbc.com/news/world-us-canada-49687478

Denver: https://www.9news.com/article/news/health/denver-lincoln-park-closure-rat-infestation/73-adfe2028-01ae-492e-a568-9c30ec816512

https://denverite.com/2020/01/15/in-definitely-not-a-sweep-denver-police-close-lincoln-park-ask-people-to-remove-their-tents/

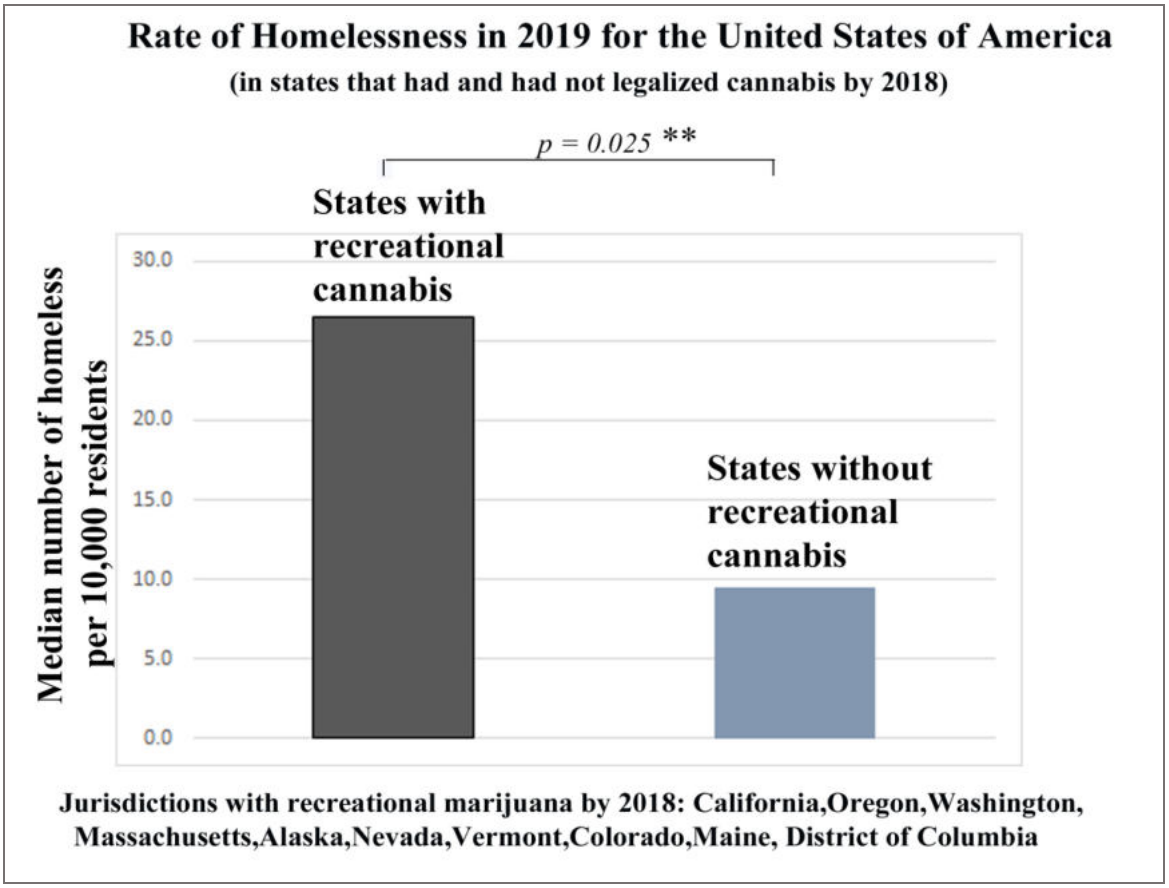
Anchorage: https://www.ktoo.org/2018/07/20/anchorage-struggles-to-balance-homeless-camping-problems/

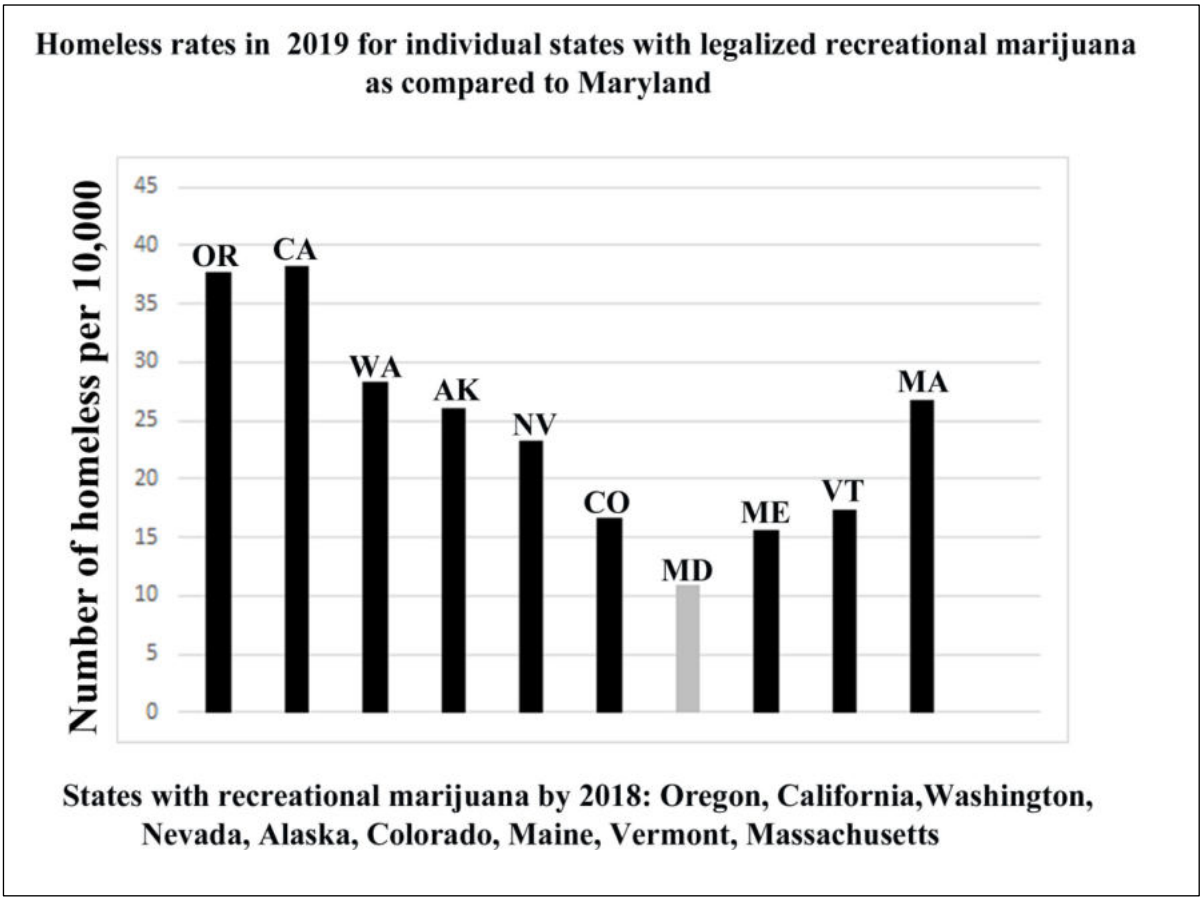
Portland: https://www.oregonlive.com/portland/2018/06/portland_homeless_accounted_fo.html

With even international news speculating that marijuana legalization may be a contributing factor: https://www.theguardian.com/us-news/2017/feb/27/marijuana-legal-homeless-denver-colorado

States with recreational marijuana have greater rates of homelessness

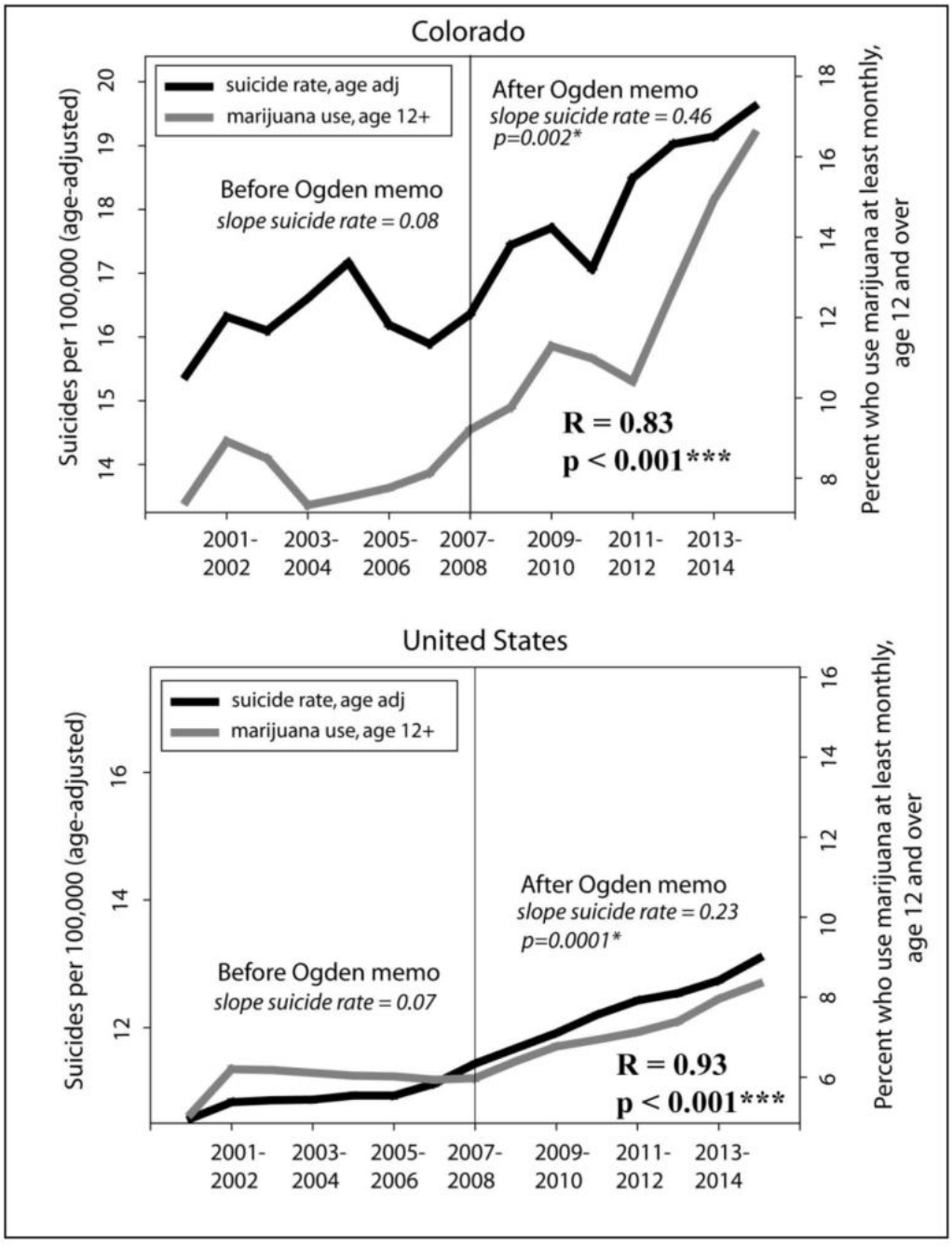
source: https://www.usich.gov/homelessness-statistics





Marijuana Use and Suicide

In addition to numerous case-control[1-3] and prospective studies[4] showing an association between marijuana use and the risk for suicide, a recent study demonstrated a dose-response effect[5]. Real world data backs up the epidemiological findings:



Multiple linear regression of the relationship between marijuana use rates and suicide rates in Colorado and in the U.S. as a whole, showed a highly significant relationship, even after correcting for other drug use rates and unemployment rates.

Figure 2 from: Miller CL, Jackson MC, Sabet K. Marijuana and Suicide: Case-control Studies, Population Data, and Potential Neurochemical Mechanisms, in: Cannabis in Medicine. An Evidence Based Approach (K Finn, ed.) Springer Press, 2020: https://www.springer.com/fr/book/9783030459673?gclid=EAIaIQobChMIrp_0wfjR6QIVSY2FCh1xfA-ZEAEYASABEgJuX_D_BwE#aboutAuthors.

1) https://www.journalofsubstanceabusetreatment.com/article/S0740-5472(12)00382-0/fulltext

2) https://europepmc.org/backend/ptpmcrender.fcgi?accid=PMC4219077&blobtype=pdf

3) https://www.thelancet.com/journals/lanpsy/article/PIIS2215-0366(14)70307-4/fulltext

4) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6450286/ 5) https://www.tandfonline.com/doi/full/10.1080/13811118.2020.1804025

The global warming impact of legal marijuana, predominantly grown indoors or in greenhouses in Maryland, is greater than other industrial sectors per dollar value of the product.

The production of one pound of marijuana is associated with a CO2 emission of 4600 pounds because of the electricity required (Mills, 2012), http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.396.4759&rep=rep1&type=pdf a carbon budget sufficient to cover thousands of meals for the needy (http://css.umich.edu/sites/default/files/Carbon%20Footprint_CSS09-05_e2019.pdf). **The most recent statistics for medical marijuana sold in Maryland was expected to have reached 34,500 pounds in 2019**, https://mjbizdaily.com/chart-marylands-2019-medical-cannabis-sales-on-pace-to-double-2018-sales/ almost exclusively grown indoors or in greenhouses, **the equivalent of 159 million pounds of CO2 per year**. If legalized to be produced here, the growth of recreational product would be expected to be at least double that of the medical product based on market statistics from Colorado, bringing the total (medical plus recreational) marijuana CO2 footprint to nearly 500 million pounds per year in Maryland. https://www.colorado.gov/pacific/revenue/colorado-marijuana-sales-reports

In contrast, the illegal recreational marijuana currently imported from grows in more favorable climates, is predominantly grown outdoors and with a very low CO2 footprint.

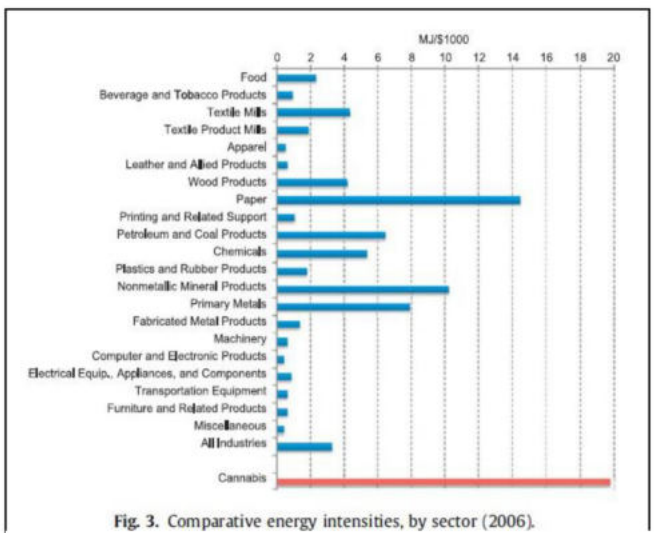


Fig. 3. Comparative energy intensities, by sector (2006).

Mills et al., 2012
http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.396.4759&rep=rep1&type=pdf

see also:

https://www.researchgate.net/publication/342364745_Energy_Use_by_the_Indoor_Cannabis_Industry_Inconvenient_Truths_for_Producers_Consumers_and_Policymakers

https://eq-research.com/wp-content/uploads/2016/09/A-Chronic-Problem.pdf

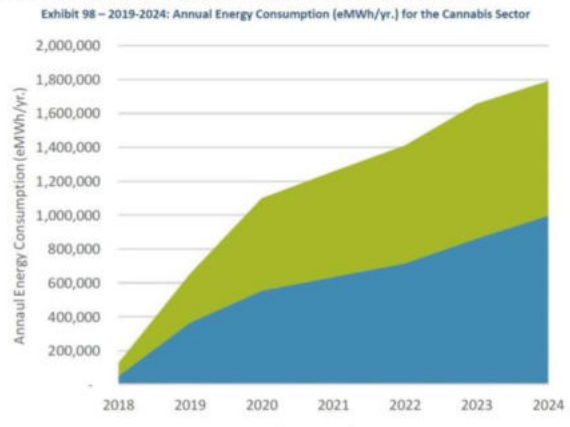
https://electricityplans.com/power-consumption-for-cannabis-growers/

https://docplayer.net/55499365-Surprising-energy-requirements.html

https://pubs.acs.org/doi/pdf/10.1021/acs.est.6b06343

Projections of growth in energy consumption by the cannabis industry in Canada, a much smaller population than the U.S.

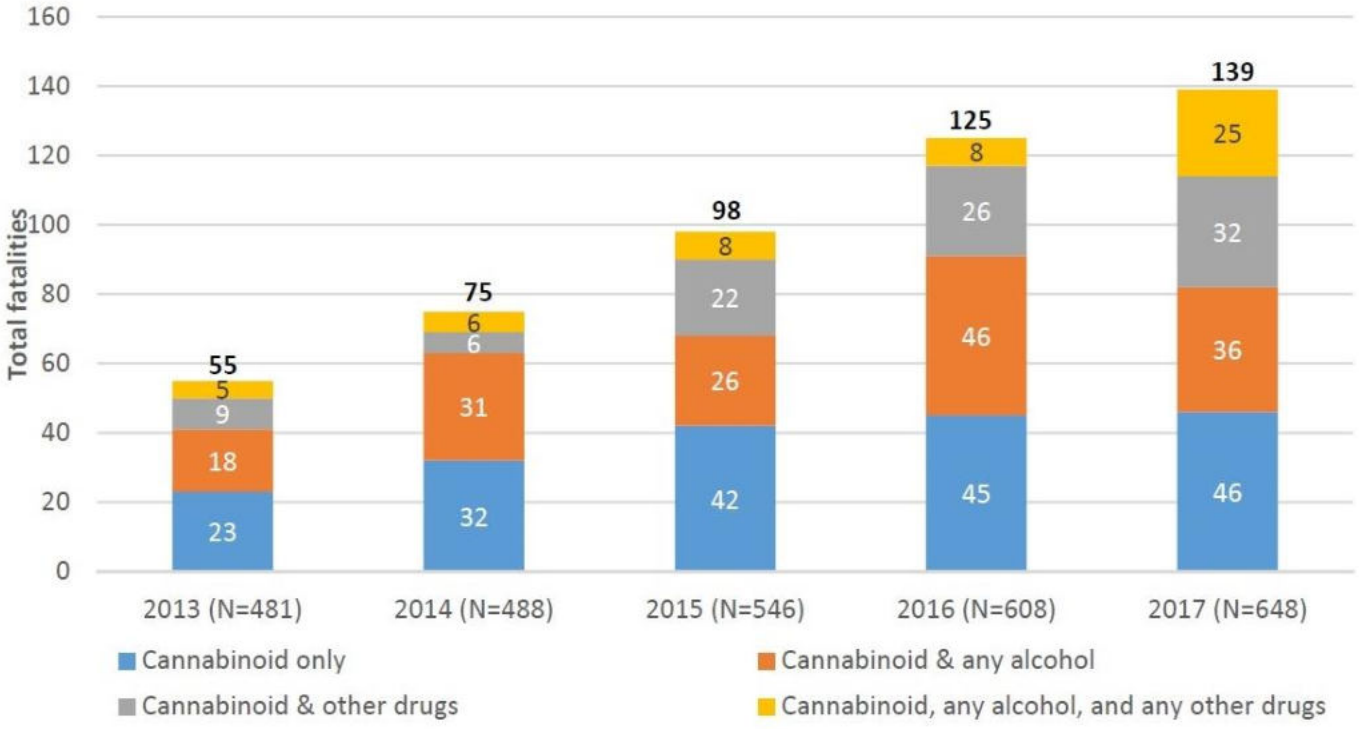
Exhibit 98 displays the projected annual energy consumption (eMWh/yr.) for the cannabis sector. This exhibit includes energy consumption from all fuels but excludes water consumption.



