Cannabis and Public Health

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Outline

- Cannabis Use
  - Adults
  - Youth
  - Trends
- Cannabis and Health
- Cannabis Legalization
  - Effects on Use
    - Adults
    - Youth
  - Impaired Driving
  - Enforcement
- Gaps/Issues
- Conclusions/Summary

Measuring Use

- Measuring cannabis use is complex and a continued struggle for research

- Lifetime use? Recent use?

- Quantify amount used? Level of "highness"?

- Incorporate frequency of use? What about daily use?

- Administration – is smoking different from vaping different from eating?

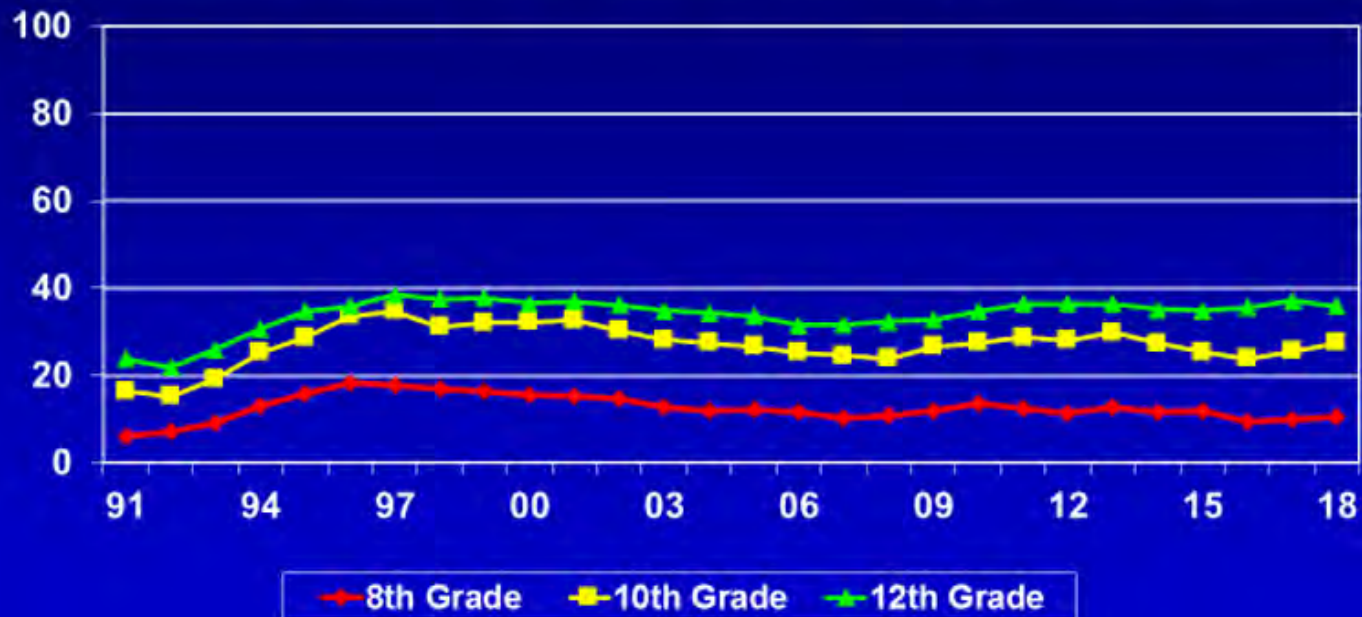- How to judge the strength of product used?

