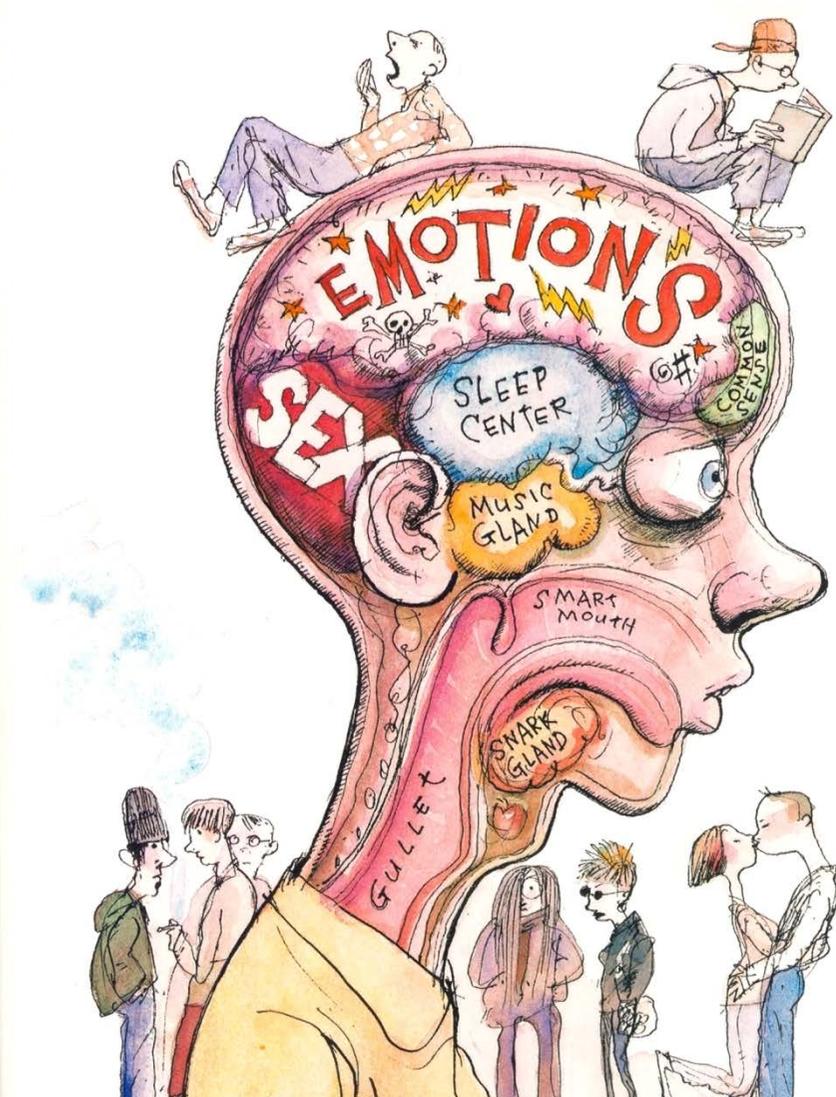
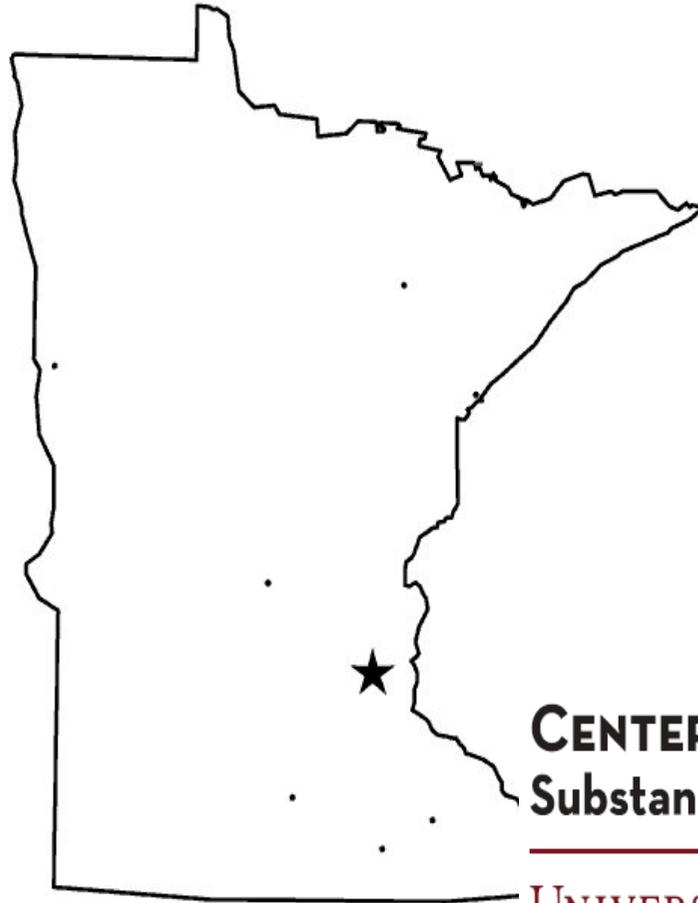