Posterity Group report in Canada (Greenhouse Energy Profile Study, https://www.ieso.ca/)

Since vote to legalize in 2012, Colorado traffic fatalities involving positive tests for THC in drivers more than doubled by 2017

Figure 16. Colorado fatalities involving drivers testing positive for cannabinoids, 2013–2017



Source: Colorado Department of Transportation, Data Intelligence Group, Toxicology Data (2018).
Note: A) Numbers are based on toxicology results where at least one driver was tested for drugs after a crash; see Table 21 for number and percent of drivers tested each year; B) the presence of a cannabinoid does not necessarily indicate recent use of marijuana or impairment.

Traffic fatality rates: legalized states trending up since 2012, other states without recreational marijuana (controls) trending down

Accessed April 21, 2020. https://www.whitehouse.gov/briefings-statements/remarks-president-trump-vice-president-pence-members-coronavirus-task-force-press-briefing-19/

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Change in Traffic Fatality Rates in the First 4 States to Legalize Recreational Marijuana

Marijuana use impairs driving,[1] but researchers have not yet conclusively determined if a state's legalizing recreational marijuana is associated with traffic fatality rates. Two early studies reported no significant change in roadway deaths following legalization in Colorado and Washington,[2,3] whereas a study including Oregon reported a temporary increase.[4] A more recent study, including 2017 data, found a statistically significant increase in fatal crashes only after commercial stores opened, suggesting that the effect of legalization may take more time to observe.[5]

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Following the recent release of 2018 roadway fatality reports by the US Department of Transportation, we analyzed data from more states over a longer period of commercial sales to get a better understanding of the relationship between legalization of recreational marijuana and traffic fatalities.

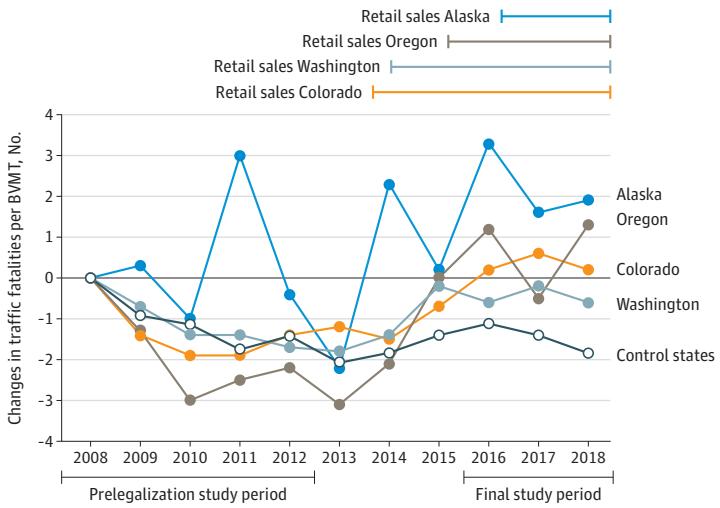
Methods | Traffic fatality rates were obtained from the National Highway Traffic Safety Administration's Fatality Analysis Reporting System.[6] The first 4 states to legalize recreational marijuana (Colorado, Washington, Oregon, and Alaska) comprised the experimental group. These states are the only ones for which there are at least 2 full years of traffic fatality data available following the opening of retail stores. All 20 states that did not legalize recreational or medical marijuana as of the beginning of 2018 served as controls.

First, parallel fatality trends in both groups of states during the 18 years preceding legalization were confirmed by graphing and inspecting the data. Then, we performed a difference-in-difference analysis with a random effects model to compare the change in traffic fatality rates between the 2 groups from the prelegalization to the postcommercialization period. The prelegalization panel data were from the 5 years preceding legalization in any state (2008-2012), and the postcommercialization data were from the years that included commercial sales in all 4 experimental states (2016-2018). Unemployment rate, maximum speed limit, and presence of a primary seatbelt law were included as covariates. We calculated our estimates using the xtreg function in Stata MP statistical software (version 16.0, StataCorp). Robust standard errors were used to generate confidence intervals. Data were analyzed from December 22, 2019 to February 29, 2020. Because the study used deidentified publicly available data, no review board approval was needed.

Results | The changes in fatality rates for the control group and each experimental state are displayed in the **Figure**. Our unadjusted difference-in-difference analysis showed an increase of 2.1 (95% CI, 1.2-2.9; $P < .001$) traffic fatalities per billion vehicle miles traveled (BVMT) in experimental states relative to control states in the postcommercialization study period. Including covariates, the increase was 2.1 (95% CI, 1.3-3.0; $P < .001$) traffic fatalities per BVMT.

Discussion | By analyzing additional experimental states over a more recent time period, we have provided additional data

Figure. Change in Traffic Fatality Rate From 2008



BVMT indicates billion vehicle miles traveled. Rates are indexed to 2008. Data points represent the change in the annual traffic fatality rate since 2008 for each experimental state and the 20-state control group mean. Colorado and Washington voted to legalize recreational marijuana in November 2012. Retail stores opened in January and July of 2014, respectively. Oregon and Alaska voted to legalize in November 2014. Retail stores opened in October 2015 and October 2016, respectively.

that legalization of recreational marijuana is associated with increased traffic fatality rates. Applying these results to national driving statistics, nationwide legalization would be associated with 6800 (95% CI, 4200-9700) excess roadway deaths each year. Despite certain methodological differences, we found an increase similar to that reported by Aydelotte et al.[4] They reported an increase of 1.8 fatal crashes (equivalent to 2.0 fatalities) per BVMT. We concur with their opinion that changes may not be detected immediately after legalization but only after a longer time period or after commercial sales begin.

We chose a control group consisting of all states with neither legal recreational nor medical marijuana to isolate the effects of marijuana. We did not require that control states have baseline attributes similar to the experimental states because the difference-in-difference technique removes biases in comparisons between experimental and control groups that result from permanent differences between those groups. Our conclusions, nonetheless, are limited by adjusting for only 3 state-specific factors that may have changed during the study period. It is possible that another confounder, rather than marijuana legalization and commercialization, caused the observed increase in roadway deaths.

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Stephen Warshafsky, MD
Gordon C. Kamer

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Author Contributions: Dr R Kamer had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Concept and design: R. Kamer, Warshafsky.
Acquisition, analysis, or interpretation of data: All authors.
Drafting of the manuscript: All authors.
Critical revision of the manuscript for important intellectual content: R. Kamer, Warshafsky.
Statistical analysis: All authors.
Supervision: Warshafsky, G. Kamer.

Conflict of Interest Disclosures: None reported.

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TestimonySB0708Feldman.pdf
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Position: UNF

LIVASIS™
More Than Medical Cannabis

WRITTEN TESTIMONY IN OPPOSITION SB0708

March 4, 2021

My name is Vicky L. Orem. I am a lawyer, a judge, a public servant who has dedicated my life to serving the under privileged in my community. I have been a resident of Maryland for over 50 years. I am a two time applicant for a cannabis grow license. I have been fighting for inclusion in the legal marijuana industry since 2015. I have spent over $800,000 fighting to participate in this industry.

I don't want a place at the table; I want to build my own table.

I don't want to serve the cannabis leaders in this industry with a job; I want to be a leader and create jobs of my own.

I don't want to work in their fields, I want to own my own fields.

I don't want you to attempt to fix the injustices of Maryland's cannabis laws with a pacifier.

I don't want the money of the cannabis leaders in Maryland. They have benefited from the unjust laws of this state which limits who participates in this lucrative market. This system of injustice and economic opportunity for a few and the priviledged must stop.

As a law abiding, constitution upholding citizen of Maryland, I speak for myself and thousands of others, who will never participate in Maryland's legal marijuana program until they are allowed a fair opportunity to become business owners and share in the wealth of the marijuana industry. If you continue to tell us we cannot win at this game, we will create our own game.

Marijuana has been readily accessible in the United States for centuries, and the citizens of Maryland have had the priviledge of access as well. As long as there is a system of Black and White opportunities in this state, the system of Black and White access to marijuana will continue. The underground access will thrive as long as the legal system of marijuana keeps opportunity for business limited to the priviledged. People with ambition do not need permission, they find a means of participation.

This bill won't fix the injustice in the cannabis industry created by this legislature. This bill copies from Illinois Social Equity laws which are held to be the standard for social equity programs. The problem with the social equity programs has been infighting over the limited number of business permits. As a result entrance into the market for social equity applicants continue to be delayed due to numerous complaints about the process of awarding these social equity licenses.

I urge you to mirror Oklahoma's free market. Their laws are simple and focus on providing opportunities to its residents. Oklahoma's medical cannabis industry generated over 345 million in 2019, Maryland generated over 250 million. Both Oklahoma and Maryland have the same percentage of approximately 6% registered patients.

Thank you for the opportunity.

Vicky L. Orem, Esq.

A HEALING LEAF, LLC | vlorem@livasis.com | 301-614-3300

Testimony - SB0708 .pdf
Uploaded by: Spicka, George F
Position: UNF

SB0708

Oppose

George F. Spicka
2528 Lodge Farm Road,
#316
Edgemere, MD 21219

"*I have a 15, a 13, and a 9-year old, and I absolutely as a physician, as a dad, as the Surgeon General of the United States, wouldn't want them exposed to these products (marijuana), and wouldn't want them to falsely believe they're safe.*"

- Dr. Jerome Adams, U.S. Surgeon General

- -

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- Mental Health Disorders / National Library of Medicine
- Mental Health Disorders / Centers for Disease Control and Prevention
- Mental Health Disorders / American Journal of Psychiatry
- Mental Health Disorders / NBC News: National Institute on Drug Abuse, Journal of Child Psychology and Psychiatry / American Journal of Psychiatry
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- Report finds increase in car insurance rate; Marijuana, distracted driving blamed
- Today Show: Driving while high on marijuana causing spike in fatal accidents
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- NORML
  - Your Government Is Lying To You (Again) About Marijuana
  - The NORML Truth Report, "Your Government Is Lying To You (Again) About Marijuana"
  - Recent Medical Marijuana Research (Fallacies)
    - Rheumatoid Arthritis
    - PTSD
    - Hepatitis C
    - Hypertension
    - Multiple Sclerosis

- Marijuana Policy Project
  "Obstruction and lies is all they've got"

A Sampling of Marijuana Victims - 38

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Why I Am Here

Imagine looking into a full length mirror, then imagine the mirror being smashed with a single blow to the head by a hammer. That has been my life for the past 50 years.

The main reason I am here, is to prevent what happened to me from happening to others.

For 50 years I've struggled with mental illness, all because I became addicted to marijuana in my early 20s, which then lead to a psychotic breakdown, shortly after my 25th birthday.

Words alone can't describe the horror of existing in hell 24/7, as if a bug were being forever ground between a block of searing anxiety and a block of crushing depression, over and over and over and over …

Worse was what I saw and felt in my brain. Thousands upon thousands of writhing and intertwining fiery tendrils, as if our sun had become home for thousands of gorgons and in the process, had gone mad.

Closing my eyes only made the horror clearer. Getting even 4-hours of sleep was a miracle. I was constantly tired, constantly exhausted, and practically catatonic.

Once while sitting in a clothing store, a person came over and touched my arm. He said I was sitting so still that he wasn't sure if I was a manikin or not.

That's how tightly I was trying to control my essence, for if I should let go for even a moment, the hell would become forever.

I was a kernel within a fetid swamp of horror. It was not me looking out my eyes. I was far back in my head, in a safe place where I'd found temporary refuge from madness.

Bright colors seemed to be reaching out to me, sinister, as if they were trying to talk. I avoided record stores, especially the “psychedelic” albums with their bright colors and distorted imagery.

Movies were far too intense to bear. Even magazines were risky, because I never knew what the next page would reveal.

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First Two Reasons Regarding How I Survived

It was because of two reasons I survived this torture:

I created a mantra that I repeated to myself over and over: “Hang on - Things will get better.”

Second and probably most important was that my wife, who wasn’t a smoker, stood by and supported me the entire time.

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I had no idea this could happen when I first started. The only perceived dangers in the late 60s and early 70s, were memory loss and paranoia, which was said at the time to only be temporary.

Getting “High” was the thing to do: You were “with it.” You were “hip.” You were “anti-establishment” and stood up to “The Man.”

It was one big party.

In fact, a popular saying of the 70s was: “Sex. Drugs. Rock & Roll.”

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The first time I smoked was an incredibly euphoric and beautiful experience. It was like all my worries and concerns had vanished. To say I wanted to repeat the experience is a major understatement.

My favorite activity was to listen the “Progressive Rock” music of the time. When I felt the High wearing off, I’d smoke another pipe. It was typical 3-4 daily, sometimes more.

After a while, I began to notice was that the highs weren't as brilliant as when I started. My thoughts were that I only needed to smoke more, which I did.

In fact between my 23rd and 25th birthdays, I was High almost every waking moment.

Thing is though, instead of recapturing that initial euphoria, things just got "darker." That's the best way to describe it.

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Besides the music, I'd also read what were called "Underground Comics." These were essentially self-published and could only be found in shops that sold drug paraphernalia and such. Much of the material was irreverent satire and counter culture stories, specifically written for those who were or frequently got high.

At the beginning, the stories were funny. Sometimes, they had a twist that would "zap" your mind while you were stoned.

But just like with the music, they began to take on a sinister aspect. I kept on smocking though, believing that I would eventually recapture that euphoria.

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The anxiety started in the final months leading up to the breakdown.

I smoked before going to bed, but instead of being "mellow" I'd have this growing sense of agitation. I'd eventually fall asleep, and in the morning, things would seem "normal," such as it was.

Again, I'd never heard any warnings about this and in my youthful naivety, just kept at it.

Though I don't remember the exact day, in January of 1972 something snapped in my mind. I had smoked, but this time the agitation, rather then ebbing, consumed my being.

Everything I described earlier began at this moment.

In spite decades of therapy and medications, some of the effects still persist to this very day!

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Beginning Therapy

I was initially treated by a psychiatrist, then a psychologist.

While this helped, it took a full 10-years for the flaming apparition to depart from my brain. Same thing with the grinding, rasping anxiety.

What I was left with though, was the crushing depression that was everywhere in my life. Plus there was this paranoia, not psychotic, but a constant undercurrent of fear. Maybe this was what the anxiety turned into.

Day after day I was plagued with hopelessness and thoughts of suicide. If it weren't for my wife and my mantra, I might not have survived the ordeal.

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Two More Reasons Why I survived

A third thing that helped was that I had found a purpose in life, which was to learn to become a jazz pianist. This lead me into composition of New Jazz and Modern Chamber Music, which has been my main focus ever since. To my credit, I've composed close to 700 pieces.

I accomplished this because I became obsessed. I had to, because the intense focus drew my attention away from the horror in my mind.

Just like with the profound negative effects, I'm still this way today.

If it hadn't been jazz, it would have been something, anything, that would give relief - just like the story of the condemned soul who begged for a single drop of water to be placed on his tongue, as he languished in eternal hell-fire.

Such was the desperation.

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A forth activity was drawing and painting. Not only had I read about art therapy, but I was also inspired by the artwork on the walls of the studio of the person I studied piano with, Jessica William's.

These weren't works of beauty or exquisite technique, but rather my attempts to come to terms with what had happened to me.

https://georgespicka.weebly.com/art-work.html

In 2017, two of these were featured in an exhibit hosted by Maryland's First Lady, Yumi Hogan, in Annapolis - as part of a Mental Health Awareness project. I was also able to perform some original piano compositions during the reception.

Those drawings were also included in that years Mental Health America campaign, "Life with a Mental Illness."

Many of my compositions served the same purpose - *https://georgefspicka-composer.weebly.com/art-videos.html*

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At Last, An End To Despair

Though there was gradual improvement, for over 25-years I struggled with this horrid depression, forcing myself by sheer willpower to better myself, only to sink back into despair.

This was a constant cycle.

The first real relief came in the late 1990s, when I began to take the modern antidepressant, Prozac.

Previously I'd been prescribed Elavil, but the results were these awful mood swings. When I took it, after the first couple of days the fog would be gone. After two more days I'd get so up - that it felt as if I were bursting out of my head. When I reduced the dosage, I went back to normal, then back to despair.

After two months of this, I decided to forego the medication.

The Prozac was more stable, but when the dose was increased, for some reason the depression returned.

I was then switched to Venlafaxine HCl, and now take the maximum daily dosage.

To that was added Trazodone, another antidepressant that helps with anxiety and insomnia. Again, it's the maximum daily dosage.

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The effect was that instead of being immersed in a fetid swamp, I was hovering inches above it. And though I'd still sometimes sink back into the darkness, it wasn't eternal like before. I could pull myself out. Even so, I can feel it lurking in the background.

The most noticeable long-term issue is difficulty with memory, something I've mentioned to my doctor several times. It's not that I'm senile, but that my mind has trouble focusing on a task, and tends to wander.

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How I Began To Learn What Had Happened To Me

- **THC Then and Now**

As I mentioned earlier, there was no warnings in the late 60s and early 70s of marijuana's dangers, so around 2014, I started searching for research and studies that might give information about what happened to me. As I was to find out, there were already studies and research articles concerning marijuana's many risks.
For example, the **American Heart Association** has published a number of studies, the first in 2001 - including a 2014 study that documented a **series fatal heart attacks** directly related to marijuana. And the evidence keeps mounting - *https://www.ahajournals.org/doi/pdf/10.1161/JAHA.113.000638*

However for my testimony, I will first focus mainly on the Mental Health aspect.