Adult Use
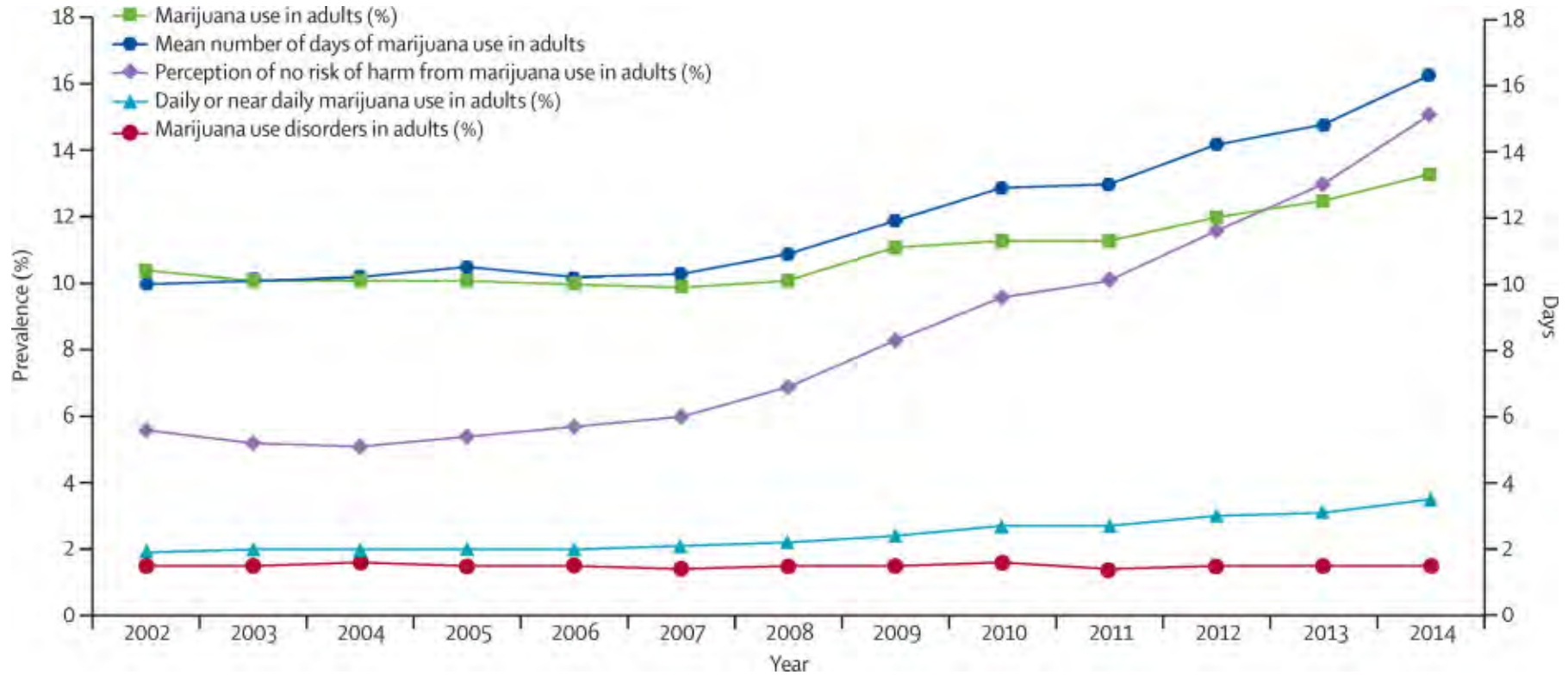
Source: Compton, Han, Jones, Blanco & Hughes (2016). Marijuana use and use disorders in adults in the USA, 2002-14: analysis of annual cross-sectional surveys. <u>The Lancet Psychiatry, 3</u>, 954-964.

Youth Use

Percent of Students Reporting Use of Marijuana in Past Year, by Grade
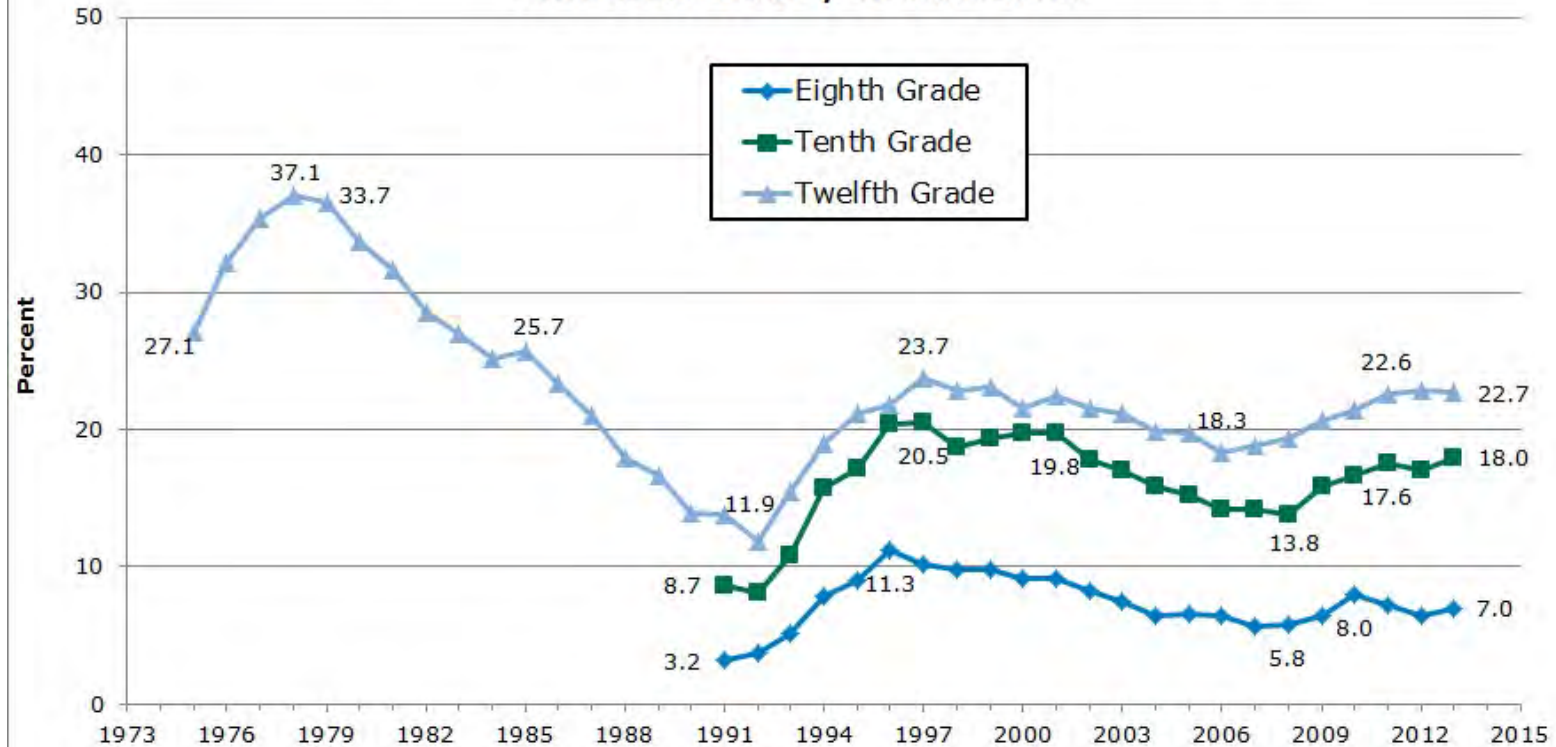
SOURCE: University of Michigan, 2018 Monitoring the Future Study