# This is Your Brain on Adolescence: The Intersection of Adolescence, Brain Maturation and Marijuana

**Ken Winters, Ph.D.**  
**Department of Psychiatry**  
**University of Minnesota**  
[winte001@umn.edu](mailto:winte001@umn.edu)

**Office of Behavioral Health's  
Summit**  
**June 6, 2014**  
**Baton Rouge, LA**





**CENTER** *for* **ADOLESCENT**  
**Substance Abuse Research**

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UNIVERSITY OF MINNESOTA

**Driven to Discover<sup>SM</sup>**

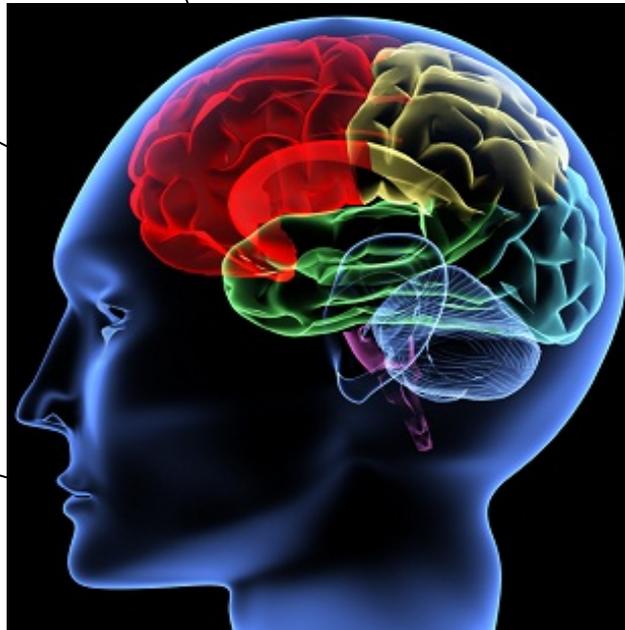
[www.psychiatry.umn.edu/research/casar/home.html](http://www.psychiatry.umn.edu/research/casar/home.html)

**1. Brain development**

**6. Summary**

**2. Marijuana use**

**5. Public policy**

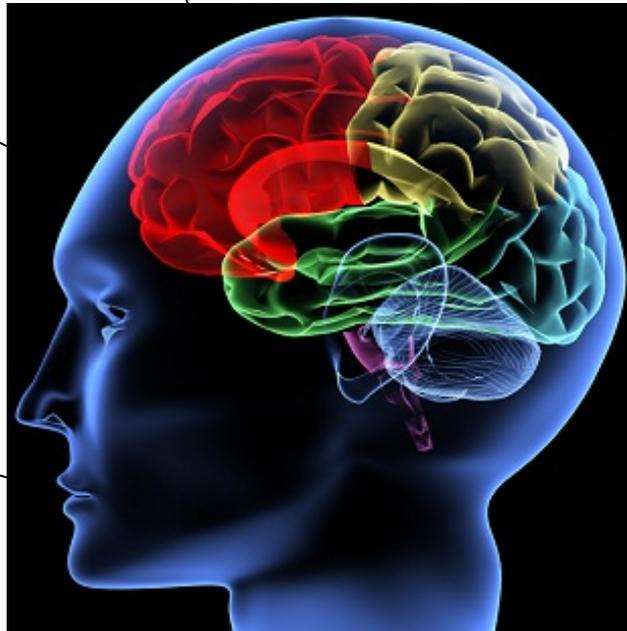


**3. Marijuana & youth vulnerability**

**4. Marijuana myths**

**1. Brain development**

6. Summary



2. Marijuana use

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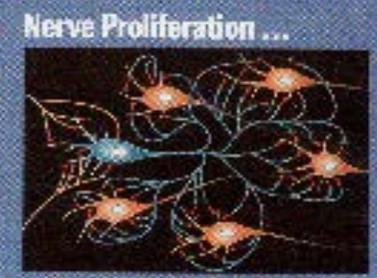
3. Marijuana & youth vulnerability

4. Marijuana myths

- Adolescence is a period of profound brain maturation.
- We *thought* brain development was complete by adolescence
- We now know... maturation is not complete until about age 25

# INSIDE THE ADOLESCENT BRAIN

The brain undergoes two major developmental spurts, one in the womb and the second from childhood through the teen years, when the organ matures by fits and starts in a sequence that moves from the back of the brain to the front.