One of the things I learned was that at the time I suffered my psychosis, THC levels in marijuana were around 3%, which by today's standards are low.

A 2019 NPR article cited a 2017 study that can be found in the National Institutes of Health "**National Library of Medicine,**" that modern potency was now around 17% THC.

"'*That's an increase of more than 300% from 1995 to about 2017,' says Staci Gruber, director of the Marijuana Investigations for Neuroscientific Discovery (MIND) program at the Harvard-affiliated McLean Hospital in Belmont, Mass. 'I would say that's a*

considerable increase.' … 'And some products with concentrated forms of cannabis, like hash and hash oil, can have as much as 80% to 90% THC,' she adds."

Nora Volkow, director of the **National Institute on Drug Abuse**, states: "*In general, people think, '**Oh, I don't have to worry about marijuana. It's a safe drug**,' " says "**The notion that it is completely safe drug is incorrect** when you start to address the consequences of this very high content of THC*."

The article goes on to say: "*That concerns scientists who study marijuana and its effects on the body, as well as **emergency room doctors who say they're starting to see more patients who come into the ER with weed-associated issues**.*"

Here is a link to the NPR article -

- https://www.npr.org/sections/health-shots/2019/05/15/723656629/highly-potent-weed-has-swept-the-market-raising-concerns-about-health-risks

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- **Mental Health Disorders / National Library of Medicine***

This 2018 piece can also be found in the National Library of Medicine, "The adverse health effects and harms related to marijuana use: an overview review."

- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6182105/

"***Evidence of harm** was reported in 62 reviews for **several mental health disorders, brain changes, cognitive outcomes, pregnancy outcomes and testicular cancer**.*"

I personally have been suffering from mental health disorders.

"***Harm was associated with most outcomes assessed**. These results should be viewed with concern by physicians and policy-makers given the prevalence of use, the persistent reporting of a lack of recognition of marijuana as a possibly harmful substance and the emerging context of legalization for recreational use*."

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- **Mental Health Disorders / Centers for Disease Control and Prevention**

The Centers for Disease Control and Prevention says the following:

- https://www.cdc.gov/marijuana/health-effects.html
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< 1 > "***About 1 in 10 marijuana users will become addicted***."
- That's what happened to me.

< 2 > "***Marijuana use directly affects the brain*** *— specifically the parts of the brain responsible for memory, learning, attention, decision making, coordination, emotions, and reaction time*."
- I suffer from memory and attention problems.

*< 3 > "Marijuana use, especially frequent (daily or near daily) use and use in high doses, can cause **disorientation**, and sometimes cause **unpleasant thoughts** or **feelings of anxiety and paranoia**."*

*"Marijuana users are significantly more likely than nonusers to develop **temporary psychosis** (not knowing what is real, **hallucinations and paranoia**) and **long-lasting mental disorders**, including schizophrenia (a type of mental illness where people might see or hear things that aren't really there)."*

*"Marijuana use has also been linked to **depression and anxiety, and suicide** among teens. However, it is not known whether this is a causal relationship or simply an association."*

- All this happened to me as well.

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- **<u>Mental Health Disorders / American Journal of Psychiatry</u>**

This 2018 study was published in Psychology Today, "Acute Marijuana-Induced Psychosis May Predict Future Illness."

"*For this study, the investigators reviewed the long-term outcomes of all persons who received a diagnosis of substance-induced psychosis between 1994 and 2014 and had no prior diagnosis of a psychotic illness — a group of over 6,700 people.*"

"***The most dramatic increases by far occurred in those who exhibited psychotic symptoms following marijuana use***."

"*Over a **twenty-year follow-up period,** about **41 percent of those who had a psychotic reaction to marijuana** developed **schizophrenia**, and **47 percent developed either schizophrenia or bipolar disorder***."

"*These results demonstrate that those who are diagnosed with* ***substance-induced psychotic symptoms****,* ***especially after marijuana use****, are at* ***high risk for eventually developing a chronic psychotic illness****.*"
- This helps explain what I went through.

https://www.psychologytoday.com/us/blog/demystifying-psychiatry/201801/acute-marijuana-induced-psychosis-may-predict-future-illness?fbclid=IwAR0S_KfDcDW_hTWvIx1PdDAtbac8b1uXIUAqN1Sk633_9aplnF7XTOzANL0

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- **Mental Health Disorders / NBC News: National Institute on Drug Abuse, Journal of Child Psychology and Psychiatry / American Journal of Psychiatry**

In 2018, NBC News ran this feature: "Mental Health - Chronic pot use may have serious effects on the brain, experts say"

https://www.nbcnews.com/health/mental-health/chronic-pot-use-may-have-serious-effects-brain-experts-say-n924441?fbclid=IwAR3WcOwi7fn4pD9dKAaLqM0QiCAWTLaWPwU6ULw0UHJD9FkrY8HXEfHUYTU

"After four years of heavy use, Warner noticed that his short-term memory was starting to fray. He avoided talking to people, and ***festering feelings of anxiety and depression*** *grew. He tried to mask them with weed, deepening his dependency."*

"Studies have shown that ***chronic marijuana use affects the same brain structures that are involved with addiction****.The National Institute on Drug Abuse suggests that 30 percent of those who use marijuana may have some degree of "marijuana use disorder."*

"Marijuana use disorders are often associated with dependence — in which a person feels withdrawal symptoms when not taking the drug. Frequent users report irritability, mood and sleep difficulties, decreased appetite, cravings, restlessness and physical discomfort … Marijuana dependence occurs when the brain adapts to large amounts of the drug, ***requiring more and more to create the desired euphoric effect.****"*

"Researchers estimate that ***4 million people in the United States met the criteria for marijuana use disorder*** *in 2015, but only 138,000 of them voluntarily sought treatment."*

"A Canadian study published in the Journal of Child Psychology and Psychiatry in 2017 showed a ***substantial increase in 'psychotic-like experiences' in teenage users****.*

*The study also reported adverse effects on **cognitive development and increased symptoms of depression**.*"
(https://acamh.onlinelibrary.wiley.com/doi/abs/10.1111/jcpp.12765?systemMessage=Wiley+Online+Library+will+be+down+on+Wednesday+05th+July+starting+at+17.00+EDT+%2F+22%3A00+BST+%2F+02%3A30+IST+%2F+05.00+SGT+%286th+July%29+for+up+to+1+hour+due+to+essential+maintenance+)

"*Other studies show that chronic use may even **interfere with normal development of the adolescent brain.***" (American Journal of Psychiatry - https://ajp.psychiatryonline.org/doi/10.1176/appi.ajp.2018.18020202)

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- **Mental Health Disorders / National Institute on Drug Abuse**
  Marijuana Research Report

In 2020, The National Institute on Drug Abuse published its revised "Marijuana Research Report. " https://www.drugabuse.gov/publications/research-reports/marijuana/what-are-marijuanas-long-term-effects-brain

"*Several studies, including two large longitudinal studies, suggest that **marijuana use can cause functional impairment in cognitive abilities** but that the degree and/or duration of the impairment depends on the age when a person began using and how much and how long he or she used*."

"Among nearly 4,000 young adults in the Coronary Artery Risk Development in Young Adults study tracked over a 25-year period until mid-adulthood, cumulative lifetime exposure to **marijuana was associated with lower scores on a test of verbal memory** … **The effect was sizeable and significant** …"

"Some studies have also **linked marijuana use to declines in IQ**, especially when use starts in adolescence and leads to persistent cannabis use disorder into adulthood."

"A large longitudinal study in New Zealand found that persistent marijuana use disorder with frequent use starting in adolescence was **associated with a loss of an average of 6 or up to 8 IQ points** measured in mid-adulthood. Those who used marijuana heavily as teenagers and quit using as adults **did not recover the lost IQ points**."

"Memory impairment from marijuana use occurs because **THC alters how the hippocampus, a brain area responsible for memory formation, processes information** … As people age, they lose neurons in the hippocampus, which decreases their ability to learn new information. **Chronic THC exposure may hasten age-related loss of hippocampal neurons**."

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- **Mental Health Disorders / Dr. Steven Simerville, St. Mary-Corwin Hospital Puedlo Physicians Code Red**

The adverse effects marijuana on the developing brains of human embryos is the subject of this 2014 testimony by Dr. Steven Simerville, a pediatrician who at the time was Medical Director of the Nursery at St. Mary-Corwin Hospital in Pueblo, Colorado.

https://m.youtube.com/watch?v=K4bcl9Fqfls&t=174s

"*About 7-10% of our babies in a given month test positive for exposure toTHC.*"

"*In the 70s when they first started looking at what does post natal THC mean, they looked at mothers who exposed their babies to marijuana. That marijuana was 2.5% THC. Our current marijuana is 15%.*"

"*So it's a **7-fold increase in the concentration of THC that our babies are being exposed to***."

"***But back then, in the 70s, we knew** that if a baby was exposed prenatally to marijuana, they would see **decreased school performance**, they would have **difficulties in spatial reasoning**, they would have **difficulties in problem solving**, **difficulties in short-term memory**, and they would be **less likely to graduate from high school**, and they would suffer from what we call **academic underperformance**, meaning **they should have more potential but don't live up to it**.*"

"*That was with the 1970s THC. We don't know what it means now."*

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I Was Not Alone

In my search about marijuana's dangers, I came across a number of parent based organizations, who were sharing submitted stories concerning the suffering and grief families had endured, because of losing a child due to marijuana addiction.

These are just three.

- **Johnny's Ambassadors** - https://johnnysambassadors.org/

"Johnny's Ambassadors is a non-partisan, non-profit, grass-roots alliance of individuals and organizations around the globe concerned about the ***harms of youth marijuana use****. We are parents, coalitions, impacted family members, healthcare professionals, teachers, and nonprofits who seek to reduce youth marijuana use through education, prevention, and awareness.* ***We use evidence-based, scientific research and experts to teach the impacts of today's high-THC marijuana on youth mental illness and suicide ideation****. Our allied organizations come together to save the lives of our youth, and Johnny's Ambassadors actively promotes their activities.*

- **Moms Strong** - https://momsstrong.org/

"We are a group of Moms who have seen marijuana ***severely damage our teenage and young adult children.*** *While pot advocates promote stories of how marijuana is a safe, natural and fun activity,* ***we have instead witnessed our children develop devastating mental health issues after using it. We have observed the side effects of anxiety, panic attacks, paranoia, depression and psychosis, and have even seen a final result of suicide.*** *We have watched how these changes have occurred in some as a sudden psychotic break and in others gradually over a long period of addiction."*

- **Parents Opposed To Pot** - https://poppot.org/

"Parents Opposed to Pot bursts the "bubble of the marijuana hype" and ***counters the false narrative that marijuana is harmless****. We know that no amount of marijuana, especially in its current high-THC forms, can be proven safe …* ***Using current research and testimony****, we strive to prevent youth marijuana use by educating the parents.*

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Victim Impact Statements

The above organizations along with others, are sources of written and video statements concerning the negative impacts, including fatal outcomes, that marijuana has had on their loved one's lives.

- *https://momsstrong.org/our-stories/*

- *https://johnnysambassadors.org/memorial/*

- *https://momsstrong.org/videos/parent/*

- *https://poppot.org/parent-perspectives/*

- *https://learnaboutsam.org/victim-stories/*

- *https://marijuana-anonymous.org/pamphlets/stories-by-teens/*

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The Maryland Connection / Part 1

1987 Amtrak Disaster

Some may be too young to remember, but in January of 1987, 16-people were killed in an Amtrak disaster in Chase, Maryland, that was directly related to marijuana.

- **NTSB Accident Report**. "*The National Transportation Safety Board determines that the probable cause of this accident was the failure, as a result of* ***impairment from marijuana****, of the engineer of Conrail train ENS-121 to stop his train in compliance with home signal 1N before it fouled track 2 at Gunpow ...*"

https://www.ntsb.gov/investigations/AccidentReports/Pages/RAR8801.aspx

- **George Mason University / Marijuana Fact sheet** - "*Marijuana can alter one's sense of time and* ***impair the ability to perform tasks that require concentration*** *... Experiments have shown that* ***marijuana affects a wide range of skills needed for safe driving****.*" - http://www.gmu.edu/resources/facstaff/facultyfacts/1-2/grass.html

- **WIKIPEDIA** - "*At the time, the wreck was the deadliest in Amtrak's history … Gates and his brakeman, Edward "Butch" Cromwell, were also* ***smoking a marijuana cigarette****. Cromwell was responsible for calling out the signals if Gates missed them, but failed to do so.*" - http://en.wikipedia.org/wiki/1987_Maryland_train_collision

Video of the tragedy can be seen at this link -

- **Rescue 911/ Amtrak 1987** - *https://m.youtube.com/watch?v=Bol7q-78muY*

"I was overwhelmed by the magnitude of destruction to the train. I've never seen a train derailment of that magnitude before." - Dennis Dembeck, EMT

"The locomotive that was on fire, it was like somebody had taken a box of train parts, and sprinkled them all over. There were pieces no bigger then 2 or 3 feet."
- Bob Hausman, Fire Captain

"I remember seeing a rescue worker pick up somebody's head off the track, and they just had him by the hair. It was this charred, charred skull of a skeleton that was left."
- Witness

- **Baltimore Magazine** - https://www.baltimoremagazine.com/section/community/special-report-on-the-crash-of-amtrak-colonial-94/

"Waskevitz, the first emergency worker on the scene, makes his way to the wreckage … One victim is buried under the seats. ***He checks for a pulse in her neck and feels none****. He digs farther, snaking along on his hands and knees, on his stomach, stashing debris behind him like a mole.* ***He comes to another victim, her neck apparently broken. She is also dead****."*

"Nearby, one woman is extricated alive and flown to the trauma unit, where ***her legs are amputated****.* ***She lingers for eight days before dying****."*

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Then there's the issue of stoned parents, who while high forget about potential consequences marijuana can have on their children.

- **Maryland Children Get Sick** - http://www.poppot.org/2018/01/24/maryland-children-get-sick-big-marijuana-pushes-its-agenda/

*"****Five schoolchildren were hospitalized*** *in southern Maryland after a middle school student brought and shared marijuana-laced food to school. Following an investigation, the St. Mary's County sheriff has charged a father from Great Mills with reckless endangerment."*

"The man's daughter and four other students ***had a reaction to marijuana laced gummy bears … All five students reported feeling ill****, and they were taken to the hospital in Leonardtown."*

Link to original story - https://www.somdnews.com/enterprise/crime_and_courts/father-charged-in-school-pot-candy-probe/article_5cc2c3b7-86c4-5509-9bf7-2617842c1e12.html

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- **Mother Charged in Maryland Crash That Killed 5 Children, 1 Man Had Marijuana and Alcohol in Her System: Prosecutors** - *https://www.nbcwashington.com/news/local/mother-charged-in-maryland-crash-that-*

killed-5-children-1-man-had-marijuana-and-alcohol-in-her-system-prosecutors/138478/?fbclid=IwAR2032POJCij0HPhkKvuNtQVQNQUfMt73Ixp8Dooq86DWn8L346SdzwPyig

"The single-car crash at about 4:25 a.m. Feb. 2 killed sisters London Dixon, 8, and Paris Dixon, 5, who were Taylor's daughters … Three of the sisters' cousins also were killed: Damari Herald, 15, Zion Beard, 14, and Rickelle Ricks, 6."

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- **Mental Health Association of Maryland**

Can Marijuana Cause Mental Illnesses?
https://www.mhamd.org/wp-content/uploads/2017/05/Risky-Business-Marijuana-w%EF%80%A2-MHAMD-logo.pdf

*"Marijuana may increase the **risk of developing psychotic disorders like schizophrenia**. It can also worsen symptoms in people who already have psychosis."*

*"**Marijuana use during adolescence can have lasting effects**, including changes to the reward system in the brain and **trouble with thinking and remembering**."*

*"Marijuana use can cause symptoms of **mental health problems like psychosis (hallucinations), anxiety (panic attacks), depression, and sleep disorders**, but these symptoms generally fade after the effect of the drug has worn off."*

"People may get "too high" by using a strain of marijuana that is stronger than they thought it would be, by using too much, or by consuming it in different ways. Smoking marijuana usually takes effect quickly (a matter of minutes), while consuming edibles usually takes longer (a matter of hours) for an individual to feel the effects, and they may end up consuming too much because they "don't feel it" at first."

*"Adults who have been **diagnosed with marijuana (cannabis) use disorder have high rates of mental health disorders including anxiety, depression, PTSD, and ADHD**. It is hard to know whether the marijuana use disorder or the mental health disorder appeared first, since many people use drugs to self-medicate."*

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More Hospitalized Kids

- **A 9-Year-Old Accidentally Shared Her Grandpa's Marijuana Gummies With Her Fifth-Grade Class -**

Time Magazine - https://time.com/5114582/thc-edibles-new-mexico/?fbclid=IwAR2aGA0gWnSPup3N1Q3u-XRhKilArcpkAv-HXT0fu5zOYNbXknF7sPbxSyo

"A 9-year-old girl came to school with what looked like typical gummy candies, but were actually edibles ***laced with THC, one of the psychoactive chemicals found in cannabis*** *… The candies reportedly belonged to the student's grandfather."*

"The Colorado Department of Public Health and Environment argued that ***edibles put young children at risk*** *of accidental poisoning, and noted that* ***calls to poison control centers and visits to Colorado pediatric hospitals related to marijuana poisoning increased*** *… "These findings suggest that greater availability of marijuana, particularly in edible products, can i****ncrease risks to young children****."*

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This is a 2020 NBC News Report - https://www.nbcnews.com/news/us-news/two-children-hospitalized-after-eating-thc-candy-food-bank-n1176721

- **At least two children are hospitalized after eating THC candy**

"An 11-year-old and a 5-year-old were ***taken to a hospital*** *Friday night after consuming "Medicated Nerds Rope" candy."*

*"'****We are absolutely horrified*** *that this product went out to any of our partner agencies.' Ginette Bott, Utah Food Bank president and CEO."*

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Centers for Disease Control and Prevention* has even reported about fatal consequences of marijuana edibles.