Youth Use

Figure 1

Percentage of Students in Grades 8, 10, and 12 Who Report They Used Marijuana in the Past Thirty Days: Selected Years, 1976-2013

Legend:
- Eighth Grade
- Tenth Grade
- Twelfth Grade

Data labels visible: 27.1, 37.1, 33.7, 25.7, 23.7, 22.6, 22.7, 18.3, 18.0, 20.5, 19.8, 17.6, 13.8, 11.9, 8.7, 11.3, 3.2, 8.0, 5.8, 7.0

Source: Johnston, L. D., O'Malley, P. M., Bachman, J. G., Schulenberg, J. E., & Miech, R. A. (2014). Demographic subgroup trends among adolescents in the use of various licit and illicit drugs: 1975-2013 (Monitoring the Future Occasional Paper No. 81). Ann Arbor, MI: Institute for Social Research. Available at: http://www.monitoringthefuture.org/pubs/occpapers/mtf-occ81.pdf. Tables 13-15

Child Trends
DATABANK

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Daily Use

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2017–2018 change
Marijuana/Hashish																													
Used Daily in Past 30 Days [33]																													
8th Grade	0.2	0.2	0.4	0.7	0.8	1.5	1.1	1.1	1.4	1.3	1.3	1.2	1.0	0.8	1.0	1.0	0.8	0.9	1.0	1.2	1.3	1.1	1.1	1.0	1.1	0.7	0.8	0.7	0.0
10th Grade	0.8	0.8	1.0	2.2	2.8	3.5	3.7	3.6	3.8	3.8	4.5	3.9	3.6	3.2	3.1	2.8	2.8	2.7	2.8	3.3	3.6	3.5	4.0	3.4	3.0	2.5	2.9	3.4	+0.5
12th Grade	2.0	1.9	2.4	3.6	4.6	4.9	5.8	5.6	6.0	6.0	5.8	6.0	6.0	5.6	5.0	5.0	5.1	5.4	5.2	6.1	6.6	6.5	6.5	5.8	6.0	6.0	5.9	5.8	-0.2
Ever Used Daily for Month or More in Lifetime [e]																													
8th Grade	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10th Grade	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
12th Grade	9.0	8.4	9.6	11.3	12.1	15.7	18.8	18.0	17.9	17.0	18.0	15.5	16.4	17.8	14.5	16.6	15.7	15.1	14.9	15.5	17.4	18.2	15.8	13.7	12.4	14.3	13.9	12.3	-1.6
Alcohol [5,33]																													
Any Daily Use																													
8th Grade	0.5	0.6‡	1.0	1.0	0.7	1.0	0.8	0.9	1.0	0.8	0.9	0.7	0.8	0.6	0.5	0.5	0.6	0.7	0.5	0.5	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.0
10th Grade	1.3	1.2‡	1.8	1.7	1.7	1.6	1.7	1.9	1.9	1.8	1.9	1.8	1.5	1.3	1.3	1.4	1.4	1.0	1.1	1.1	0.8	1.0	0.9	0.8	0.5	0.5	0.6	0.5	-0.1
12th Grade	3.6	3.4‡	3.4	2.9	3.5	3.7	3.9	3.9	3.4	2.9	3.6	3.5	3.2	2.8	3.1	3.0	3.1	2.8	2.5	2.7	2.1	2.5	2.2	1.9	1.9	1.3	1.6	1.2	-0.4 s
Been Drunk																													
Daily [0,33]																													
8th Grade	0.1	0.1	0.2	0.3	0.2	0.2	0.2	0.3	0.4	0.3	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
10th Grade	0.2	0.3	0.4	0.4	0.6	0.4	0.6	0.6	0.7	0.5	0.6	0.5	0.5	0.4	0.4	0.5	0.5	0.3	0.4	0.3	0.2	0.4	0.3	0.3	0.1	0.1	0.2	0.2	0.0
12th Grade	0.9	0.8	0.9	1.2	1.3	1.6	2.0	1.5	1.9	1.7	1.4	1.2	1.6	1.8	1.5	1.6	1.3	1.4	1.1	1.6	1.3	1.5	1.3	1.1	0.8	0.8	1.1	0.7	-0.4
5+ Drinks in a Row																													
in Last 2 Weeks																													
8th Grade	10.9	11.3	11.3	12.1	12.3	13.3	12.3	11.5	13.1	11.7	11.0	10.3	9.8	9.4	8.4	8.7	8.3	8.1	7.8	7.2	6.4	5.1	5.1	4.1	4.6	3.4	3.7	3.7	0.0
10th Grade	21.0	19.1	21.0	21.9	22.0	22.8	23.1	22.4	23.5	24.1	22.8	20.3	20.0	19.9	19.0	19.9	19.6	16.0	17.5	16.3	14.7	15.6	13.7	12.6	10.9	9.7	9.8	8.7	-1.1
12th Grade	29.8	27.9	27.5	28.2	29.8	30.2	31.3	31.5	30.8	30.0	29.7	28.6	27.9	29.2	27.1	25.4	25.9	24.6	25.2	23.2	21.6	23.7	22.1	19.4	17.2	15.5	16.6	13.8	-2.8 ss