By age 13 for girls and 15 for boys, the neurons in the front of the brain have sorted themselves out into networks. Now, 90 percent of the neural circuitry that will be pruned is in place.

## Corpus Callosum

Though it is an archipelago of small islands and reefs, the bundle of nerves that connects the left and right hemispheres of the brain, the corpus callosum, the nerve that connects and processes information from and to both sides of the brain.

## Prefrontal Cortex

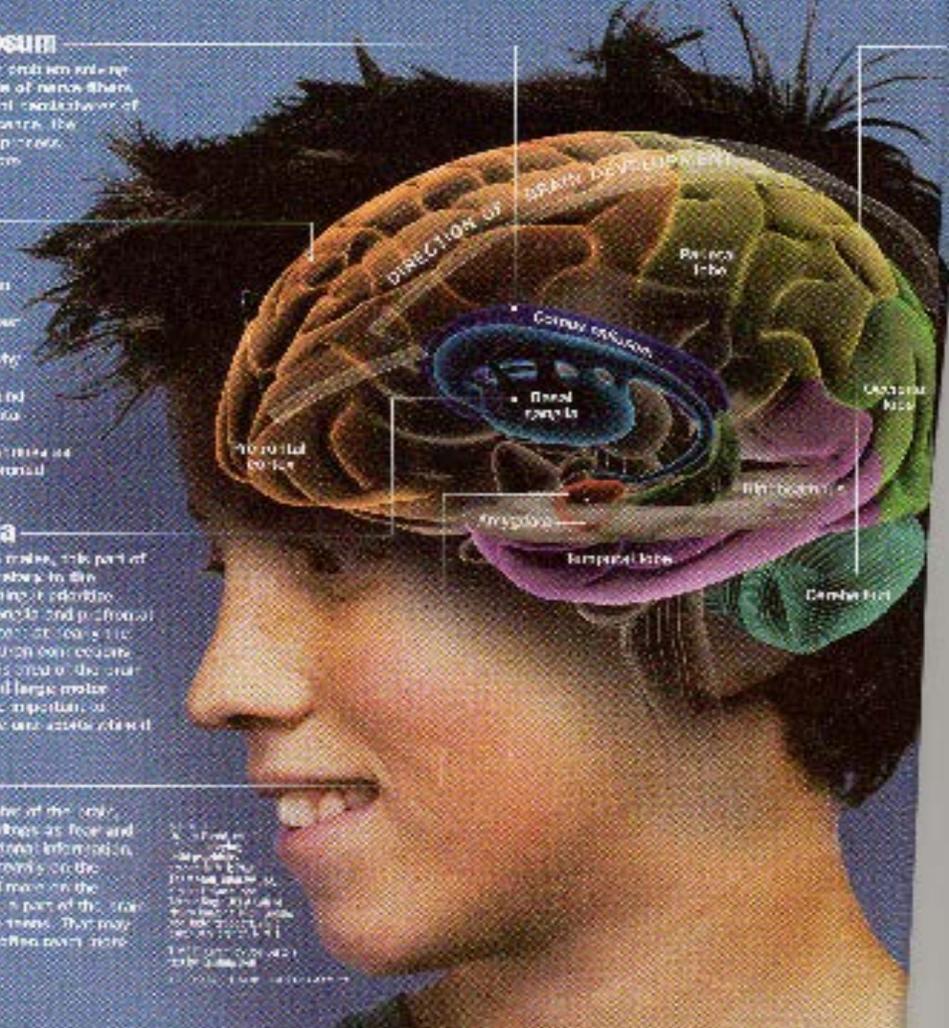
The CEO of the brain, also called the area of higher thought, is the part of the brain that is most involved in planning, organization, and decision-making. The prefrontal cortex grows during the pre-teen years and then continues to develop and mature throughout adolescence.

## Basal Ganglia

Larger in females than in males, this part of the brain acts like a switchboard in the prefrontal cortex by relaying information to the brain's motor and prefrontal areas. As the brain's motor and prefrontal areas mature, the basal ganglia also matures and then prunes itself. This part of the brain is involved in small and large motor movements, so it's an important, as opposed to a critical, part of the brain to be growing.