- **Death Following Ingestion of an Edible Marijuana Product**

http://www.cdc.gov/Mmwr/preview/mmwrhtml/mm6428a6.htm

"In March 2014, the Colorado Department of Public Health and Environment (CDPHE) learned of the ***death of a man aged 19 years after consuming an edible marijuana product.***

*" … he reportedly exhibited **erratic speech and hostile behaviors**. Approximately 3.5 hours after initial ingestion, and 2.5 hours after consuming the remainder of the cookie, he **jumped off a fourth floor balcony** and died from trauma."*

*"The autopsy, performed 29 hours after time of death, **found marijuana intoxication as a chief contributing factor**."*

*"This case illustrates a **potential danger associated with recreational edible marijuana** use. Some studies have suggested an **association between cannabis and psychological disturbances**."*
*"Consuming a large dose of THC can result in a higher THC concentration, greater intoxication, and an **increased risk for adverse psychological effects**."*

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- **Children's Hospital Colorado: Acute Marijuana Intoxication** - *https://www.childrenscolorado.org/conditions-and-advice/conditions-and-symptoms/conditions/acute-marijuana-intoxication/*

*"The most common **overdose incidents in children** occur when the drug has been combined with food in an "edible" form of marijuana … **kids mistake "edible" marijuana** (like **gummy bears**, **brownies**, **lollipops**, etc.) **for regular food."***

*"**Many young children who consume marijuana edibles require hospital admission due to the severity of their symptoms**."*

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Established Causal Links

That was in 2014. In 2019, the following report was published in the National Institutes of Health, National Library of Medicine*

- **"Neonate Death Due to Marijuana Toxicity to the Liver and Adrenals"**
  https://pubmed.ncbi.nlm.nih.gov/31838485/

"*We report a **death of an 11-day-old** white female neonate due to **acute marijuana toxicity**. She died of **extensive necrosis and hemorrhage of the liver and adrenals due to maternal use of marijuana**.*"

"*This case is unique in that **other possible causes of death can be eliminated.** With growing use of marijuana by pregnant women and increases in newborn drug screening of umbilical cord homogenate, more cases of neonatal death due to acute marijuana toxicity could be discovered*."

***** What's important with this case is that it establishes a **direct causal link between marijuana and death**.

The absence of this link has been used by the marijuana industry and it's representatives to deny all the dangers legitimate research has revealed. However, it has now been proven.

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Published just a few weeks ago in February 2021, another piece in the *National Library of Medicine** establishes a ***Casual Link between Cannabis*** *and* ***Pediatric Cancer***

- **A geospatiotemporal and causal inference epidemiological exploration of substance and cannabinoid exposure as drivers of rising US pediatric cancer rates** - *https://pubmed.ncbi.nlm.nih.gov/33632159/*

*"Age-adjusted US total pediatric cancer incidence rates (TPCIR) rose 49% 1975-2015 for unknown reasons. **Prenatal cannabis exposure has been linked with several pediatric cancers** which together **comprise the majority of pediatric cancer types**."*

*"TPCIR rose while all drug use nationally fell, **except for cannabis which rose** … **Cannabis legalization was associated with higher TPCIR**."*

*"Data **confirm a close relationship** across space and lagged time **between cannabis and TPCIR** … making confounding unlikely and **establishing the causal relationship** … **Cannabis-liberal jurisdictions were associated with higher rates of TPCIR and a faster rate of TPCIR increase**."*

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Behind the Wheel

But it's more then stoned parents, kids, and marijuana edibles - A persistent piece of misinformation that's been delibrately spread, is that it's safe to smoke marijuana and drive.

- **'Miracle kid' has face rebuilt** - https://www.syracuse.com/crime/2015/06/4-year-old_miracle_kid_has_face_rebuilt_after_near-fatal_crash_caused_by_father.html#incart_story_package

*"When **a 4-year-old girl's face and skull were shattered to pieces** in a crash on the State Thruway, doctors mended the bones together with sugar-based compounds."*

*"Peyton Bean was airlifted by Mercy Flight from the Sept. 25, 2014, crash in Ontario County to Strong Memorial Hospital in Rochester, where **she spent 11 days on life support in an induced coma and five more days recovering**. She was admitted as a level one trauma patient, the most serious."*

*"**Peyton suffered 14 different injuries** - some of which are listed as 'multiple fractures' … she was in the back passenger's seat as her father drove … Her father, Bryan Tanner, 25, **was smoking marijuana in the car** before he **lost control and hit a tree**."*

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- **3 killed, including 2 kids, in 5 vehicle crash**

ABC News

- https://abc7news.com/pot-crash-marijuana-cannabis-fremont-car/3481312/

"The Alameda County Coroner's office identified two victims of the fatal I-880 crash in Fremont Tuesday night. They are 14-year-old Christy Limas and 9-year-old Brooke Limas."

*"Dang Nguyen Hai Tran, 21, was driving a Toyota Camry involved in the crash and was **arrested for suspicion of driving under the influence of marijuana."***

*"'**Driving under the influence, whether it's alcohol or drugs, the outcome is the same. It's dangerous. It kills people,'** said CHP Officer Manuel Leal."*

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AAA has been talking about the link between marijuana and fatal crashes for years

- **Fatal Crashes Involving Drivers Who Test Positive for Marijuana Increase After State Legalizes Drug**
  https://newsroom.aaa.com/2020/01/fatal-crashes-involving-drivers-who-test-positive-for-marijuana-increase-after-state-legalizes-drug/

"A concerning number of Washington state drivers involved in fatal crashes are testing positive for recent use of marijuana, according to new research from the AAA Foundation for Traffic Safety."

"The share of drivers who, after a fatal crash, tested positive for active THC – the drug's main psychoactive ingredient – has doubled since the state legalized marijuana."

"This study enabled us to review a full 10-years' worth of data about the potential impact of marijuana on driving safety – and it raises significant concerns."

*"Marijuana use can **inhibit concentration, slow reaction times and cloud judgment**. Its effects vary by individual, but a number of studies have concluded that **marijuana use impairs the ability to drive safely**. Previous research suggests that users who drive high are up to twice as likely to be involved in a crash."*

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The Auto Insurance Industry is talking about this too.

- **First States to Legalize Marijuana See Rise in Car Insurance Claims, Research Shows** https://www.insurancejournal.com/magazines/mag-features/2019/01/07/513762.htm

*"Crashes are up by as much as six percent in **Colorado**, **Nevada**, **Oregon** and **Washington**, compared with neighboring states that haven't legalized marijuana for recreational use, according to research from the Insurance Institute for Highway Safety (IIHS) and Highway Loss Data Institute (HLDI)."*

"The new IIHS-HLDI research on marijuana and crashes indicates that legalizing marijuana for all uses is having a negative impact on the safety of our roads … States exploring legalizing marijuana should consider this effect on highway safety."

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- **Report finds increase in car insurance rate; Marijuana, distracted driving blamed** https://www.wcvb.com/article/report-finds-increase-in-car-insurance-rate-marijuana-distracted-driving-blamed/26946952#

*"Another factor driving Boston's rise in car insurance premiums could be the **legalization of marijuana**, say experts. Research from the Insurance Institute for Highway Safety and Highway Loss Data Institute found that **car crashes increase in states that legalize retail sales of marijuana** … '**States exploring legalizing***

marijuana should consider this effect on highway safety, *' IIHS-HLDI President David Harkey."*

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- **Today Show: Driving while high on marijuana causing spike in fatal accidents -** *http://www.today.com/health/driving-while-high-marijuana-causing-spike-fatal-accidents-t91746*

"After the accident, Mary Gaston learned that the driver of the car that hit her son's motorcycle, 33-year-old Caleb Floyd, admitted he had been smoking pot."

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- **Driver of truck that hit church bus killing 13 was high on marijuana** - *http://metrovoicenews.com/driver-of-truck-that-hit-church-bus-killing-13-was-high-on-marijuana/*

"'*The pick-up truck driver in this crash made terrible choices with tragic consequences,' NTSB Chairman Robert L. Sumwalt said in a news release.*"

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- **9-year old girl killed by Inattentive Driver Possessing Marijuana**

https://www.wmdt.com/2018/04/update-driver-identified-and-charged-with-fatal-child-hit-and-run/?fbclid=IwAR0J-eB0uD7vdhS-D90b-BaK36DCqUShxAOZAKQb41fsSJTOvaYBcGPLaEM

"Delaware State Police have identified and charged the the man who was wanted connection with a fatal child hit and run … McConnell is charged with operation of a vehicle causing death of another person, ***inattentive driving****, leaving scene of a collision resulting in death, failure to report a collision resulting in injury or death, and* ***possession of marijuana****."*

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The Maryland Connection / Part 2 - Violence, Drugs, Gangs

The marijuana lobby scoffs at the notion of there being a connection to violence.

MS-13, one of the most violent drug gangs, first got into the United States as illegal immigrants through California.

They've been in or area ever since Washington, D.C. legalized recreational marijuana.

Most of the following crimes occurred in our region.

- **Montgomery homicide victim was ambushed by MS-13, according to court documents**

"*Know the connection between **marijuana use and gang violence**. This murder happened in Wheaton, MD, Montgomery County. "Detectives also said that on the night before the killing, at least **three of the suspects gathered together, smoked marijuana and discussed the ambush**.*"

https://www.washingtonpost.com/local/public-safety/montgomery-homicide-victim-was-ambushed-by-ms-13-according-to-court-documents/2020/06/11/786d2dd0-abed-11ea-a9d9-a81c1a491c52_story.html?fbclid=IwAR3mg1xuDMjOApRRHdIN4h1tynBbzjgSiHOBuymebYe7yc1EoilN04-VnfE

- **ICE: Undocumented immigrant, deported twice before, caught raping woman under stairwell**

*"According to U.S. Immigration and Customs Enforcement, Lopez-Gonzalez is a Salvadoran national believed to be associated with **MS-13** ..."*

https://wjla.com/news/local/ice-undocumented-immigrant-deported-twice-before-caught-raping-woman-under-stairwell

- **Police say Towson killing is linked to MS-13.**

*"MS-13 Came to our region **after Washington DC legalized recreational marijuana** …"*

https://www.baltimoresun.com/maryland/baltimore-county/bs-md-co-ms13-response-20190906-se2u7lzkvrgexewsyzo7lnkade-story.html

- **Police: Group of MS-13 members beat Md. man with bat in woods for refusing to join gang**

*"During their meal, two men sat down at the table and **invited the victim to smoke marijuana with them**. The victim declined."*

https://wjla.com/news/local/ms-13-members-beat-md-man-with-bat-in-woods

- **Police: MS-13 members in Maryland stab man more than 100 times and decapitate him**

"As many as 10 members of the MS-13 street gang lured a man into a park in Wheaton, Md., spoke with one another over walkie-talkies as he arrived, ***stabbed him more than 100 times****,* ***decapitated him*** *and then* ***cut out his heart*** *... "*

https://www.washingtonpost.com/local/public-safety/police-ms-13-members-in-maryland-stab-man-more-than-100-times-and-decapitate-him/2017/11/22/0cba9760-cf7e-11e7-a1a3-0d1e45a6de3d_story.html

- **3 teens charged in MS-13 killing of 14-year-old girl used machete, baseball bat, police say**

"Three Maryland teenagers have been charged as adults in the ***brutal slaying of a 14-year-old girl*** *who police said may have planned to go to authorities about a crime she and the suspects committed last month."*

https://www.boston25news.com/news/trending-now/3-teens-charged-in-ms13-killing-of-14yearold-girl-used-machete-baseball-bat-police-say/950156117/

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More Evidence of Violence

- **A Review of Cases of Marijuana and Violence (2020)**

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7084484/ *

“Here, we present 14 cases of violence with chronic marijuana users that highlight reoccurring consequences of: ***marijuana induced paranoia*** *(exaggerated, unfounded distrust) and* ***marijuana induced psychosis*** *(radical personality change, loss of contact with reality).* ***When individuals suffering from pre-existing medical conditions use marijuana in an attempt to alleviate their symptoms, ultimately this worsens their conditions over time****.”*

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- **Violence and Cannabis Use: A Focused Review of a Forgotten Aspect in the Era of Liberalizing Cannabis (2020)**
  https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7525024/ *

*"… the focus of most cannabis-related harms has been on effects with users themselves. Harm-to-others including **injuries from violence** have nevertheless been unfortunately largely overlooked. There is meta-analytical **evidence pointing towards an association.**"*

*"First, evidence from meta-analytical studies in youths, intimate partners, and individuals with severe mental disorders have shown that **there is a global moderate association between cannabis use and violence** … Preliminary data has even **highlighted a potential dose-response relationship with larger effects in more frequent users.**"*

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- **Marijuana: Tucson Massacre Suspect Jared Loughner Was 'Habitual' Pot User**

https://www.laweekly.com/marijuana-tucson-massacre-suspect-jared-loughner-was-habitual-pot-user/

*"Jared Loughner, who killed 16 and severely injured Congresswoman Gabby Giffords along with 13 others, was **an admitted marijuana user**"*

*"Addiction medicine specialist Dr. Drew Pinsky of Celebrity Rehab has said repeatedly that **daily marijuana use triggers deep depression**.*

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- **New Details Emerge About Orlando Nightclub Shooter Omar Mateen, the 29-year-old man who authorities say killed 49 people and injured 53 more at a gay nightclub in Orlando**

*"In a portion of the questionnaire dealing with drug usage, **Mateen answered "yes" to having used cannabis or marijuana** …"*
https://abcnews.go.com/US/details-emerge-orlando-nightclub-shooter-omar-mateen/story?id=39891550

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- **Denver Man Who Said Marijuana Made Him Kill His Wife Gets 30 Years** - https://www.nbcnews.com/news/us-news/denver-man-who-said-marijuana-made-him-kill-his-wife-n744056

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- **Father charged with capital murder after stabbing toddler in Lewisville, police say -** *https://www.dallasnews.com/news/crime/2018/08/21/father-charged-with-capital-murder-after-stabbing-toddler-in-lewisville-police-say/*

*"Police said evidence indicates that Ness' attack on the toddler began inside the apartment … Police said they found "**fresh burnt marijuana as well as a haze of smoke in the apartment.**"*

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- **Paranoid factory worker stabbed parents to death in frenzied attack during psychotic episode after smoking cannabis for years -** *https://www.dailymail.co.uk/news/article-3099469/Paranoid-factory-worker-stabbed-parents-death-frenzied-attack-psychotic-episode-smoking-cannabis-years.html#ixzz3bN9GPw6f*

*"He had been **smoking cannabis for 12 years** and was sectioned in 2011 after calling police and saying his parents had been murdered and 'replaced by imposters who were wearing their faces' … police found around **five grams of cannabis in Dante's room** and **he admitted smoking around 12 hours before the attack**. He also told officers that **smoking the drug affected him 'strongly'**."*

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- **Queens man sentenced to 5 to 15 years in prison for 2016 fatal stabbing of his poet roommate -** *https://www.nydailynews.com/new-york/nyc-crime/ny-queens-roommate-fatal-stabbing-sentencing-20200611-vrvhxjbqvjgixl3yp2mlgpqcju-story.html*

*" … the court finding Stetson-Shanahan **suffered a psychotic break due to his marijuana use** on the night of the killing. Authorities said the man **admitted to police that he was drinking beer and smoking pot** before the rampage."*

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- **Police: Accused killer told cops that bong hits led to violent episode** - *https://www.toacorn.com/articles/police-accused-killer-told-cops-that-bong-hits-led-to-violent-episode/*

*" … the 26-year-old was **stabbed 108 times** by multiple knives."*

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- **Niles Township man found guilty of killing wife** - *https://www.southbendtribune.com/news/publicsafety/niles-township-man-found-guilty-of-killing-wife/article_c8fa30ae-6ddc-5b13-ae1c-8181a9d581a0.html*

*"Lewis, 49, was accused of shooting and **killing his wife inside a small marijuana grow room** … Lewis also was found guilty of **possession with intent to manufacture marijuana**."*

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- **Japanese man Satoshi Uematsu sentenced to death for killing 19 people at disabled care home** - *https://www.scmp.com/news/asia/east-asia/article/3075346/japanese-man-satoshi-uematsu-sentenced-death-killing-19-people*

*"Defence lawyers said he was **suffering from a 'mental disorder' linked to his use of marijuana.**"*

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- **Salman Abedi: How Manchester attacker turned from cannabis-smoking dropout to Isis suicide bomber** - *https://www.independent.co.uk/news/uk/home-news/salman-abedi-manchester-attacker-isis-terrorist-europe-islamist-suicide-bomber-arena-explosion-a7753541.html*

"A short time later, he walked through the glass doors of the Manchester Arena, the city's biggest concert venue, and blew himself up, killing 22 people and wounding 116 more.

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- **Cannabis addict obsessed with serial killings who stabbed two elderly women jailed** (January 2021) - https://attackersmokedcannabis.com/2021/01/08/cannabis-addict-obsessed-with-serial-killings-who-stabbed-two-elderly-women-jailed/

"Jayden Hayes attempted to kill one of his victims just 90 minutes after he had been released on bail by magistrates following other alleged offences."

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- **'I will kill you all' – what Sheffield machete attacker yelled inside McDonald's as people fled in terror -** https://attackersmokedcannabis.com/2019/08/28/i-will-kill-you-all-what-sheffield-machete-attacker-yelled-inside-mcdonalds-as-people-fled-in-terror/

"[T]he defendant had come to the UK with his father and was 'doing well' until he fell in with the wrong crowd and started taking cannabis and then spice."

- -

U.S. Surgeon General Jerome Adams

In addition to earlier providing information from the Center for Disease Control and Prevention, and the National Institutes of Health (marked in a red asterisk) * I also provided a quote from U.S. Surgeon General Jerome Adams. Below is a more detailed account of his statements.

https://m.youtube.com/watch?v=sxl7S9c0Vfg&t=14s

- "**U.S. Surgeon General sounds the alarm for pregnant women and adolescents"**

*"No amount of marijuana use during **pregnancy**, or **adolescence**, is safe."*

*"**This (warning) is being driven by the science**, and the most important thing I want people to know, is that marijuana potency has increased three-fold over the past several decades, and that's just the plant."*

"It's a fundamentally different product that increases the dangers and the risks to young people and pregnant women."

*"What we are talking here now is **science and data**."*

*"Youth in those states (that have legalized recreational marijuana) think it's more safe, when **the reality is that's it's less safe**, and that can cause **cognition problems,***

learning attention and memory. *We're seeing* ***emergency department admissions for psychosis and poisonings*** *go up for adolescents."*

"Here's one of the scariest things that people don't know. As the THC content goes up, ***the danger of addiction*** *goes up.* ***1 out of 5 adolescents who use marijuana will become addicted to the substance****. We know that i****f you use one substance, you're likely to use other substances****."*

*"****My own brother is in prison*** *due to crimes he committed to support his addiction.* ***His first drug was marijuana****."*

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Dr. Adams has also released the following statement

- **U.S. Surgeon General's Advisory: Marijuana Use and the Developing Brain -** *https://www.hhs.gov/surgeongeneral/reports-and-publications/addiction-and-substance-misuse/advisory-on-marijuana-use-and-developing-brain/index.html*

"I, Surgeon General VADM Jerome Adams, am emphasizing ***the importance of protecting our Nation from the health risks of marijuana use in adolescence and during pregnancy****.* ***Recent increases in access to marijuana and in its potency, along with misperceptions of safety of marijuana endanger our most precious resource, our nation's youth****."*

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"A Mind Is A Terrible Thing To Waste"

This iconic slogan of the United Negro College Fund is more important now then ever, especially as representative of the Universal Right to grow up with a mind unencumbered by recreational drugs that falsely claim to be "healthy."