THC Concentrations Increasing
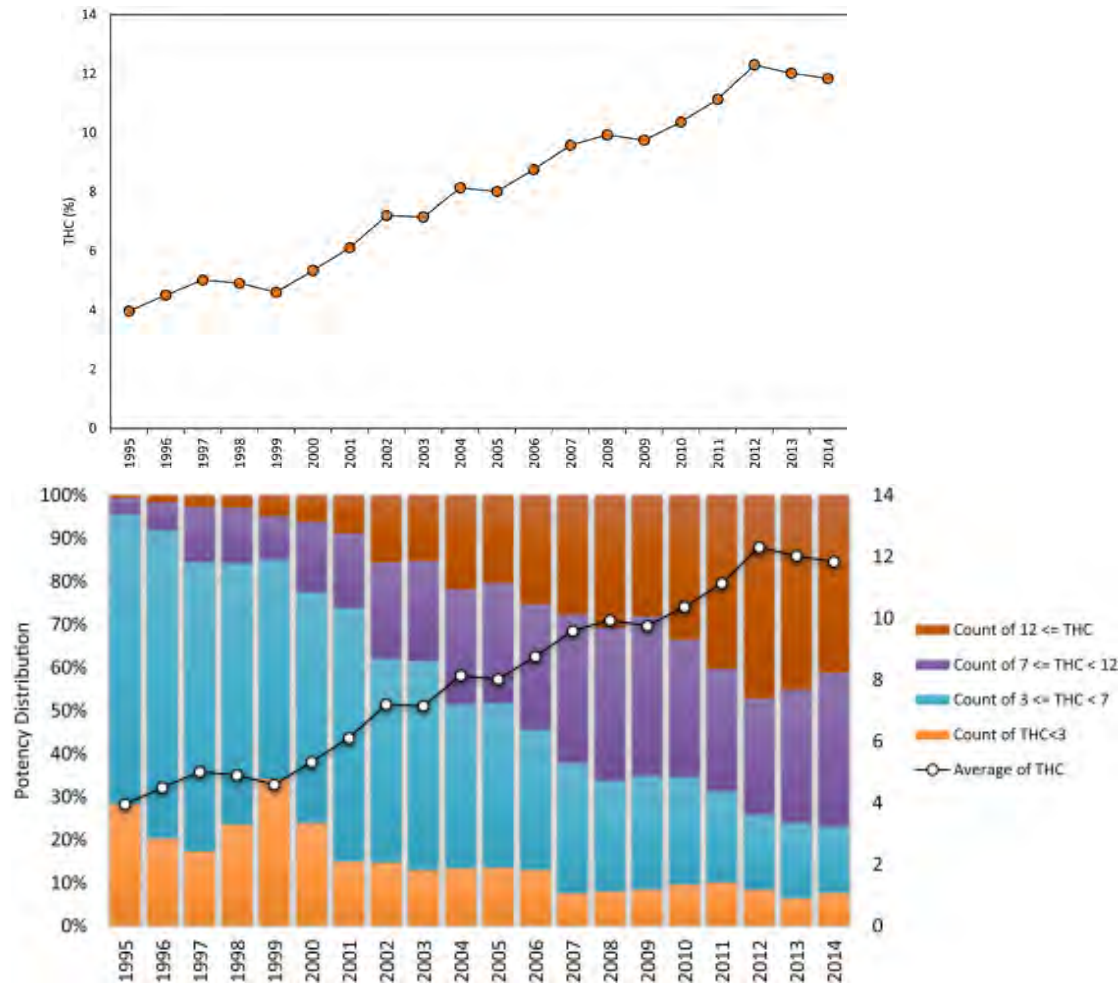
Source: ElSohly, Mehmedic, Foster, Gon, Chandra & Church (2016). Changes in cannabis potency over the last 2 decades (1995-2014): Analysis of current data in the United States. Biological Psychiatry, 79, 613-619.