## Amygdala

The so-called emotional center of the brain, the amygdala processes feelings as fear and rage. In the early, emotional information flows into the amygdala from the senses. As the amygdala matures, it becomes a part of the brain that is involved in decision-making. They may be the amygdala's most important part, but it's not the amygdala's most important part.



Source: *Brain Development*, National Institute of Mental Health

# An Immature Brain = Less Brakes on the "Go" System



# Maturation Occurs from Back to Front of the Brain

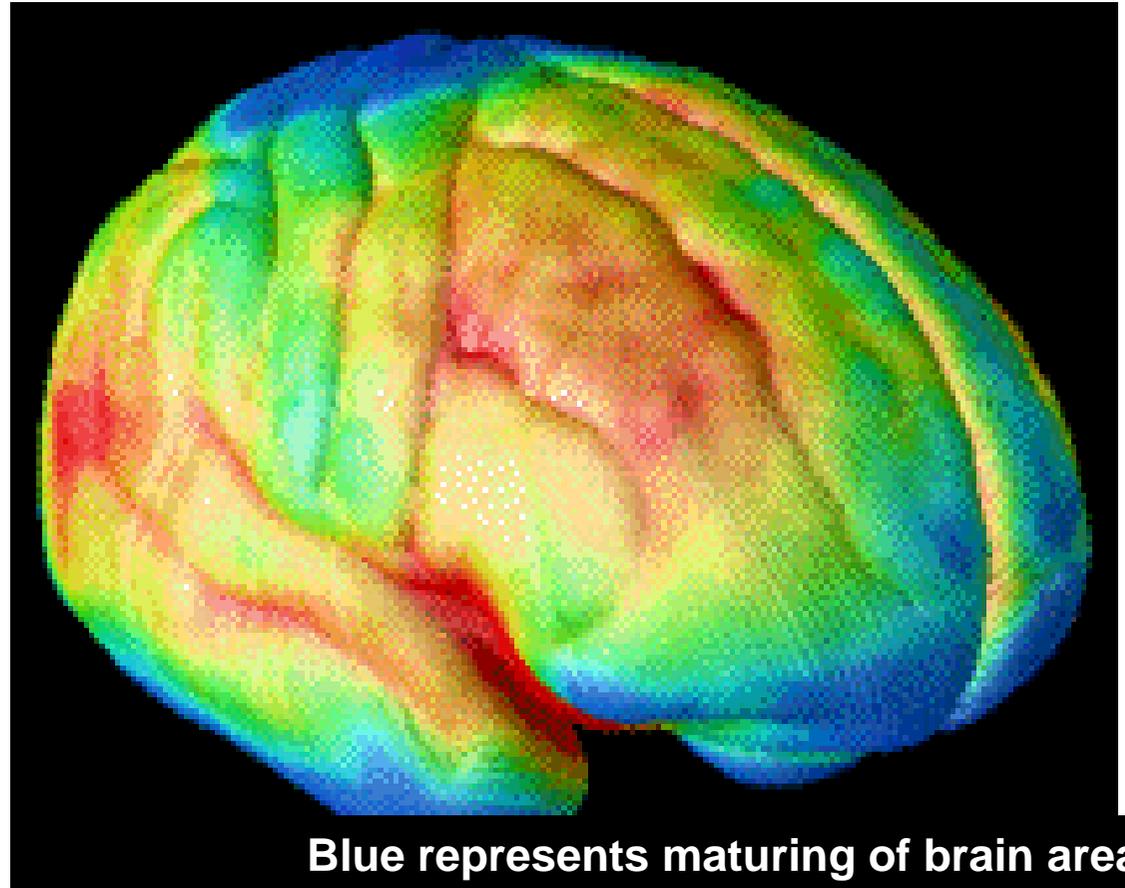
## Images of Brain Development in Healthy Youth (Ages 5 - 20)