We've seen the scientific evidence. We've seen the testimony from grieving parents. Do we think it's not going to happen here?

Baltimore is already plagued by drugs and violence, but there are those who rather then fight, wish to capitulate, to surrender. This is not what "progressive" leadership is about. Those who really care for the community put its health, safety, and well-being first - Not their political careers.

What the community needs is healthy and clear young minds, minds that are full of courage and vision. Surrendering to the Marijuana Lobby sends out the message that we are helpless victims. Who here truly believes that?

Take away the Siren song, and the overt manipulation becomes far more clear.

So who are we to believe? The U.S. Surgeon General, the Centers for Disease Control and Prevention, the data in the Medical Library of the National Institutes of Heath, and the volumes of critical research performed by researchers, doctors, and scientists whose profession is to protect the health of our nation, - or the Marijuana Lobby, who dangles a carrot of prosperity before our communities, while continuing to ignore or denigrate those who are concerned about out nation's health?

My Personal Experience with the Marijuana Lobby

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- **NORML**

In March of 2017, I testified before the Maryland Senate Judicial Proceedings Committee, regard the recreational legalization of Marijuana.

The hearing started off with a statement by the bill's sponsor, Senator William Smith (D), Montgomery County, claiming that "No one had died from marijuana."

In my two minutes, I cited a 2014 study by the American Heart Association, that directly linked marijuana to a series of fatal heart attacks - *https://www.ahajournals.org/doi/pdf/10.1161/JAHA.113.000638*

Afterwards, I was followed by someone as I exited the hearing room, who verbally accosted me, saying that I was "rude" to contest the Senator's remark, and that I need to "Learn My Facts."

My response was that all I deal in is facts, and held out to him a copy of my written testimony, saying it had nearly 20 research links and articles about marijuana's dangers.

What he did was to turn around and re-enter the hearing room.

It wasn't that he didn't know about marijuana's dangers, he didn't want to know.

I was puzzled by his remark of needing to "learn my facts." The American Heart Association is this nation's highest authority on heart disease. There are no other facts.

Then I discovered that NORML has its own "Medical Library."

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One document is:

"**Your Government Is Lying To You (Again) About Marijuana (2003)"**
- *https://norml.org/news/2003/01/15/your-government-is-lying-to-you-again-about-marijuana-norml-charges-in-new-report-rebutting-drug-czar/*

That would include the National Institutes of Health, the U.S. Surgeon General, Centers for Disease Control and Prevention, and the FDA - for starters.

The National Library of Medicine, the largest of it's kind in the world, is housed in the National Institutes of Health. Typing "Marijuana Effects" into the search box yields 17,225 results.

Are we to believe that all research that points to marijuana's dangers are "Lies"
https://pubmed.ncbi.nlm.nih.gov/?term=marijuana+effects

NORML states: "*This report responds to a recent letter from the Drug Czar's office urging law enforcement officials to "aggressively prosecute" marijuana violators. The letter further advocates prosecutors "tell the truth" about marijuana, and then lists more than a dozen unsubstantiated, misleading, and fallacious statements regarding cannabis*."

This trouble for NORML is, as supported by the research and statements I've shared, these "*unsubstantiated, misleading, and fallacious statements regarding cannabis"* are not only real, but deadly.

This is how NORML indoctrinates people, including legislators, into believing marijuana is harmless, by telling them they're being continually lied to, which they are indeed.

It's why teenagers, in spite of all the warnings, smoke, get addicted, develop mental health problems, and sometimes in desperation take there own lives.

We as a people, as a community, as a nation, need to take a stand against this.

- **The NORML Truth Report** https://norml.org/marijuana/library/truth-report/
  "Your Government Is Lying To You (Again) About Marijuana"

"*The White House's anti-marijuana propaganda campaign has continued to take on an increasingly alarmist and extremist tone, arguably crossing over any reasonable line of probity. The Administration's latest rhetoric does not qualify as mere exaggeration; they are flat-out lying to the American public about marijuana.*"

Besides accusations of lying, there's extremism. In psychology, this is known as projection. Even as far back as the late 60s when I became addicted, we knew marijuana made one paranoid.

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- **Recent Medical Marijuana Research (Fallacies)** https://norml.org/marijuana/library/recent-medical-marijuana-research

The FDA has only approved four medications that involve marijuana, for three specific uses.

This NORML document presents a list of 24 treatments that involve marijuana.

I'm sure that as scientific research continues, more legitimate uses will be found. However, as with many of NORML's statements, this document is misleading.

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Rheumatoid Arthritis is listed, but then I found this from the **Rheumatology Network**:

"*Many rheumatology patients may seek cannabinoids to relieve pain, but* ***solid evidence for effectiveness is lacking*** *…"*

"The groundswell of advocacy driving the use of medicinal herbal cannabis is ***contrary to medical opinion*** *… "*

"Contrary to common belief, ***herbal cannabis is not an innocuous substance, either for short- or long-term use****, and* ***its effects undermine the primary goals for treatment of rheumatic pain,*** *namely reduction of symptoms and maintenance of function."*

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PTSD is also listed, however the **U.S. Department of Veteran Affairs** along with the **National Center for PSTD** state: *https://www.ptsd.va.gov/professional/consult/2016lecture_archive/11162016_lecture_slides.pdf*

Short-term use
- Impaired short-term memory, making it difficult to learn and to retain information
- Impaired motor coordination, interfering with driving skills and increasing the risk of injuries
- Altered judgment, increasing the risk of sexual behaviors that facilitate the transmission of sexually transmitted diseases
- In high doses, paranoia and psychosis

Long-term use
- Addiction (in about 9% of users overall, 17% of those who begin use in adolescence, and 25 to 50% of those who are daily users)
- Altered brain development
- Poor educational outcome, with increased likelihood of dropping out of school
- Cognitive impairment, with lower IQ among those who were frequent users during adolescence
- Diminished life satisfaction and achievement (determined on the basis of subjective and objective measures as compared with such ratings in the general population)
- Symptoms of chronic bronchitis
- Increased risk of chronic psychosis disorders (including schizophrenia in persons with a disposition to such disorders

"As marijuana use becomes legal in some states, the dominant public opinion is that marijuana is a harmless source of mood alteration. Although the harms associated with marijuana use have not been well studied, enough information is available to cause concern."

Originally published in the New England Journal of Medicine - *https://www.researchgate.net/publication/262846407_Adverse_Health_Effects_of_Marijuana_Use*

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Hepatitis C is also mentioned by NORML, however another research article in the National Health Library says: "*We conclude that daily cannabis use is strongly **associated with moderate to severe fibrosis** and that HCV-infected **individuals should be counseled to reduce or abstain from cannabis use***."

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3184401/

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Hypertension: The 2014 American Heart Association study I cited earlier mentions elevated blood-pressure levels. THC gets to the brain by latching onto red-blood cell oxygen receptors. The brain, being deprived of oxygen, instructs the heart to beat faster.

Also, this piece from the Harvard Medical School, originally published in the European Journal of Preventive Cardiology states: "*They concluded that **marijuana users had a higher risk of death related to high blood pressure** than non-users. In addition to increasing the risk of heart disease, **high blood pressure can lead to kidney disease and heart failure**.*" *https://www.health.harvard.edu/heart-health/marijuana-linked-to-high-blood-pressure-risk*

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Multiple Sclerosis*:* The National Multiple Sclerosis Society has published the following statement:

"*The AAN findings (American Academy of Neurology) state that smoked cannabis research studies **have not produced enough evidence to assess its safety or effectiveness for treating MS symptoms** including spasticity, pain, balance, posture and cognition changes … Cannabis is a complex substance which may contain many different components affecting the body. Production of marijuana for medical use is not standardized or supervised by the FDA or any other agency … The guideline notes that cannabis usage, as with any therapy, may result in both potential benefits and potential side effects. For these cannabis derivatives, **the most commonly reported side effects were dizziness, drowsiness, difficulty concentrating and memory disturbance**. The guideline also points out that **the long-term safety of cannabis use for MS symptom management is not yet known**.*"

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- **Marijuana Policy Project**

  "Obstruction and lies is all they've got - let's disarm the prohibitionists today" *https://ashevilleprogressive.com/site/uncategorized/24762/*

So starts a letter I received last year, written by Marijuana Policy Project's Executive Director, Steve Hawkins. From a psychological perspective, it, is an excellent example of "Projection."

“Projection” is a process by which an individual who cannot consciously confront his own failings, “projects” them onto others. It is one of the more common psychological defense mechanisms.

Relying on “dishonesty and blatant falsehoods to achieve its goal” is the description of Marijuana Policy Project.

Rather then openly discuss the growing problems with marijuana that are being reported by victims, and supported by research, Steve Hawkins, Marijuana Policy Project, and NORML, instead denigrate those who are concerned for the health of our nation, especially its youth, as being “Lying Prohibitionists.”

The reason can clearly be seen in MPP’s logo “We Change Laws.” In order to do that, they have to influence the minds of legislators and as we all know, propaganda is rampant in politics.

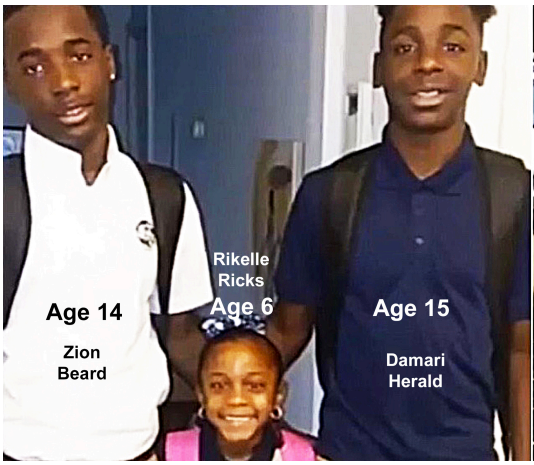
Throughout the ages, one of the greatest forms of trickery has been the siren song of money, prosperity.

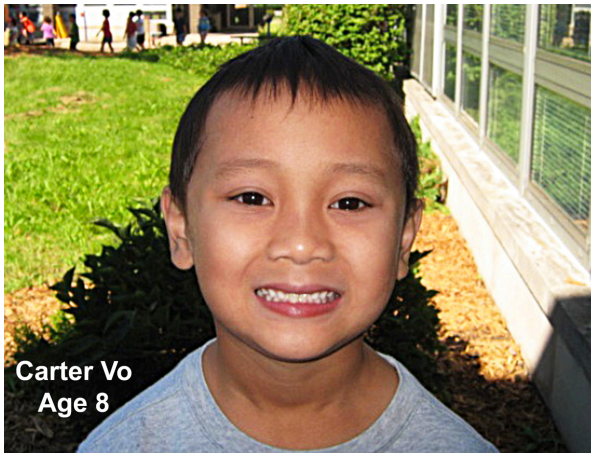
That spell must never be broken, because to do so risks a sudden glance beyond the mesmerizing scenery, into the dimness beyond.

For the marijuana industry and its lobbyists, it is a glimpse into hell - a hell that consists of the CDC, the U.S. Surgeon General, the National Institutes of Health, the American Heart Association, the American Journal of Psychiatry, the American Psychiatric Association, Baltimore Sun, Dr. Steven Simerville - St. Mary-Corwin Hospital, European Journal of Preventive Cardiology, Frontiers of Psychiatry, Harvard Medical School, Insurance Institute for Highway Safety, Journal of Child Psychology and Psychiatry, Mental Health Association of Maryland, National Center for PSTD, National Institute on Drug Abuse, National Library of Medicine, National Multiple Sclerosis Society, National Public Radio, NBC News, New England Journal of Medicine, Psychology Today, Time Magazine, Washington Post, U.S. Department of Veteran Affairs

Americans Against Legalizing Marijuana, American Anti Drug Council, American Society of Addiction Medicine, Attacker Smoked cannabis.com, Community Alliance for Drug Free Youth, Drug Abuse Resistance Education, Drug Free America Foundation, Families Anonymous, Five Minutes of Courage, Marijuana Anonymous, Marijuana Victims Alliance, National Families in Action, One Chance to Grow Up, the Other Side of Cannabis, Partnership for Drug-Free Kids, Smart Approaches to Marijuana

A Sampling of Marijuana Victims






Jenna Marie Farley
age 14
Cassidy Clark
age 16
Luther Wiggins-Stoudermire
age 18
Three Teens Killed


13 Killed
Texas
March 29, 2017


16 Dead
Chase MD
January 4, 1987

MDDCSAM - SB 708 LOI - Cannabis Legalization.pdf
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Position: INFO

Maryland-DC Society of Addiction Medicine
A Chapter of American Society of Addiction Medicine

SB 708 Cannabis – Legalization and Regulation

Senate Finance Committee March 4, 2021

LETTER OF INFORMATION

SUMMARY:

- We support all of the decriminalization & expungement provisions.
- Cannabis Use Disorder (CUD) occurs in about 10% of cannabis users and causes significant functional impairment similar to other addictions.
- A commercial model of legalization is likely to increase the prevalence of CUD due to industry consolidation, product design, marketing, public relations, lobbying, and "regulatory capture," as has occurred in the tobacco and alcohol markets.
- Non-commercial legalization can avoid many of these harms. Various models have been used including limiting production and marketing to non-profits, B corporations, buyers' clubs/co-ops, home cultivation and/or a public authority.
- Regulatory complexity should be avoided through a unitary market of medical and adult-use cannabis as in other states. Complex regulations are less enforceable and are more likely to be circumvented by a powerful commercial industry.
- In a public health framework the Department of Health would be the lead agency with a mandate to minimize all use, with significant limitations on advertising, and with mechanisms to avoid industry influence on policy.
- Taxation should be based on THC content. Otherwise, THC concentrations, which are associated with greater harms, will continue to rise.

I am Joseph Adams, MD, FASAM, an addiction medicine specialist who participated in drafting the policy statement on cannabis by the American Society of Addiction Medicine (ASAM) released October 2020, (1) testifying on behalf of the Maryland-DC Society of Addiction Medicine (MDDCSAM)

MDDCSAM strongly supports all of the decriminalization and expungement measures in the bill. Civil fines also pose severe burdens and should be reduced, which is consistent with ASAM policy.

We are not opposed to cannabis legalization per se. We acknowledge the harms of both the prohibition of legal production, as well as the harms of commercial legalization (primarily CUD). Any legalization of cannabis production and sale **should be done in a way that minimizes the harms of both legalization and of prohibition.**

Most adults have no discernable harms from the use of cannabis. However, cannabis legalization using a commercial model is very likely to increase the prevalence and intensity of **cannabis use among adults, with a consequent increase in cannabis use disorder (CUD). CUD occurs in at least 8-12% of cannabis users**, with even higher rates in more frequent users. (2) (3) (4)

Of cannabis users with CUD, 23% are symptomatically severe (with at least 6 of 11 diagnostic criteria), so CUD is not rare and can be serious. (3). As with other substance use disorders, by definition CUD causes clinically significant impairment or distress, can interfere with the ability to fulfill major role obligations, and can result in an inability to cut down or control cannabis use despite recognition that it is causing significant problems.

To prevent increasing the prevalence of CUD, any cannabis legalization of production and sale should follow a non-commercial model. **The tobacco and alcohol industries** exemplify how powerful commercial entities tend to undermine public health policies through product design, sophisticated marketing and promotion, as well as public relations and lobbying to create a favorable regulatory environment. Largely as a result of these activities, tobacco and alcohol are, respectively, the number one and number three causes of preventable death in the United States. (5) (Cannabis use does not cause mortality). Both industries are incentivized to **promote sales to consumers with hazardous or harmful use of their products who account for a significant proportion of industry profits. Such incentives will also be present in the commercial cannabis industry.**

SB 708 includes no significant barriers to commercial investment and market consolidation. This is likely to result in weakening of public health regulation through 'regulatory capture' by industry. Consistent with tobacco control best practices (6), a public health framework would require that any person employed by the cannabis industry or any entity working to further its interests should be prohibited from serving on any government body, committee or advisory group that sets or implements cannabis control or public health policy. All advisory committees involved in regulatory and oversight processes should consist solely of public health officials and experts and **limit the cannabis industry's advisory role** to that of a member of the "public." A public health framework would designate the health department as the lead agency **with a mandate to minimize *all* use (not just in youth**). As described in the ASAM cannabis policy, various options for non-commercial models of legalization could include limiting production and marketing to nonprofit entities, Benefit corporations, small co-ops, buyers' clubs, home cultivation or a public authority. State store sales of alcohol in seventeen U.S. states have been associated with reduced harms in youth. Four Canadian provinces use state stores for cannabis sales. Tobacco and alcohol markets are controlled by public entities in many nations.

A public health framework would also **avoid regulatory complexity** which favors corporations with financial resources to create and manipulate policies that are difficult to enforce. A simplified, more enforceable regulatory system **would create a unitary market in which all legal sales, regardless of whether for recreational or medical purposes**, follow the same rules, as in other states. (6)

Unlike tobacco or alcohol, cannabis use is relatively safe and is not associated with mortality. However, **the risk of developing harmful addiction to cannabis is similar to the risk of addiction to alcohol.** Efforts to *promote* cannabis consumption as a means of creating wealth or raising tax revenue will inevitably increase the rate of cannabis use, and cannabis use disorder, with severe consequences.

Legalization of adult use of potentially addicting substances can be accomplished without ceding control to powerful commercial industries; there are many examples of this being done in tobacco and alcohol markets, and in some cannabis markets. Non-commercial legalization of production and sale, with enforceable regulations and a robust public health framework, **could avoid a possible surge in cannabis addiction.**

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MDDCSAM is the Maryland state chapter of the American Society of Addiction Medicine whose members are physicians and other health providers who treat people with substance use disorders.

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Position: INFO

March 4, 2021

The Honorable Delores Kelley
Chair, Senate Finance Committee
3 East
Miller Senate Office Building
Annapolis, Maryland 21401

RE: SB 708 – Cannabis – Legalization and Regulation – Letter of Information

Dear Chair Kelley and Committee Members:

The Maryland Medical Cannabis Commission (the Commission) is submitting this letter of information for Senate Bill (SB) 708 entitled "Cannabis – Legalization and Regulation." SB 708 establishes an extensive framework for the legalization, taxation, and regulation of cannabis for personal adult-use in Maryland.