Extracts/Concentrates

- 50-99% THC

- Edibles, Vaping, Dabbing

- Many products

  - Kief, Hash, Rosin

  - Oil

  - BHO (butane hash oil)

  - Budder

  - Shatter

  - Wax

  - Sugar

  - Distillate

  - Tincture

Cannabis Use and Health

The National Academies of Sciences, Engineering, and Medicine Report

Report

HIGHLIGHTS

January 2017

The Health Effects of Cannabis and Cannabinoids

The Current State of Evidence and Recommendations for Research

Recent years have seen a rapid rise in the medical and recreational use of cannabis: a broad term that can be used to describe the various products and chemical compounds (e.g., marijuana, cannabinoids) derived from different species of the cannabis plant. Despite increased cannabis use and a changing state-level policy landscape, conclusive evidence regarding the short- and long-term health effects—both harms and benefits—of cannabis use remains elusive.

A lack of definitive evidence has resulted in insufficient information on the health implications of cannabis use, causing a significant public health concern for vulnerable populations such as adolescents, pregnant women, and others. Unlike with substances such as alcohol or tobacco, no accepted standards exist to help guide individuals as they make choices regarding if, when, where, and how to use cannabis safely and, in regard to therapeutic uses, effectively.

With support from a host of federal, state, philanthropic and nongovernmental organizations, the National Academies of Sciences, Engineering, and Medicine

Despite increased cannabis use and a changing state-level policy landscape, conclusive evidence regarding the short- and long-term health effects—both harms and benefits—of cannabis use remains elusive.

Source: National Academies of Sciences, Engineering, and Medicine. 2017. *The health effects of cannabis and cannabinoids: Current state of evidence and recommendations for research.* Washington, DC: The National Academies Press.

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Report Conclusions – Substantial Evidence

There is <u>conclusive or substantial evidence</u> that cannabis or cannabinoids are effective:
- For the treatment for chronic pain in adults (cannabis)
- Antiemetics in the treatment of chemotherapy-induced nausea and vomiting (oral cannabinoids)
- For improving patient-reported multiple sclerosis spasticity symptoms (oral cannabinoids)

There is <u>substantial evidence</u> of a statistical association between cannabis smoking and:
- Worse respiratory symptoms and more frequent chronic bronchitis episodes (long-term cannabis smoking)

There is <u>substantial evidence</u> of a statistical association between cannabis use and:
- Increased risk of motor vehicle crashes

There is <u>substantial evidence</u> of a statistical association between maternal cannabis smoking and:
- Lower birth weight of the offspring

There is <u>substantial evidence</u> of a statistical association between cannabis use and:
- The development of schizophrenia or other psychoses, with the highest risk among the most frequent users

There is <u>substantial evidence</u> that:
- Stimulant treatment of attention deficit hyperactivity disorder (ADHD) during adolescence is not a risk factor for the development of problem cannabis use
- Being male and smoking cigarettes are risk factors for the progression of cannabis use to problem cannabis use
- Initiating cannabis use at an earlier age is a risk factor for the development of problem cannabis use

There is <u>substantial evidence</u> of a statistical association between:
- Increases in cannabis use frequency and the progression to developing problem cannabis use
- Being male and the severity of problem cannabis use, but the recurrence of problem cannabis use does not differ between males and females

Source: National Academies of Sciences, Engineering, and Medicine. 2017. *The health effects of cannabis and cannabinoids: Current state of evidence and recommendations for research.* Washington, DC: The National Academies Press.

Report Conclusions – Challenges and Barriers

CONCLUSIONS FOR: CHALLENGES AND BARRIERS IN CONDUCTING CANNABIS AND CANNABINOID RESEARCH

There are several challenges and barriers in conducting cannabis and cannabinoid research, including:

- There are specific regulatory barriers, including the classification of cannabis as a Schedule I substance, that impede the advancement of cannabis and cannabinoid research
- It is often difficult for researchers to gain access to the quantity, quality, and type of cannabis product necessary to address specific research questions on the health effects of cannabis use
- A diverse network of funders is needed to support cannabis and cannabinoid research that explores the beneficial and harmful effects of cannabis use
- To develop conclusive evidence for the effects of cannabis use for short- and long-term health outcomes, improvements and standardization in research methodology (including those used in controlled trials and observational studies) are needed