### Earlier: Limbic system

- Processing emotions
- Processing social info
- Experience reward, punishment

### Later: Prefrontal cortex

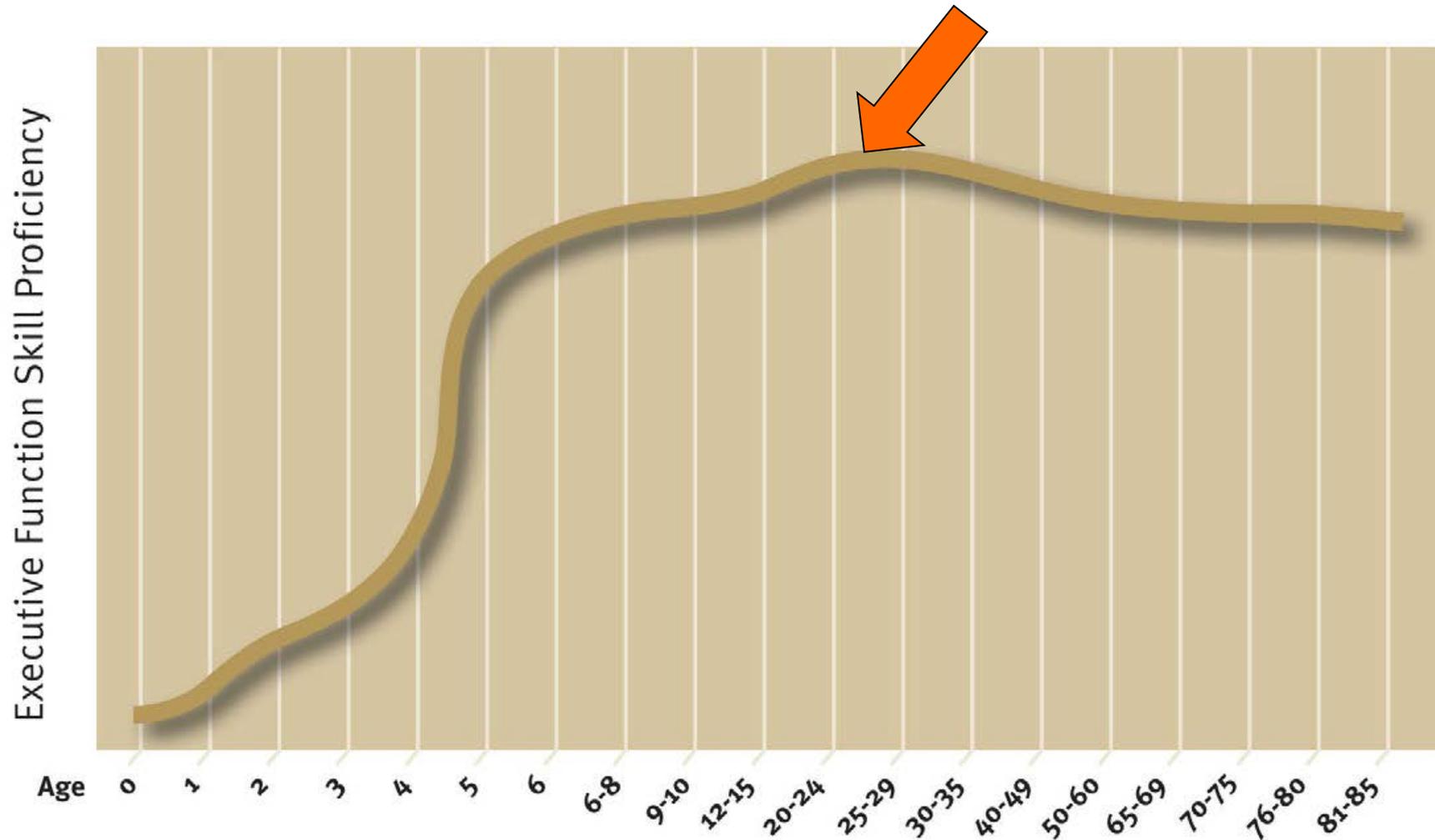
- Deliberative thinking
- Logical reasoning
- Planning ahead
- Weighing costs and benefits
- Regulating impulses



# Limbic System



## Executive Function Skills Build Into the Early Adult Years

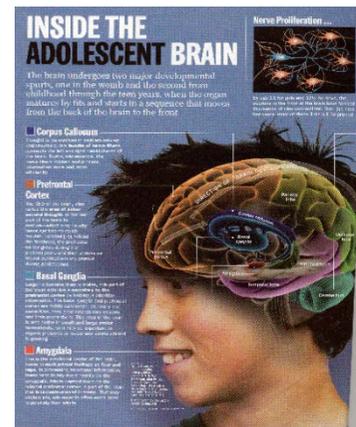


Source: Weintraub et al. (Submitted for Publication)

Tests measuring different forms of executive function skills indicate that they begin to develop shortly after birth, with ages 3 to 5 a window of opportunity for dramatic growth in these skills. Development continues throughout adolescence and early adulthood.