Notably and admirably, Senate Bill 708 seeks to establish an equitable adult-use industry and ensure that small, minority, and women businesses, and minority and women entrepreneurs, have adequate access to capital and opportunities to thrive in this new industry. Specifically, the bill would establish several funds and a licensing structure aimed at ensuring inclusion and participation among minority groups and women, as well as addressing the critical issue of expungements for individuals with cannabis- or marijuana-related charges. As demonstrated by the 2018 disparity analysis ordered by Governor Hogan, as well as arrest data and cannabis ownership data collected in Maryland and across the country, the minority groups who have been disproportionately impacted by the criminalization of cannabis by and large have not benefited from the legalization of the same. The Commission commends the bill's sponsor for his efforts in crafting legislation that seeks to address the significant issues of social justice and equity.

Fifteen states and the District of Columbia have legalized adult-use cannabis. In addition, legislative proposals are currently under consideration in the nearby states of New York, Pennsylvania, and Virginia. The Commission requested information from these jurisdictions through the Cannabis Regulators Association (CANNRA) – a nonpartisan national organization of cannabis regulators that provides policy makers and regulatory agencies with the resources to make informed decisions when considering whether and how to legalize and regulate cannabis – to assist the General Assembly as it considers the complex issue of cannabis legalization.

Based on information provided by states allowing adult-use cannabis and lessons learned over the past seven years developing, implementing, and administering the State's medical cannabis program, the Commission identified several issues with the bill as introduced. However, the bill sponsor has proposed amendments to address these issues. Specifically, the sponsor amended the bill to (1) combine the medical and adult-use cannabis programs under one regulatory body, (2) transfer Maryland Medical Cannabis Commission staff to the Alcohol, Tobacco, and Cannabis

Commission, ensuring joint resources and regulation, (3) establish the joint medical and adult-use cannabis program as a division within the Office of the Executive Director of the Alcohol, Tobacco, and Cannabis Commission, and (4) establish an advisory board of cannabis, law enforcement, public health, laboratory, and other experts to advise on supplemental regulations and additional changes to the program. The Commission appreciates that Senator Feldman continues to collaborate with stakeholders in order to identify a consensus approach.

The Commission identified the following concerns with the bill as introduced, each of which the bill sponsor has addressed through proposed amendments:

1. **Competing and redundant regulatory structures.**
   SB 708 places regulatory oversight of the program under the Alcohol and Tobacco Commission within the Health-General Article, while regulatory oversight of medical cannabis would remain with the Commission. Establishing two agencies to perform substantially the same work would significantly increase operational costs to the State. In addition, businesses that hold both adult-use and medical licenses (permitted under the bill), would be subject to two sets of regulators and two sets of laws. If the bill were to pass in its current form, Maryland would be the first state to regulate medical and adult-use cannabis under entirely separate agencies.

2. **No funding to cover initial operational costs.**
   While the Alcohol and Tobacco Commission is authorized to assess license fees to operate the program, expenditures in excess of several million dollars must occur prior to the solicitation of license applications and award of licenses in order to get the adult-use program up and running (e.g. seed-to-sale tracking system, agent and business licensing system). In other jurisdictions, the state legislature either (1) appropriates start-up funds or (2) where the medical and adult-use programs are jointly administered, authorizes the regulator to use existing funds from the medical program to cover the necessary start-up costs of the adult-use program.

3. **Lack of expertise among commission members and staff.**
   While the Alcohol and Tobacco Commission membership currently is required to have alcohol, fiduciary or public health expertise, there are no amendments to require any cannabis experience or expertise among the members who will be adopting regulations for the program and making licensing and other critical decisions. The bill would make Maryland the first state to legalize adult-use and not leverage existing staff cannabis expertise and resources.

   Staffing is a vital concern for a nascent adult-use program. Cannabis is a unique subject matter – it is an agricultural crop, a drug, a dietary supplement, and a food product, that is currently illegal under federal law. The conflict with federal law coupled with the fact that each jurisdiction has chosen a different path to legalization creates sizable challenges for the agency tasked with developing, implementing, and enforcing regulations to administer an adult-use program. Given that the industry as a whole is relatively novel and differs vastly from state-to-state, it is often the existing medical programs that have the most expansive subject matter expertise.

In Maryland, the Commission – including its staff – have developed cannabis-specific regulatory expertise over seven years. Rather than leveraging this expertise, SB 708 as introduced requires a new regulatory body and staff to start from scratch. Absent continuity in administration, the implementation of an adult-use cannabis market will almost certainly face a significant delay. The bill includes an aggressive timeline for developing regulations and implementing the program – based on the experience of the Commission, this timeline will not be possible to meet if a new regulatory body is required to build the adult-use program from the ground up. In line with this, the hiring of staff for a new agency can take years. This is why HB 1052 (2019), which created the Alcohol and Tobacco Commission, included specific provisions to transition existing staff from the Comptroller of Maryland to the new agency. SB 708 contains no such analogous provisions and would make Maryland the first state to transition from medical-only to adult-use and medical without also transitioning existing staff and expertise.

4. **Separate regulatory body from social equity fund administration.**
SB 708 would require the Alcohol and Tobacco Commission to oversee licensing, regulations, and compliance for adult-use, as well as establish the Office of Social Equity and administer several new funds (e.g. cannabis education, community reinvestment, and social equity start-up funds). These funds are critical to the program's success and Maryland achieving its goal of a truly equitable cannabis industry, and the scope of responsibilities to administer each fund are incredibly broad.

The Alcohol and Tobacco Commission and the State are best served by clearly separating these functions for the following reasons:

- *Subject matter experts should be in charge of each aspect of the program*. Adult use jurisdictions have shared that establishing certain program functions in other agencies helps ensure that (1) subject matter experts are in charge of each aspect of the program and (2) the cannabis program can become operational and successful more quickly, because its focus can be on regulations, licensing, and compliance.
- *Conflict of interest or the appearance of a conflict of interest*. Beyond not being a subject matter expert in administering social equity programs, or business loans or grants, placing the cannabis regulatory body in charge of administering special funds earmarked for certain businesses that they regulate within the cannabis program may create conflicts of interest or make the regulatory body vulnerable to claims of favoritism or impropriety.

5. **Requiring adoption of all new regulations**.
The Commission developed its current regulations over a seven-year period. These regulations represent best practices across medical and adult-use programs in terms of laboratory testing, product safety, product requirements, and security, and were developed following consultation with the cannabis industry, law enforcement, public health, and the General Assembly. Yet the bill requires the Alcohol and Tobacco Commission to

develop *new* regulations, rather than utilize existing statutes and regulations that can readily apply to medical or adult-use cannabis.

The process of adopting regulations could be significantly streamlined if instead of developing entirely new regulations, existing medical cannabis regulations were supplemented to address a limited number of issues specific to an adult-use market (e.g. ID verification, advertising, sales to minors, application/award of adult-use licenses). Requiring the adoption of entirely new regulations will significantly delay the adult-use industry from becoming operational.

6. **Failing to protect medical cannabis patients or the medical cannabis program**. SB 708 currently provides no protections for the medical cannabis program or medical cannabis patients. While the bill does provide an avenue for existing medical businesses to obtain adult-use licenses, the fees associated with obtaining a dual-license are prohibitively high, and there is no requirement for these businesses to maintain their medical cannabis licenses or continue to manufacture or dispense medically-focused products. The likely effect of this is that many licensees may decide to leave the medical cannabis program all together, in favor of a more robust and profitable adult-use program, rather than seeking dual licensure. While it is difficult to ascertain the exact number of licensees that may not seek renewal of their medical license, it is likely to be a significant number. The combined decrease in the number of patients and licensees, coupled with a loss of funding under the FY 2022 budget, would almost certainly render the Commission unable to cover its budget obligations by 2024.

   Without medically focused businesses or products, patients must look to adult-use dispensaries, where specialty medical products are either not for sale or are prohibitively expensive. As witnessed in other jurisdictions, the Commission anticipates the number of medical licenses and medical patients will plummet absent additional protections. In Oregon, the number of medical cannabis patients has dropped by nearly 66% since the legalization of adult-use in 2015. Alaska, Nevada, and Colorado also experienced significant drops in their patient populations with the advent of adult-use legalization (63%, 40%, and 19% respectively).

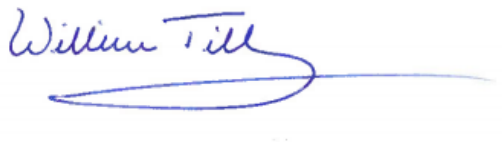
To address the concerns detailed above, the Commission offers the following technical changes to the bill:

1. Rename the Alcohol and Tobacco Commission the Alcohol, Tobacco, and Cannabis Commission;
2. Create the Cannabis Regulation and Enforcement Division within the Office of the Executive Director of the Alcohol, Tobacco, and Cannabis Commission, which would be responsible for regulation and enforcement of both medical and adult-use cannabis;
3. Amend the definitions in Health – General Article §13-3301 to include the Alcohol, Tobacco, and Cannabis Commission;
4. Repeal Health – General Article §13-3302 and 13-3303, which eliminates the Maryland Medical Cannabis Commission membership;

5. Establish the Office of Social Equity as an independent office within the Alcohol, Tobacco, and Cannabis Commission – this will ensure the regulation of the program and administration of various funds are separate;
6. Clarify that amendments must be made to existing cannabis regulations to meet the requirements of a new adult-use program;
7. Authorize use of existing medical program funds and staff to operationalize adult-use program; and
8. Require the Alcohol, Tobacco, and Cannabis Commission to submit a report in December 2021 recommending any necessary conforming amendments between the medical and adult use programs.

The Commission appreciates the work the General Assembly has done over the past seven years to advance the medical cannabis program, and it is with the future of the program and its patients in mind that I am providing this information to you today. I hope you find it useful. If you would like to discuss this further, please contact Taylor Kasky, Director, Policy and Government Affairs, at (443) 915-5297 or at taylors.kasky@maryland.gov.

Sincerely,



William Tilburg, JD, MPH
Executive Director
Maryland Medical Cannabis Commission

cc: Members of the Senate Finance Committee

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Uploaded by: Hammond, Christopher
Position: INFO

INFORMATIONAL TESTIMONY
Bill No.: Senate Bill 708 (SB0708)
Bill Title: Cannabis - Legalization and Regulation
Bill Sponsor: Senators Feldman, Ferguson, Guzzone, King, Smith, Waldstreicher, & Washington

Christopher J. Hammond MD PhD
Director of Co-occurring Disorders in Adolescents and Young Adults (CODA) Clinical and Research Programs and Assistant Professor of Psychiatry & Child Psychiatry at Johns Hopkins University School of Medicine

Dear Chair and Members of the Maryland Senate Finance Committee,

My name is Christopher Hammond. I am an MD PhD physician scientist with training in child & adolescent psychiatry and addiction medicine with over 10 years of clinical and research experience working with children and families impacted by substance use and mental health disorders. At Johns Hopkins, I direct clinical, research, and educational programs focused on prevention and early-intervention for substance use and co-occurring mental health disorders in young people. Much of my research focuses on adolescent cannabis use and on the impact of cannabis use during adolescence on brain development and health outcomes. In my clinic, I work directly with youth and families that have been impacted by changing cannabis legislation.

I am here today to provide unbiased scientific background and answer questions about the risks related to cannabis use and effects of cannabis legislation on health outcomes in young people and people with mental health problems as part of an informational testimony related to Senate Bill 708 (SB0708), a bill supporting Cannabis Legalization in the State of Maryland. I feel strongly that this and future cannabis legislation in Maryland should be evidence-informed, apply a public health framework, and that our state legislators should rely on sound empirical data to guide their policy choices. Of relevance to SB0708, current scientific evidence supports the following four points:

- **Cannabis use is common among American youth**
    - Cannabis is the most commonly used drug by American youth, and cannabis use disorder is the main drug problem that teens receive substance use treatment for in the U.S.[1-3]
- **Cannabis use by young people is associated with adverse health outcomes**
    - Adolescent cannabis use is associated with immediate and possibly long-term impairments in cognition, worse academic and vocational outcomes, and increased prevalence of psychotic, mood, and addictive disorders and suicidal thoughts and behaviors.[4-8]
    - Odds of having adverse health outcomes (across outcome types) are increased in youth who start using cannabis at an earlier age and who engage in regular heavy use, and high potency Δ-9-tetrahydrocannabinol (THC) cannabis use. [9-11]
    - Depressive, anxiety, and psychotic symptoms, cognitive and memory impairments, legal problems, and rates of school-related absences and failure all DECREASE following cessation or reduction of cannabis use by young people.[12-16]
- **Legalization of cannabis increases the risk for adverse health outcomes in American youth**

- Cannabis legalization for recreational purposes is associated with increase rates of cannabis use by American adolescents and young adults.[17-20]

- Cannabis legalization is associated with increased availability of, access to, and use of high THC potency cannabis products (e.g. dabbing/concentrates) by American youth.[21-23]

- Cannabis legalization is associated with increased rates of cannabis-related motor vehicle crashes and *costly* emergency department visits and hospitalizations as a result of high potency cannabis use by young people.[24-27]

- Societal perceptions that cannabis use is harmful have decreased dramatically among American youth and their parents increasing the likelihood of future youth cannabis use.[1]

- **More research is needed to understand the risks of legalization and how to mitigate them**

  - Not all cannabis policies are the same.[26,27]

  - Specific policy strategies may increase or decrease the likelihood of youth cannabis use and risk for adverse health outcomes in young people.[27-31]

    - Capping the THC potency of cannabis products
    - Pricing/taxation policies that promote public health
    - Use of warning labels, clear labeling, and childproof packaging
    - Restricting marketing/advertising and minimizing youth advertisement exposure
    - Reduced purchase quantity limits
    - Location restrictions prohibiting sale near places frequented by youth
    - Enhanced regulatory monitoring and enforcement practices

  - These policies could mitigate some of the risks for negative health outcomes for youth, but more research is needed before they are considered evidence-based risk mitigation policies.

  - Research is being conducted *right now* that will answer important questions about the downstream health effects of cannabis legalization and how to mitigate risks.

When deciding how to amend and vote on Senate Bill 708, please take into consideration the scientific evidence, the gaps in our current scientific evidence, and the fact that cannabis legalization outcome research that is highly relevant to public health outcomes for Maryland youth is being conducted right now but has not yet shown us which policies are safest and most effective at mitigating risk. I very much appreciate the Chair and Committee for giving me the opportunity to educate you about the current state of the scientific evidence in this field and would be happy to provide additional information and guidance as it relates to SB0708 and other cannabis-related legislation at your request.

Thank you.

Christopher Hammond, M.D., Ph.D.
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Background research and publications showing effects cannabis use on health outcomes among young people from my lab

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REVIEW ARTICLE

Cannabis use among U.S. adolescents in the era of marijuana legalization: a review of changing use patterns, comorbidity, and health correlates

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ABSTRACT

Decriminalization, medicalization, and legalization of cannabis use by a majority of U.S. states over the past 25 years have dramatically shifted societal perceptions and use patterns among Americans. How marijuana policy changes have affected population-wide health of U.S. youth and what the downstream public health implications of marijuana legalization are topics of significant debate. Cannabis remains the most commonly used federally illicit psychoactive drug by U.S. adolescents and is the main drug for which U.S. youth present for substance use treatment. Converging evidence indicates that adolescent-onset cannabis exposure is associated with short- and possibly long-term impairments in cognition, worse academic/vocational outcomes, and increased prevalence of psychotic, mood, and addictive disorders. Odds of negative developmental outcomes are increased in youth with early-onset, persistent, high frequency, and high-potency Δ-9-THC cannabis use, suggesting dose-dependent relationships. Cannabis use disorders are treatable conditions with clear childhood antecedents that respond to targeted prevention and early intervention strategies. This review indicates that marijuana policy changes have had mixed effects on U.S. adolescent health including potential benefits from decriminalization and negative health outcomes evidenced by increases in cannabis-related motor vehicle accidents, emergency department visits, and hospitalizations. Federal and state legislatures should apply a *public health framework* and consider the possible downstream effects of marijuana policy change on paediatric health.

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Psychiatric Times

Adolescent Marijuana Use and Vulnerability for Neuropsychiatric Disorders

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Christopher J. Hammond, MD
Christopher J. Hammond, MD

An overview of some of the recent scientific data examining the relationship between adolescent marijuana use and later onset of neuropsychiatric disorders.

CONFERENCE COVERAGE

In context of the evolving legal regulations on the medical and recreational use of marijuana, there has been an increase in marijuana use and marijuana-related disorders in the US, especially among adolescents, where daily use is at a 30-year high among US high school seniors.[1] Because adolescence represents a period of significant neurodevelopment, the effects of marijuana use during adolescence and possible short- and long-term consequences are a growing concern. Here we discuss some of the recent scientific data examining the relationship between adolescent marijuana use and later onset of neuropsychiatric disorders.

Converging scientific evidence from preclinical studies, human neuroimaging, and large longitudinal studies suggests that adolescent-onset marijuana use, particularly heavy marijuana use, is associated with a number of neuropsychiatric sequelae including neurocognitive deficits and reductions in IQ, increased risk for psychosis, affective disorders, marijuana and non-marijuana drug addiction, and lower academic attainment.[2] Is a relationship between adolescent marijuana use and neuropsychiatric disorders biologically plausible?

In the human brain, cannabinoid 1 receptors, the receptors which marijuana's biochemical components act on to cause its psychoactive effect, are expressed widely with the highest density of receptors found in the striatum, amygdala, hippocampus, hypothalamus, and cerebellum-all brain regions that are implicated in marijuana addiction and other neuropsychiatric disorders. Neuroimaging studies of adolescent marijuana users have found structural and functional differences in some of these brain regions when compared to matched controls.[3]

Preclinical studies have shown that when rodents are exposed to cannabinoid compounds during adolescence, brain and behavioral changes are observed.[4] The animals show signs of being more anxious and depressed in animal behavioral stress tests compared to non-exposed rodents, and their brains show altered maturation of the prefrontal cortex and subcortical structures, as well as altered connections between those structures. The brains of adolescent cannabis-exposed rodents also show changes in a number of different neurotransmitters (eg, dopamine, glutamate, GABA) and the stress-response system (ie, hypothalamic-pituitary-adrenal gland [HPA] axis). Interestingly, many of these brain and behavior changes do not develop when chronic cannabinoids are administered to older (adult) animals, suggesting an age-dependent vulnerability to adverse effects of marijuana which may be specific to childhood and adolescence.