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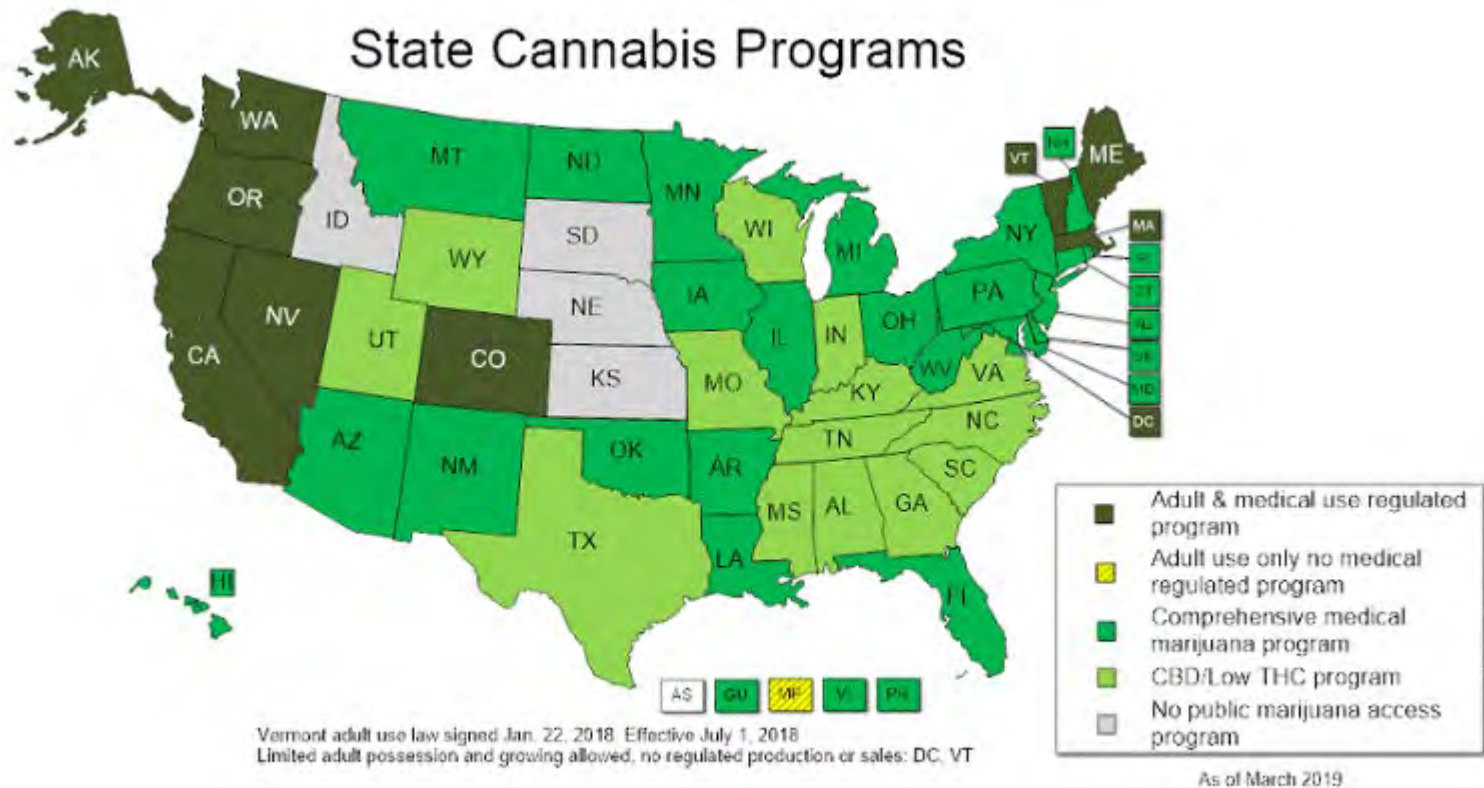UNIVERSITY OF MINNESOTA

Cannabis Legalization

Why Legalize?

- Medicalization
- Opiates
- Public support
- Risk/harms
- Consistency with alcohol and tobacco
- Remove illicit markets
- Social Justice
- Economics
- Hemp
- Regulation and oversight
- ???

Why Prohibit?

- Vice
- Culture
- Supply side
- Cannabis dependence
- Big cannabis
- Availability
- Impaired driving
- ???

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Cannabis Policies across the US

State Cannabis Programs

As of March 2019

Vermont adult use law signed Jan. 22, 2018. Effective July 1, 2018
Limited adult possession and growing allowed, no regulated production or sales: DC, VT

Legend:
- Adult & medical use regulated program
- Adult use only no medical regulated program
- Comprehensive medical marijuana program
- CBD/Low THC program
- No public marijuana access program

Source: http://www.ncsl.org/research/health/state-medical-marijuana-laws.aspx

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Does Legalization Affect Use?