# Implications of Brain Development for Adolescent Behavior

- **Preference for ....**
  1. physical activity
  2. high excitement and rewarding activities
  3. activities with peers that trigger high intensity/arousal
  4. novelty
- **Less than optimal..**
  5. control of emotional arousal
  6. consideration of negative conseq.
- **Greater tendency to...**
  7. be attentive to social information
  8. take risks and show impulsiveness

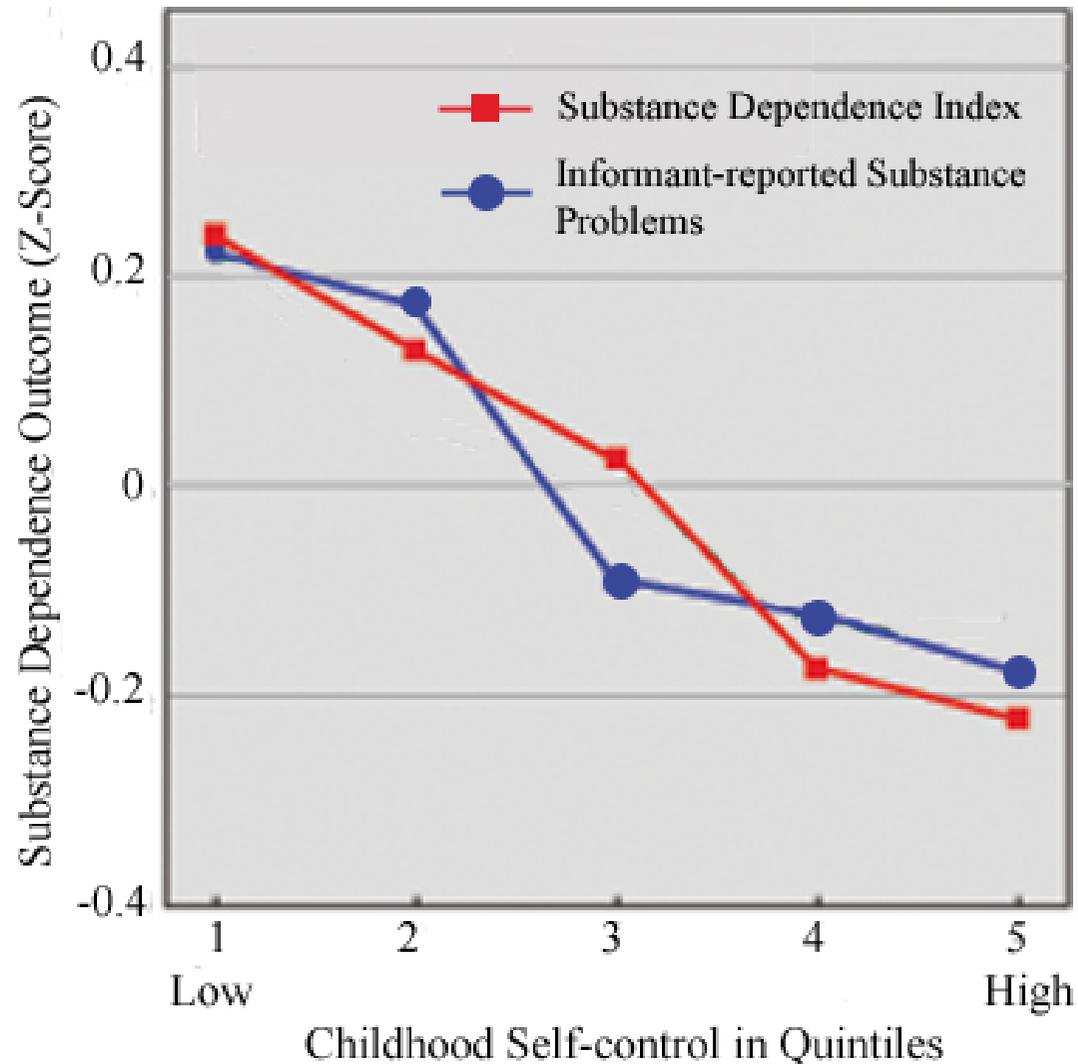


# Risk-Taking



- **Based on science of brain development, a modern view of risk taking in adolescence is...**
  - **normative; important to development**
  - **evolutionarily adaptive**
  - **significant individual differences**
  - **is due primarily to emotional and contextual, not cognitive, factors**