Perhaps the strongest evidence that links adolescent marijuana use to neuropsychiatric disorders comes from a series of large longitudinal studies, many of which were done in Australia and New Zealand.[5,6] These studies have followed children from birth through young adulthood (some for up to 30 years) and many have attempted to control for a number of cofounding variables, allowing for the isolation of the effects of marijuana on specific neuropsychiatric outcomes.

While these studies have consistently shown a dose-response relationship between adolescent marijuana use and increased vulnerability to developing neuropsychiatric disorders, the results are less consistent after controlling for confounding variables, such as childhood adversity and shared risk genes, suggesting that at least some of the risk may be related to common factors.

To better answer questions about the impact of marijuana on neurodevelopment, data from these large cohort studies have recently been pooled for systematic reviews and integrative analyses.[5,6]Moore and colleagues[5]

completed a systematic review that includes 35 studies to examine if marijuana use was associated with psychotic or affective outcomes (both symptoms and disorders), beyond transient intoxication.[5]

The researchers found that there was an increased risk for psychotic outcomes in individuals who had ever smoked marijuana (1.5 times more likely to develop psychosis) (adjusted odds ratio [OR] = 1.41, 95%CI = 1.54-2.84) with a dose-response such that heavy marijuana use and earlier age of onset were associated with increased risk. While the data was less consistent for affective disorders, there was also association between heavy marijuana use and an increased risk for depression (adjusted OR = 1.49, 95%CI = 1.15-1.94).

An integrative participant-level analysis was recently completed using pooled data from three large longitudinal studies which included 3765 subjects.[6]Silins and colleagues[6] looked at the maximum frequency of teenage marijuana use (age < 17) and a number of developmental outcomes in young adulthood. They found a dose-response relationship between adolescent marijuana use and a number of adverse outcomes in young adulthood with the heaviest marijuana users (daily use) experiencing the most neuropsychiatric sequelae as young adults.

After controlling for covariates, adolescent daily marijuana users were 18 times more likely to develop a marijuana use disorder (adjusted OR = 17.95, 95%CI = 9.44-34.12); 8 times more likely to use other illicit drugs (adjusted OR = 7.80, 95%CI=4.46-14.63); and 7 times more likely to attempt suicide (adjusted OR = 6.83, 95%CI = 2.04-22.90) in young adulthood. They were also significantly less likely to graduate high school and achieved lower academic attainment.

These findings linking adolescent-onset marijuana use to neuropsychiatric outcomes in young adulthood, and bridging preclinical, clinical translational, and prospective longitudinal methodologies, underscore the need for increased research in this area and the importance of psychiatrists to help patients with the following:

1. educate youths and their parents about the harms of marijuana
2. screen and provide early treatment to high-risk adolescents
3. increase advocacy
4. involve the scientific community in marijuana-related policy decisions

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Temporal dynamics of the relationship between change in depressive symptoms and cannabis use in adolescents receiving psychosocial treatment for cannabis use disorder

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ABSTRACT

Aims: Cannabis use disorder (CUD) and depression frequently co-occur in youth. How depressive symptoms change over the course of CUD treatment and how they impact substance use treatment outcomes is unknown. In the current study, we examine the temporal relationships between cannabis use and depression in adolescents receiving evidence-based treatments for CUD as part of a multisite clinical trial.

Design: Six hundred adolescents (age 12–18) with a CUD were randomly assigned to substance use treatment from one of five evidence-based psychosocial interventions. We assessed self-reported cannabis use frequency and depressive symptoms at baseline (BL) and again at 3-, 6-, 9, and 12-months. A bivariate latent change model assessed bidirectional effects of baseline levels and time-lagged changes in depressive symptoms and cannabis use on depression and cannabis use outcomes.

Findings: Depressive symptoms (72%) and major depressive disorder (MDD) (18%) were common at BL. Both depression and cannabis use decreased over time and change in cannabis use was significantly associated with change in depressive symptoms ($b = 1.22$, $p = .003$). Time-lag analyses showed that within-subject change in depression (from one time point to the next) was predicted by previous depression ($b = -0.71$, $p < .001$) but not cannabis use ($p = .068$), and change (decrease) in cannabis use was predicted by previous (greater) depressive symptoms ($b = -1.47$, $p < .001$) but not cannabis use ($p = .158$), respectively.

Conclusion: These findings indicate an enduring relationship between decreasing cannabis use and decreasing depression among adolescents lasting for 9-months after receiving psychosocial interventions for CUD. The presence of depressive symptoms did not appear to interfere with substance use treatment or attenuate improvements in cannabis use frequency. A decrease in cannabis use was not contingent upon a reduction in depressive symptoms. These findings are limited by the possibility of regression to the mean for both cannabis use and depressive symptoms, and the lack of a nonintervention control group.

FULL-LENGTH REPORT

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An exploratory examination of marijuana use, problem-gambling severity, and health correlates among adolescents

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Background and aims: Gambling is common in adolescents and at-risk and problem/pathological gambling (ARPG) is associated with adverse measures of health and functioning in this population. Although ARPG commonly co-occurs with marijuana use, little is known how marijuana use influences the relationship between problem-gambling severity and health- and gambling-related measures. *Methods:* Survey data from 2,252 Connecticut high school students were analyzed using chi-square and logistic regression analyses. *Results:* ARPG was found more frequently in adolescents with lifetime marijuana use than in adolescents denying marijuana use. Marijuana use was associated with more severe and a higher frequency of gambling-related behaviors and different motivations for gambling. Multiple health/functioning impairments were differentially associated with problem-gambling severity amongst adolescents with and without marijuana use. Significant marijuana-use-by-problem-gambling-severity-group interactions were observed for low-average grades (OR = 0.39, 95% CI = [0.20, 0.77]), cigarette smoking (OR = 0.38, 95% CI = [0.17, 0.83]), current alcohol use (OR = 0.36, 95% CI = [0.14, 0.91]), and gambling with friends (OR = 0.47, 95% CI = [0.28, 0.77]). In all cases, weaker associations between problem-gambling severity and health/functioning correlates were observed in the marijuana-use group as compared to the marijuana-non-use group. *Conclusions:* Some academic, substance use, and social factors related to problem-gambling severity may be partially accounted for by a relationship with marijuana use. Identifying specific factors that underlie the relationships between specific attitudes and behaviors with gambling problems and marijuana use may help improve intervention strategies.

Keywords: marijuana, gambling, at-risk/problem gambling, adolescence, risk behaviors

Treatment

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Pharmacotherapy for Substance Use Disorders in Youths
Christopher J. Hammond, M.D.* and Kevin M. Gray, M.D.

Psychiatric Times

8 Core Principles When Treating Addiction in Adolescents
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Christopher J. Hammond, MD, PhD
Pravesh Sharma, MD
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Structural and Functional Neural Targets of Addiction Treatment in Adolescents and Young Adults: A Systematic Review and Meta-Analysis
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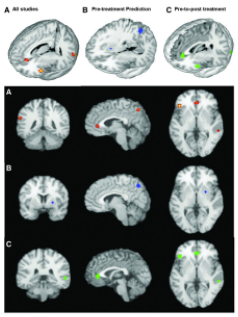

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Neurobiology of Adolescent Substance Use and Addictive Behaviors: Prevention and Treatment Implications
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The adverse consequences of cannabis use among North American college students.*

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*=This report on cannabis-related outcomes in North American college students using the Healthy Minds Dataset will be presented at the Society for Behavioral Medicine 2021 Scientific Meeting April 2021.

ABSTRACT

Background: Cannabis is the most widely used drug among college students in the United States with rising prevalence year-to-year. Existing evidence indicates that cannabis use may have negative mental health and wellness consequences in young adults. However, research on outcomes of cannabis use among college students has been limited. The current study extends knowledge by examining extensive health, wellness, and social consequences of cannabis use. **Methods:** A survey was administered to college students (N = 40,250) between the ages of 18 and 25 years in universities across the United States (n =53) and Canada (n=1). Multiple logistic and ordinal regression analyses, adjusted by sociodemographic, academic, and other drug use covariates, was conducted to examine the relationship between past 30-day cannabis use with multiple outcomes. **Results:** Cannabis use was significantly ($p < .0001$) associated with greater risk for suicide ideation (*AOR* = 1.54), suicide planning (*AOR* = 1.39), suicide attempts (*AOR* = 1.66), depression (*AOR* = 1.32), anxiety disorder (*AOR* = 1.19), eating disorders (*AOR* = 1.20), binge drinking (*AOR* = 4.96), tobacco use (*AOR* = 3.57), cocaine use (*AOR* = 7.13), ecstasy use (*AOR* = 10.14), methamphetamine use (*AOR* = 6.91), stimulant use (*AOR* = 6.68), financial stress (*AOR* = 1.22), poorer grade point average (*AOR* = 1.20), violence victimization (*AOR* = 1.36), and poorer quality social relationships (*AOR* = 1.10). Cannabis use was significantly ($p < .0001$) associated with less risk of insomnia (AOR = .67). Cannabis use was not associated with greater heroin use. **Conclusions:** Cannabis use has significant negative health, wellness, and social consequences for college students. These findings point to the importance of identification and treatment of cannabis users in a college setting and for robust prevention interventions.

Different clinical characteristics and hospital course of adolescents diagnosed with substance-induced psychosis and primary psychotic disorders in a United States Nationwide inpatient sample*

Rikkin Patel, MD, MPH; Ankit Chalia, MD; Pravesh Sharma, MD; Christopher J Hammond MD PhD

*=This report has been submitted as a oral/poster presentation abstract to the College on Problems of Drug Dependence (CPDD) 2021 Scientific Meeting to be presented in June 2021.

ABSTRACT

Background/Objective: Over the past decade, scientific evidence has increasingly blurred the diagnostic boundaries and etiologies of substance-induced psychotic disorders (SIPD) and 'independent' primary psychotic disorders (PPD) (e.g. schizophrenia) among youth, creating a conundrum for clinicians. Evidence-based data to guide diagnostic differentiation and treatment selection for SIPD and PPD in youth is lacking. Given this, we compared clinical characteristics, hospital courses, and relationships with substance use disorder (SUD) diagnoses among youth hospitalized for SIPD and PPD using data on national hospital admissions in the U.S.

Methods: Data from the present analysis were drawn from healthcare cost and utilization project's (HCUP) nationwide inpatient sample (NIS) data from 2010-14. Analyses focused on HCUP-NIS data from pediatric inpatient psychiatric hospitalizations and examined clinical and non-clinical patient-level data elements including demographics, diagnoses (ICD-9-codes), procedural codes, length of stay, and cost. Specifically, we conducted case-control study using the NIS sample comparing psychiatric inpatients between the ages of 12 and 17 years with primary diagnoses of SIPD (N=345) versus PPD (N=2412). Binomial logistic regression model was used to evaluate odds ratio (OR) of association between SIP and SUDs. Pearson's correlation (r) test was used to analyze the relationship between SIP and cannabis use.

Results: SIP inpatients had comorbid mood disorders (47.8%), ADHD/conduct disorder (24.6%), and anxiety (18.8%). Among SUDs, cannabis was prevalent (49.3%) followed by amphetamine (10.1%), cocaine (4.3%) and opioid (2.9%) use. Cannabis use was associated with five times higher odds (OR 95%CI 3.54–7.59) for SIP, and after adjusting for psychiatric comorbidities and other SUDs the association was statistically significant (OR 3.5, 95%CI 2.29–5.38). No other SUDs had a significant association with SIP. Among SIP inpatients, comorbid cannabis use was prevalent in adolescents (mean age: 16.4y), male (82.4%) and whites (44.8%). There existed a significant positive correlation between cannabis use and SIP (r = 0.35, 95%CI 0.28–0.42).

Conclusion: Cannabis use increases the odds of SIP-related hospitalization by 250% in pediatric population.

Cannabis cravings at treatment initiation moderate the relationship between ethnicity and abstinence in Hispanic and Non-Hispanic adults treated for cannabis use disorder

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*=This report on will be presented at the American Society for Addiction Medicine (ASAM) 2021 Scientific Meeting in April 2021.

ABSTRACT

Background: Recent epidemiological data indicate that racial/ethnicity differences in cannabis use and cannabis-related problems as a function of Hispanic/Latinx identity are present and may impact treatment outcomes. The mechanisms and factors that contribute to these racial/ethnicity differences are poorly understood. In the present study, we sought to characterize moderators of the relationship between Hispanic ethnic group membership and during-treatment cannabis abstinence in adults receiving combination pharmacotherapy plus behavioral treatment for Cannabis Use Disorders (CUD).

Methods: This post-hoc analysis used data from the Achieving Cannabis Cessation-Evaluating N-Acetylcysteine Treatment study (ACCENT, NIDA-CTN-0053), a double-blind randomized placebo-controlled 12-week trial of N-acetylcysteine (NAC) pharmacotherapy in combination with contingency management for CUD treatment. Participants included 302 adults diagnosed with CUD including N=65 (22%) Hispanic participants and N=237 (78%) Non-Hispanic participants. Baseline sociodemographic and clinical profiles were compared across participants stratified by Hispanic ethnicity. Moderation models were run to determine if clinical features differentiating Hispanic and Non-Hispanic participants at baseline moderated the association between Hispanic ethnicity and during-treatment cannabis abstinence measured via negative urine cannabis tests (UCT).

Results: Compared to Non-Hispanic participants, Hispanic participants had higher cannabis cravings (MCQ scores: 55.3 vs. 48.4, *p=0.005*) and lower nicotine dependence scores (FNDS scores: 0.7 vs. 1.3, *p=0.03*) at baseline. Hispanic and Non-Hispanic participants showed no differences in sociodemographic characteristics or on baseline measures of cannabis use, cannabis withdrawal, and anxiety/depressive symptoms. During treatment, Hispanic participants were half as likely to test negative for urine cannabinoids (adjusted OR= 0.46; 95%CI: 0.24-0.92). A cannabis craving-by-ethnicity interaction effect was observed (F= 6.8, *p=0.03*). Post-hoc analyses showed that baseline cannabis craving severity and tobacco smoking status partially moderated the association between Hispanic ethnic group membership and cannabis abstinence.

Conclusions: These findings provide preliminary evidence that compared to Non-Hispanic adults, Hispanic adults seeking treatment for CUD show important differences in key clinical features including cravings and tobacco smoking status and that these differences may, in part, contribute to poorer treatment outcomes in this population. Of clinical relevance - we found that Hispanic adults had greater cannabis cravings at treatment initiation and the severity of these cravings accounted for some of the variance in the likelihood of achieving cannabis abstinence during treatment. As such, cravings may represent a prognostically-relevant modifiable treatment target in Hispanic adults.

Do the transmissible liability index (TLI) and adolescent cannabis use predict paranoid and schizotypal symptoms at young adulthood?*

Sharma P, Rabinowitz J, Myerburg L, Tarter RE, Reynolds MD, Horner MS, **Hammond CJ**.

*=This report is currently under review for publication and has been presented at the American Academy of Child & Adolescent Psychiatry (AACAP) 2018 Annual Scientific Meeting.

ABSTRACT

Background*:* Adolescent cannabis use is an established risk factor for the development of psychosis, but the premorbid vulnerability factors and specificity versus generality of the psychotic symptom domains affected in cannabis-psychosis relationships remain incompletely understood. To improve our understanding of these relationships, we used longitudinal data to examine the individual and interactive effects of preadolescent transmissible liability to substance use disorders (SUD), measured via the transmissible liability index (TLI), and adolescent cannabis use on the development of two distinct psychotic symptom domains, paranoid and schizotypal personality traits in young adulthood. ***Methods:*** We performed secondary analysis of data from the Center for Education and Drug Abuse (CEDAR) study, which longitudinally assessed offspring of men with (N=211) and without (N=237) lifetime history of SUD at ages 10-12, and across adolescence as they transitioned to young adulthood. TLI scores were calculated at age 10-12, self-reported cannabis use was assessed at age 16, and paranoid and schizotypal symptoms were assessed at age 19. ***Results:*** Cannabis use at age 16 and family history of SUD were significantly associated with paranoid and schizotypal symptoms at age 19, but TLI scores were not. The interactive effect of TLI x cannabis use was also not significant. Paranoid and schizotypal symptoms showed different dose-dependent sensitivities to cannabis exposure at age 16. ***Conclusions:*** These findings indicate that adolescent cannabis use and family history of SUD differentially contribute to the development of paranoid and schizotypal personality traits through mechanisms that do not include behavioral disinhibition.

This poster presented at the 12th Annual National Network for Depression Centers (NNDC) Scientific Meeting shows preliminary data from a large study that we are conducting on attitudes and perceptions about marijuana and cannabidiol use from Maryland youth receiving treatment for mood disorders and their parents

Marijuana and cannabidiol attitudes, perceptions, and behaviors among youth receiving mood disorder treatment and their parents: Preliminary results from the MABS study

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Introduction

Decriminalization, medicalization, and legalization of marijuana use across the U.S. over the past 25 years has dramatically shifted societal perceptions and use patterns among Americans. Recent hemp deregulation by the federal government has enabled cannabidiol (CBD) products to be sold as health supplements nationwide. These legislative shifts and the accompanying widespread promotion of non-evidence-based health claims about cannabinoids have unknown implications for American youth.[1-3]

Objectives

In the present study, we examine attitudes, perceptions, and behaviors related to marijuana and CBD product use among youth receiving treatment for mood disorders and their parents.

Methods

Overview. This analysis used preliminary data from an ongoing NNDC-funded study - the Marijuana and Cannabidiol Attitudes, Beliefs, and Behaviors Survey [MABS] study.

Measures. The survey was administered electronically, and branching logic was used. The *MABS Survey instrument* included 130 items querying marijuana- and CBD related attitudes, perceptions, and behaviors, including acceptability, perception of harmfulness and medical benefit, beliefs and expectancies about marijuana's and CBD's effects on mood, anxiety, and cognition, along with parent-youth communication, parenting practices, and participant demographics and clinical/practice characteristics. Respondents also completed the *Marijuana Effect Expectancy Questionnaire-Brief (MEEQ-B)* and youth respondents completed the *Patient Health Questionnaire-2 (PHQ-2)* and *Generalized Anxiety Disorder 2-item (GAD-2)* .

Methods, cont.

Participants and procedures. Participants included adolescent (ages 12-17) and young adults (ages 18-25) patients in treatment for mood disorders, parents of patients, and mental health providers recruited from NNDC-affiliated Child Mood Disorder Clinics throughout the U.S. All participants were informed that the survey was anonymous, and that their participation was optional. The MABS study has a target accrual goal of 50 participants from each group respectively (N=150 total sample). Preliminary single-site data presented here are from 23 participants (15 youth and 8 parents) recruited from the Johns Hopkins NNDC site.