- I believe we are realistically 5-10 years away from making definitive statements about whether adult use legalization has affected use

- But, there is a lot of research happening right now and it is an exciting and active time to be doing research in this area

- Much of the research currently coming out is evaluating effects of medical marijuana policies on use and associated outcomes

Legalization and Adult Use

TABLE 1. Percentage of past-year marijuana use for the Washington State population aged 18 and older before and after marijuana legalization from surveys conducted in 2014 and 2015

Variable	Any last year [95% CI]	≥Weekly [95% CI]	<Weekly [95% CI]	Use with alcohol [95% CI]	Not use with alcohol [95% CI]
Use in 2012	23.6%	12.4%	11.2%	12.2%	11.3%
(retrospective from 2014 data)	[21.0%, 26.4%]	[10.2%, 14.9%]	[9.4%, 13.2%]	[10.1%, 14.6%]	[9.5%, 13.4%]
Current use in 2014	24.9%	13.6%	11.3%	12.1%	12.6%
	[22.3%, 27.7%]	[11.4%, 16.2%]	[9.6%, 13.3%]	[10.0%, 14.6%]	[10.7%, 14.7%]
Difference	1.3%	1.2%	0.1%	-0.1%	1.3%
Use in 2012	25.1%	14.1%	11.0%	13.6%	11.2%
(retrospective from 2015 data)	[22.1%, 28.3%]	[11.7%, 16.9%]	[9.0%, 13.4%]	[11.2%, 16.4%]	[9.1%, 13.6%]
Current use in 2015	26.2%	14.6%	11.6%	13.1%	13.0%
	[23.3%, 29.3%]	[12.2%, 17.4%]	[9.7%, 13.8%]	[10.8%, 15.7%]	[11.0%, 15.4%]
Difference	1.1%	0.5%	0.6%	-0.5%	1.8%
Use before legalization	24.3%	13.2%	11.1%	12.9%	11.2%
(retrospective from combined 2014 & 2015 data)	[22.3%, 26.5%]	[11.6%, 15.1%]	[9.7%, 12.6%]	[11.3%, 14.7%]	[9.8%, 12.8%]
Use after legalization	25.6%	14.1%	11.5%	12.6%	12.8%
(current use from combined 2014 & 2015 data)	[23.6%, 27.6%]	[12.4%, 16.0%]	[10.2%, 12.9%]	[11.0%, 14.4%]	[11.4%, 14.4%]
Difference	1.2%	0.9%	0.4%	-0.3%	1.6%

Source: Kerr, Ye, Subbaraman, Williams & Greenfield (2018). Changes in marijuana use across the 2012 Washington state recreational legalization: Is retrospective assessment of use before legalization more accurate? *Journal of Studies on Alcohol and Drugs*, 79, 495-502.

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Legalization and Adult Use

TABLE 2. Prevalence [95% CI] of any past-year marijuana use before and after legalization from National Survey on Drug Use and Health (NSDUH) and National Alcohol Survey (NAS)

NSDUH, Washington State	
2009–2010 combined	13.8% [12.0%, 16.0%]
2010–2011 combined	14.9% [12.9%, 17.1%]
2011–2012 combined	15.3% [13.3%, 17.5%]
December 6, 2012, recreational legalization	
2013–2014 combined	19.1% [16.9%, 21.4%]
2014–2015 combined	17.7% [15.5%, 19.9%]
NAS, Washington State	
2009–2010 survey	19.5% [11.5%, 31.1%]
2014–2015 survey	28.6% [18.7%, 41.2%]

Source: Kerr, Ye, Subbaraman, Williams & Greenfield (2018). Changes in marijuana use across the 2012 Washington state recreational legalization: Is retrospective assessment of use before legalization more accurate? *Journal of Studies on Alcohol and Drugs*, 79, 495-502.

Legalization and Youth Use

Figure 2. Marijuana Use Before and After Legalization in Colorado, Washington, and States Without Recreational Marijuana Laws (RML)
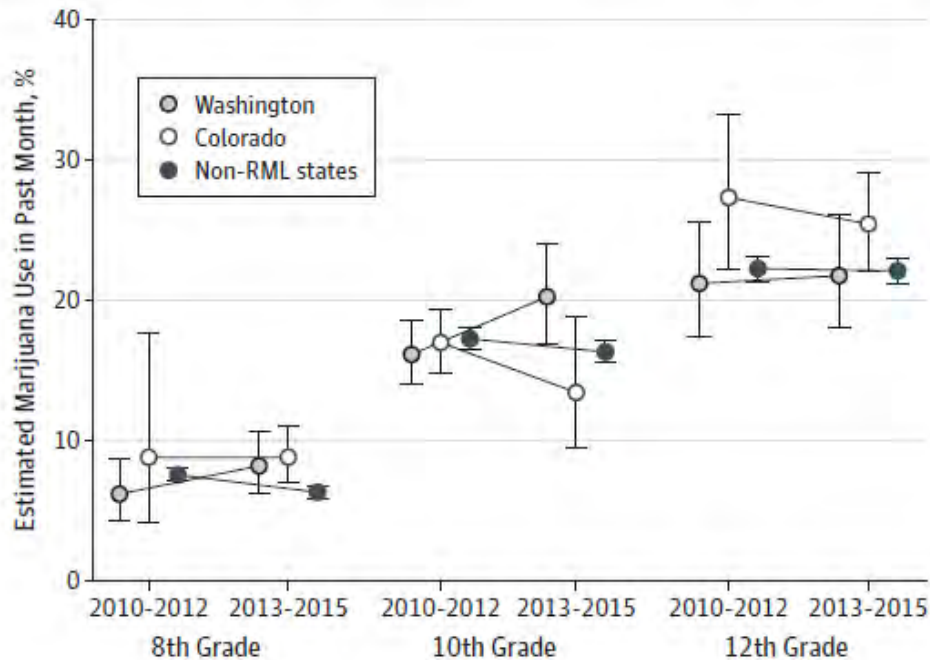
The solid lines indicate the adjusted prevalence of past-month marijuana use before and after RML in Colorado, Washington, and non-RML states by grade. Error bars indicate 95% CIs.