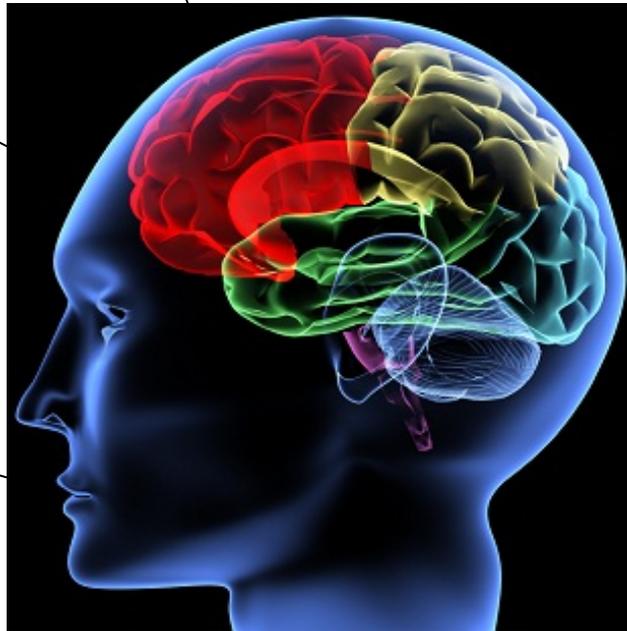
# Childhood Self-Control as a Predictor of Adult Substance Use Dependence (Moffitt et al., in press)



Outcomes were converted to Z-Scores and childhood self-control is represented in quintiles.