Results

Results from youth respondents (n=15) showed that most youth (93% and 87%) agreed/strongly agreed that medical marijuana and CBD products are safe and effective treatments for certain mental health conditions

Table 1. Sample Characteristics

	Youth (n = 15)
Age (Years)	18.4 (2.8)
Sex (% Female)	80 %
Mental Health Conditions (%)	
Depressive disorder	87 %
Anxiety disorder	100 %
Bipolar disorder	7 %
ADHD	40 %
Substance use disorder	0 %
Suicidal ideations	67 %
Mental Health Treatment (%)	
Individual Psychotherapy	100 %
Psychotropic medication	100 %
Medical marijuana is being used in the home (%)	27 %
CBD products are being used n the home (%)	21 %
MEEQ-B positive expectancy score	4.1 (0.6)
MEEQ-B negative expectancy score	3.4 (0.7)
PHQ-2 Depression Total Score	2.0 (1.5)
GAD-2 Anxiety Total Score	2.6 (1.7)
Probably/definitely plan to use in the next 6 months (%)	
Marijuana	20 %
Medical marijuana	7 %
CBD	7 %

Funding: Support for this study came from a National Network of Depression Centers (NNDC) Task Group Monument Grant. COI Statement: The authors report no conflicts of interest related to the information presented in this poster.

Results, cont.

Fifty-three percent and 57% of youth agreed/strongly agreed that mental health providers should be recommending or prescribing medical marijuana and/or CBD for treatment of mental health conditions. Results from parents (n=8) were also largely positive towards medical marijuana and CBD with 63% and 56% agreed/strongly agreed that medical marijuana and CBD products are safe and effective treatments for certain mental health conditions. Fewer parents as compared to youth believed that mental health providers should be recommending or prescribing medical marijuana and/or CBD for treatment of mental health conditions, with 25% and 33% agreeing/strongly agreeing. Generally, both youth and parents believed that regular use of marijuana and CBD products improves depression in the typical user (**Fig. 1**)

Fig. 1. Beliefs about antidepressant effects of MJ + CBD

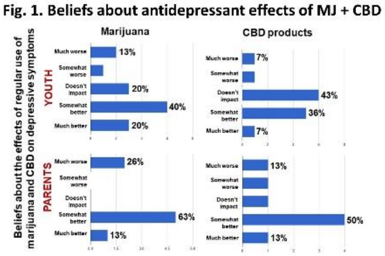
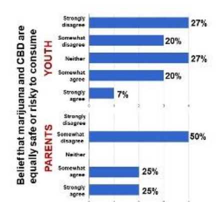


Fig. 2. Belief that marijuana + CBD are equally safe/risky to consume



Conclusion

While requiring cautious interpretation due to their preliminary nature, our results suggest that youth receiving treatment for mood disorders and their parents perceive marijuana and CBD products to be safe and effective treatments for mental health problems, including depression. These early findings from the MABS study suggest a mismatch between youth/parent perception[1-3] and the current evidence related to safety and efficacy of cannabinoid products for mood disorders.[4,5] Mental health clinicians and public health campaigns should provide targeted, evidence-based education to youth and parents and encourage fact-driven discussions between parents, youth, and providers about cannabinoids and mood disorders.

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SB 708 Testimony MD Alliance.pdf
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BOYS & GIRLS CLUBS
MARYLAND ALLIANCE

March 4, 2021

The Honorable Chairman Guy Guzzone
The Honorable Chairwoman Delores Kelly
The Honorable Vice-Chairman Jim Rosapepe
The Honorable Vice-Chairman Brian Feldman
Honorable Members of the Budget & Taxation and Finance Committees

RE: Funding for Youth Development Programming in Senate Bill 708

Dear Honorable Chairs, Vice-Chairs and Members of the Committees,

We appreciate the focus in Senate Bill 708 on addressing community needs, particularly those in the areas of racial injustice and prevention programming. The establishment of The Office of Social Equity and the funding prescribed within is a thoughtful use of potential revenue from cannabis.

We are thrilled to see the recognition of the importance of funding available to providers like us and look forward to working with the Office of Social Equity on this opportunity as stated on page 49, of the proposed legislation. "(IV) GRANTS TO COMMUNITY–BASED ORGANIZATIONS TO PROVIDE SERVICES TO PREVENT VIOLENCE, SUPPORT YOUTH DEVELOPMENT, PROVIDE EARLY INTERVENTION FOR YOUTH AND FAMILIES, AND PROMOTE COMMUNITY STABILITY AND SAFETY". We know there are likely to be changes made to this bill and ask that this remain in the legislation as it moves forward.

We know there will be incredible competition for grant funding and urge you to ensure there are adequate funds set aside, not only for prevention, but a full array of recreational, leadership, and educational programming. Prevention works best when it is wrapped in fun as part of a larger curriculum and offering by trusted community partners like Boys & Girls Clubs.

From the Eastern Shore to Western Maryland, Clubs provide a safe place for youth to go when schools are closed. Our mission, "To enable all young people, especially those who need us most, to reach their full potential as productive, caring, responsible citizens" guides Clubs as we seek to serve youth and meet their unique needs. An additional investment of funds from the State would allow Clubs to serve more youth with quality programming and wraparound support.

Thank you to the bill sponsors for recognizing the important role community-based organizations play. We look forward to working with the Office of Social Equity in the future.

Sincerely,

The Maryland Alliance of Boys & Girls Clubs

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SB708 - Informational Testimony - Curio Wellness._
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CURIO WELLNESS

Curio Wellness Written Comments
SB708 Hearing - Thursday, March 4, 2021

Founded and based in Maryland, Curio Wellness is a **family-owned** and operated **cGMP certified** medical cannabis company and trusted healthcare partner. We're dedicated to increasing the accessibility of high-quality medical cannabis to the growing population of citizens who seek a transformational solution to their health complications. Available in over 80 dispensaries across Maryland, our **patient-centered** and **innovative approach** to medical cannabis has made Curio the market leader in Maryland.

In three and half years, Curio has **created over 200 jobs** offering a competitive benefits **package** including comprehensive healthcare, 401k, PTO, and tuition reimbursement, to name a few. As an organization, Curio knows that a **diverse and inclusive workforce** creates an optimum workplace that attracts and retains talented employees and loyal customers. In fact, this commitment to diversity has been **present since inception** with Curio's inaugural leadership team comprising a multi-racial group of men and women. As the company has grown, so has its focus on a diverse team of workers and leaders. **Overall, 40% of the Curio Wellness workforce is female and 51% identifies as Black, Hispanic, Asian or multi-racial. Among management, 38% are female and 44% identify as Black, Hispanic or multi-racial**.

Curio's commitment to diversity and inclusion extends beyond our workforce and into industry action through the creation of a $30MM WMBE fund to support women, minority and disabled veteran participation in the cannabis industry. This program provides eligible candidates with **start-up capital** needed to open a Curio Wellness dispensary franchise at **fair market value** and with **verified path to ownership**. The WMBE fund not only seeks to create **generational wealth** among minority entrepreneurs; it also provides a vehicle for under-represented investors to participate in the cannabis industry.

Curio Wellness is dedicated to creating and supporting a medical cannabis program in the State that provides a safe, effective and reliable product for Maryland patients. **As an existing licensee we respectfully offer the following perspective on Senate Bill 708.**

Regulator and Regulatory Structure

Senate Bill 708 proposes to regulate the adult use industry through the Alcohol and Tobacco Commission (ATC) while maintaining the Maryland Medical Cannabis Commission's (MMCC) oversight of the medical program. **For efficiency and safety reasons, an adult use program should fall under the same regulatory paradigm as the medical cannabis program**. With the exception of adult use specific deviations (e.g., limitations on dosage or the application of taxes), an adult use program should reflect the values and regulations of the medical program (security, seed-to-sale tracking, testing, diversion, labeling, advertising, child-proof packaging, crop protection, etc.). Why would the state allow cultivators and processors in the adult use space to cut corners using a different set of safety protocols

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or to answer to a different regulatory body? This point is especially pertinent for dual licensees who should not have to manage two sets of rules. **We ask that this committee strongly consider regulatory uniformity.**

Existing Licensees

We appreciate that Senate Bill 708, like legislation in other states, sees the value in existing Cultivation, Manufacturing, Dispensary and Independent Laboratory licensees having access to an adult use program – further enhancing the State's ability to more efficiently, effectively, and safely stand up a new program with existing licensees currently operating under a strict regulatory structure.

As seen in other states, Senate Bill 708 contemplates a social equity fund to support diverse participation in the industry with this financial vehicle being funded by existing licensees. **However, we respectfully request that this Committee consider the reduction or removal of such fees for existing licensees who have made meaningful investment to address issues surrounding minority participation.**

For example, we have established a $30MM private equity fund that will provide the necessary capital for up to 50 women, minority or disabled veteran entrepreneurs to open a dispensary franchise. Having those individuals pay exorbitant fees to enter the adult use marketplace only sets them back and undercuts the intent of our initiative (see "280e & Fees" below). Our MBE program aims to address two major issues in the conversation around minority participation: investment opportunity and access to capital. The fund itself has a robust group of minority investors, many of which are local Maryland business leaders.

280e & Fees

When establishing licensing fees for existing or new licensees, it is important to understand the punitive role that 280e plays within the tax code. **Due to cannabis' federal illegal status, licenses pay upwards of a 90% effective rate due to their inability to deduct ordinary business expense.** This means that many cannabis companies retain little to no profit relative to their overall revenue. **Until 280e is resolved on the federal and state levels, fees should be attenuated to align with the cash position of licensees.** As the State seeks to be a model of inclusivity in the cannabis industry, understanding 280e and creating non-onerous fee structures will better enable success of diverse participants.

Licensing: Number, Size, Ownership

In addition to the current medical licensees, the current draft of Senate Bill 708 creates an adult use program with 40 new grower licenses, unlimited processor licenses and 47 dispensary licenses. While the bill has the noble intent of promoting a diverse industry, the bill as drafted creates issues for existing licensees and conflicts with current statute governing medical program (e.g., restrictions on capacity and transfer and sets new employment standards to name a few).

For example, limiting total production for a licensee ignores the exorbitant cost of capital and a longer window to return on investment that comes with growing and manufacturing. With the current federal/state conflict, cannabis entrepreneurs only have access to capital thru private investment. Investors place their money in scalable businesses that provide favorable returns. Placing limits on the capacity of a cannabis facility diminishes the attractiveness of the investment and ultimately, will lead to investment in larger capacity license holders than those relegated to restrictive smaller capacity licenses.

Restricting Location and Dual Licensing

Senate Bill 708 creates an expectation that an existing medical licensee must utilize their current footprint if they intend to participate in an adult use program (p. 50 lines 28-31). Curio opposes any requirement tethering the location of adult use to an existing medical licensee's cultivation or processing location.

Requiring adult use cultivation and processing to take place at the same location as medical cultivation and processing: (1) may negatively impact the existing medical program (forcing some licensees to choose whether to stay in the medical program or abandon it once entering the adult use space if it is more profitable); (2) unfairly harms those existing medical licensees located in certain areas of the state that are more landlocked than others; (3) causes concerns with program overlap and (4) unnecessarily restricts business decisions that could have a beneficial impact on the program and state.

With the exception of dispensaries -- that require statewide coverage and have territorial market considerations -- cultivation and processing facilities should be geographically agnostic and not tethered to a single location (this is especially true for medical licensees). Certainly, with respect to a grow (particularly if total canopy is capped), tying a cultivation to a single location (which in effect may force them to pick between indoor or outdoor cultivation) does not benefit the industry or overarching state interests. In that situation, the cultivator should be allowed to locate in the most economically advantageous location in the state. Ultimately, by allowing cultivators and processors more flexibility to spread their operations out, businesses will reduce the cost of production, promote more accessible pricing and foster job creation that is diverse both socially and geographically.

Existing Medical Program

Senate Bill 708 advocates for the continuation of the current medical program by existing licensees and we applaud this measure. However, there is a lack of clarity on how the program and its patients will be protected and preserved. As you will find in many adult use states, product availability often has dosage and/or delivery constraints. For example, in Colorado's adult use market you may only possess or use one ounce of flower and for manufactured products the limit is eight grams total of concentrate and edibles containing no more than 800mg per package.

It can be argued that medical conversion to adult use is analogous to a prescription drug versus over-the-counter medication and regulations should follow accordingly. Allowing medical market to retain higher potency products and diverse delivery methods to support patient needs. **Any effect of the adult use program that makes manufacturing, processing and dispensing medical cannabis less attractive will undoubtedly undermine access and increase expense for medical patients. Keeping patients incentivized to enroll in the program should be of paramount importance and consideration!**

Moreover, while we believe the provision to suspend a licensee for "increasing prices or reducing product availability" seeks to protect the medical program and patient access, it is broad, vague and does not account for market dynamics. **A better approach to protecting patients and the integrity of the medical program may be to consider a penalty for existing licensees who are awarded adult use licensing only to leave medical behind to the detriment of patients and licensees committed to medical program. Meaning if a dual licensee abandons medical, should they have to relinquish their adult use license?**

In considering adult use, the State must seek to find more ways to incentivize the existing medical market. Otherwise, Maryland will fail to be any better than other states that blindly converted to adult use, or worse of all becomes Oregon 2.0.

Taxation

Senate Bill 708 contemplates a scale up of excise tax from 10% to 20% (over five years) and the potential for a local sales tax of up to 3% on adult use cannabis products. Most notably, Curio supports the provision of the bill which requires the collection of all taxes to take place at the point of sale to the consumer. In addition to generating revenue to the state, any tax rates imposed on adult use cannabis products must also factor in the impact on preserving the medical market (ensuring patients remain incentivized to continue enrolling in the program) and preventing the proliferation of product on the black market.

Conclusion

If Maryland decides to adopt an adult use system, Curio Wellness would like to lend its experience as industry leader in the medical market to help develop a diverse, successful and economically viable program. We appreciate Senator Feldman's efforts to make this possible.

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Testimony for SB0708, Laura Stack.pdf
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Informational testimony for SB0708

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Johnny's Story

"To me, altruism means being selfless or giving to other people, even when there may be nothing to gain and something to lose. Altruistic people do things for the collective interest instead of their own." — Johnny Stack

Johnny Stack was born on February 7, 2000 and died by suicide on November 20, 2019 at the age of 19. He was a funny, charming young man. We are a typical suburban family and did typical family things. He had a happy life, a 4.0 GPA with a scholarship to college, and a family who loved him very much. **Unfortunately, we lived in Colorado, which was the first state to legalize marijuana in 2014, when Johnny was 14 years old.**

Johnny used marijuana for years, starting at age 14 at a high school party. He struggled with social anxiety and panic attacks in high school, which were successfully managed with support, prescription medications, and therapy. He could have been fine. Then at about 16 years old (when he could drive), Johnny discovered dabbing marijuana and believed it helped his anxiety. When I said "dabbing" just now, did you think it was a typo for "dabbling"? Did you know what I meant when I said he was dabbing? Not everyone does. Do you understand the difference between smoking cannabis flower and dabbing high-THC concentrates, such as wax, oil, shatter, or budder (not a typo)? Most of my friends look at me blankly when I say these words and say, "I've never even heard about this" or "I have no idea what you're talking about."

Yes, we still live in Colorado. Yes, it is everywhere. Yes, here any kid can get it unless you chain them to their beds.

He entered college as a marijuana user. We would dis-enroll him from his current university when called about his odd behavior, admit him to mental hospitals, and they would stabilize him with medications, and he'd recover…until he did the drugs again. He would try other illicit drugs as well. Eventually, even when he stopped using marijuana, the psychosis did not go away, and he developed full-blown schizophrenia.

He was put on antipsychotics to control the delusions, but he didn't like how "stupid" they made him feel. So, he would stop taking them without telling us (a common problem with the disorder). When he died, he had given up smoking, he wasn't on drugs, and he wasn't depressed. But because he wouldn't take the medications he now needed, the paranoid delusions told him to stop the pain, and he jumped.

Three days before he passed, he came over for dinner. He lived in our condo a couple miles down the street and would often pop in for a home-cooked meal. "I need to tell you that you were right," he says to me. "**Right about what?" I ask. "Right about the marijuana. You told me weed would hurt my brain, and it's ruined my mind and my life. You were right all along. I'm sorry, and I love you."** He died by suicide three days later.

You may be thinking, "C'mon, Laura, it's no big deal – it's just pot." "Pot's legal, so it must be safe." Or "I did pot when I was a kid, too, and look, it didn't hurt me."

Well, have you recently studied TODAY'S pot, and have you personally seen its effects on your children like I have?

Why is it so different? First, the tetrahydrocannabinol (THC), a crystalline compound that is the main active ingredient of cannabis that gives the "high," is extracted out of the cannabis so that it's nearly pure. THC is the principal psychoactive constituent of cannabis. Then a butane torch is used to heat the crystals (similar to beeswax) or oil in a "rig" (just google it), or a vaping device with a heating element called a dab pen can be used. Forget the "grass" or "papers" that were rolled in the 70s and 80s. The pot we grew up with (10% or less THC content) is HUGELY different than today's high-concentrate extracts (often 80% THC content or higher).

The brain is still developing through a person's 20s, and psychotic disorders typically develop in the late teenage years. During brain formation, heavy cannabis use has been shown to have a negative effect on the formation of neural pathways. It can also lead to heavier drug use. While the vast majority of marijuana smokers never experience permanent mental illness, researchers have found that the earlier and heavier someone starts dabbing, the more likely it is that they will develop a disorder at some point (often years later).

The harmful combination of a still-forming mind, high-potency THC products, and a high frequency of use = Cannabis-Induced Psychosis. Yes, that's a real diagnosis (or High-THC Abuse – Severe). Repeated CIP incidents can trigger schizophrenia or other mental illness, and even when the cannabis is withdrawn, the psychosis doesn't go away.

This is what happened to my beautiful boy. When he died, the toxicology report showed he had ZERO drugs in his system. His note said the mob was after him, the university was an FBI base, and the whole world knew everything about him. He wasn't depressed, neglected, drugged, or unloved. He was psychotic, paranoid, and delusional, and he jumped from a 6-story building in his pain. He refused the anti-psychotic drugs that he now needed, because he thought he wasn't sick (common to schizophrenia).

As parents, grandparents, friends, and counselors, we must first educate ourselves about the dangers of high-THC marijuana. Then we must warn our children when they are young (10-12 years old) and use hyper-vigilance in the early teen years. This is much easier to do before the age of 16 when they can drive, as you can't lock them up or monitor them 24/7. They need to understand what this is, before "that friend" shows up at a party offering dabs.

I am compelled to help increase awareness about dabbing and prevent more senseless deaths.