Source: Cerdá, Wall, Feng, et al. (2017). Association of State Recreational Marijuana Laws With Adolescent Marijuana Use. *JAMA Pediatr,* 171:142–149.

Legalization and Youth Use

Figure. Past-Month Cannabis Use Prevalence Among Washington State Youth by Survey and Grade Before and After Legalization
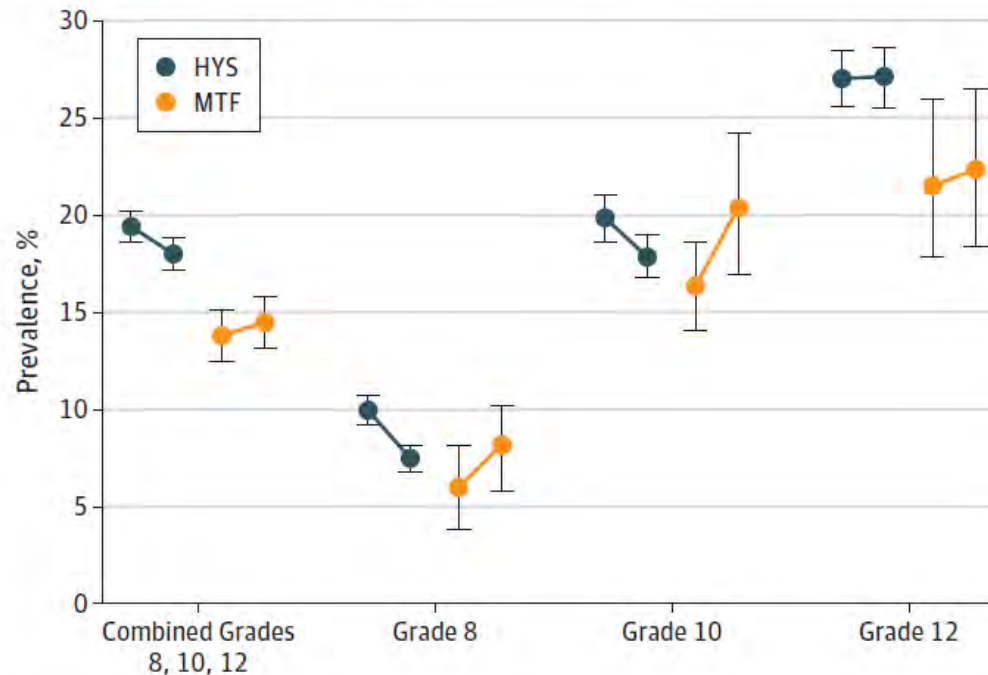
Washington Healthy Youth Survey (HYS) modeled estimates in 2010-2012 and 2014-2016 and Monitoring the Future survey (MTF) in 2010-2012 and 2013-2015. Error bars indicate 95% CI.

Source: Dilley, Richardson, Kilmer, Pacula, Segawa & Cerdá (2018). Prevalence of cannabis use in youths after legalization in Washington state. *JAMA Pediatr,* 173:192–193.

Legalization and Impaired Driving

- Simulator Studies
- Roadside Survey Studies
- Crash Studies
- "Per Se" Laws
  - Are police trained to detect cannabis impaired driving?
  - Are there available reliable and valid tests where 'per se' laws are in place?
  - Are the 'per se' levels appropriate?

Legalization and Enforcement

- Who is responsible for enforcing new policies and regulations?

- We know from alcohol and tobacco that underage compliance checks work – are they being done? Who is doing them?

- Is cannabis enforcement siphoning resources from alcohol and tobacco enforcement?

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Legalization and Illicit Markets

- How does legalization affect illicit cannabis markets?

- Are licensed growers and producers operating illicit markets 'out the back'?

- Has legalization created a reselling/unlicensed/'gray market'?

- Are youth-targeted illicit markets changing following legalization?

Gaps/Issues

- Literally too many to list
- Data
  - Limited post-legalization data
  - Shallow measurement of cannabis use
  - Lack of state-representative surveys
- Methods
  - Endogeneity
  - Confounding
  - Appropriate comparisons
  - Time series models
- Access to cannabis for research
- Funding
  - NIH/Fed issue

My (semi-informed) Perspective on Cannabis and Legalization

- Cannabis is less harmful than alcohol and tobacco
- Cannabis should not be a Schedule 1 controlled substance
- There are both harms and benefits associated with use
- Prohibition has negative effects
- Legalization virtually nationwide in US is likely
- Youth have always had easy access to marijuana, and availability is likely not a part of decision to use
- Stores in currently legalized states are not selling to youth indiscriminately
- We need more research