**1. Brain development**

6. Summary



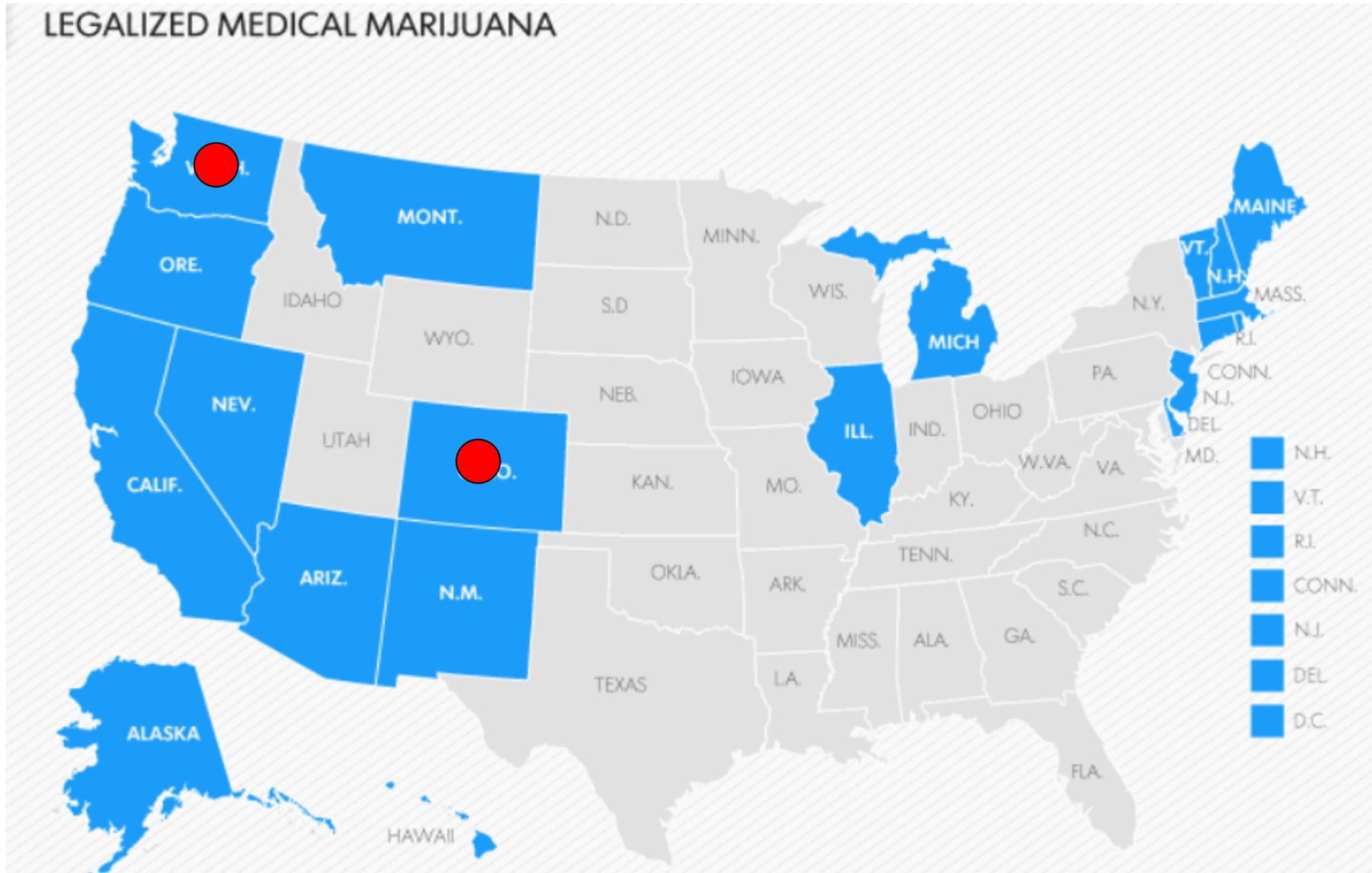
**2. Marijuana use**

5. Public policy

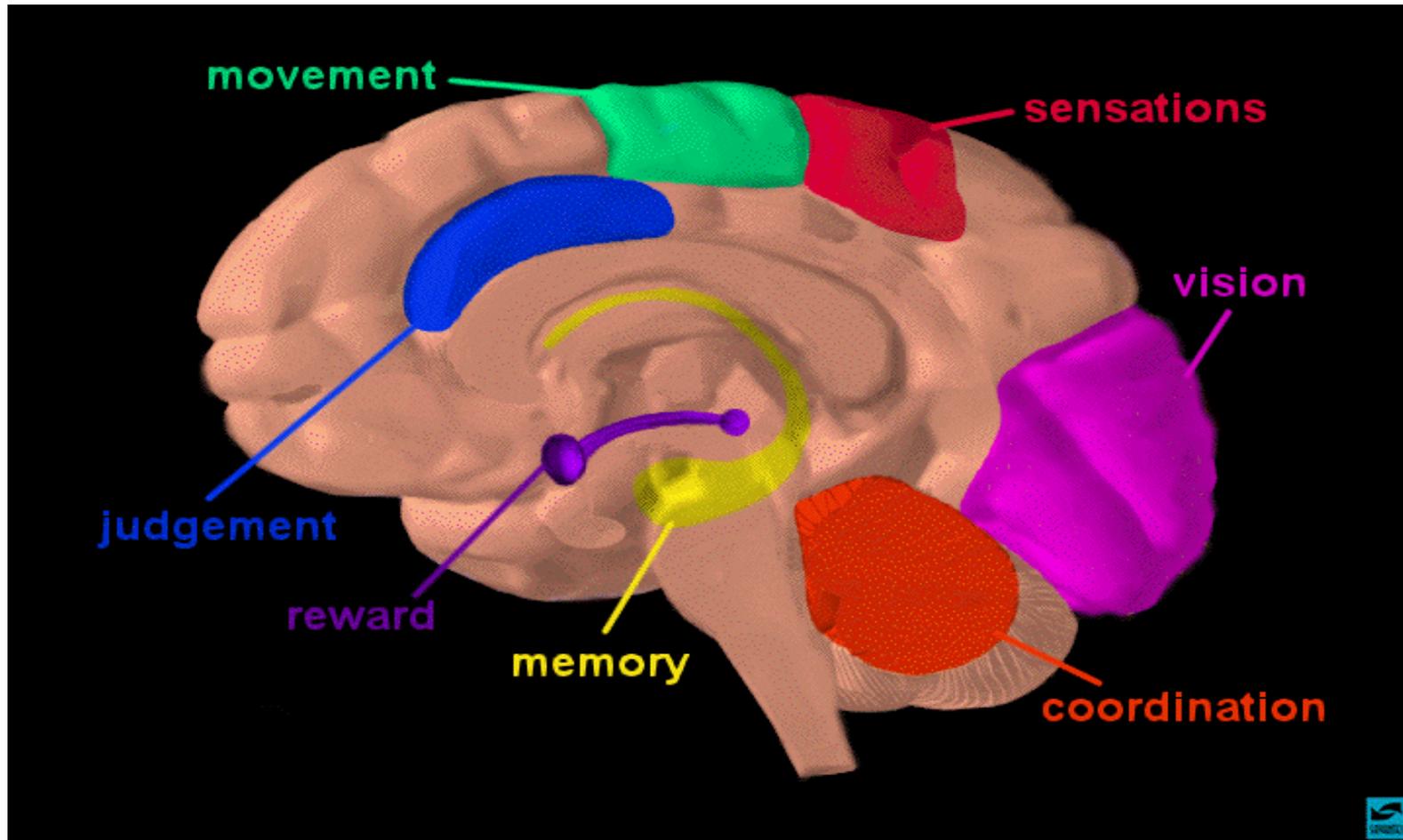
3. Marijuana & youth vulnerability

4. Marijuana myths

# LEGALIZED MEDICAL MARIJUANA



# What's Affected by THC?



# Cannabinoid receptors in our brains - why?



- **Animal and human studies show that without these receptors...**
  - **Experience more pain**
  - **Can't control appetite**
  - **More anxious**
  - **Less able to cope with stress**

# Drug use starts early and peaks in the teen years



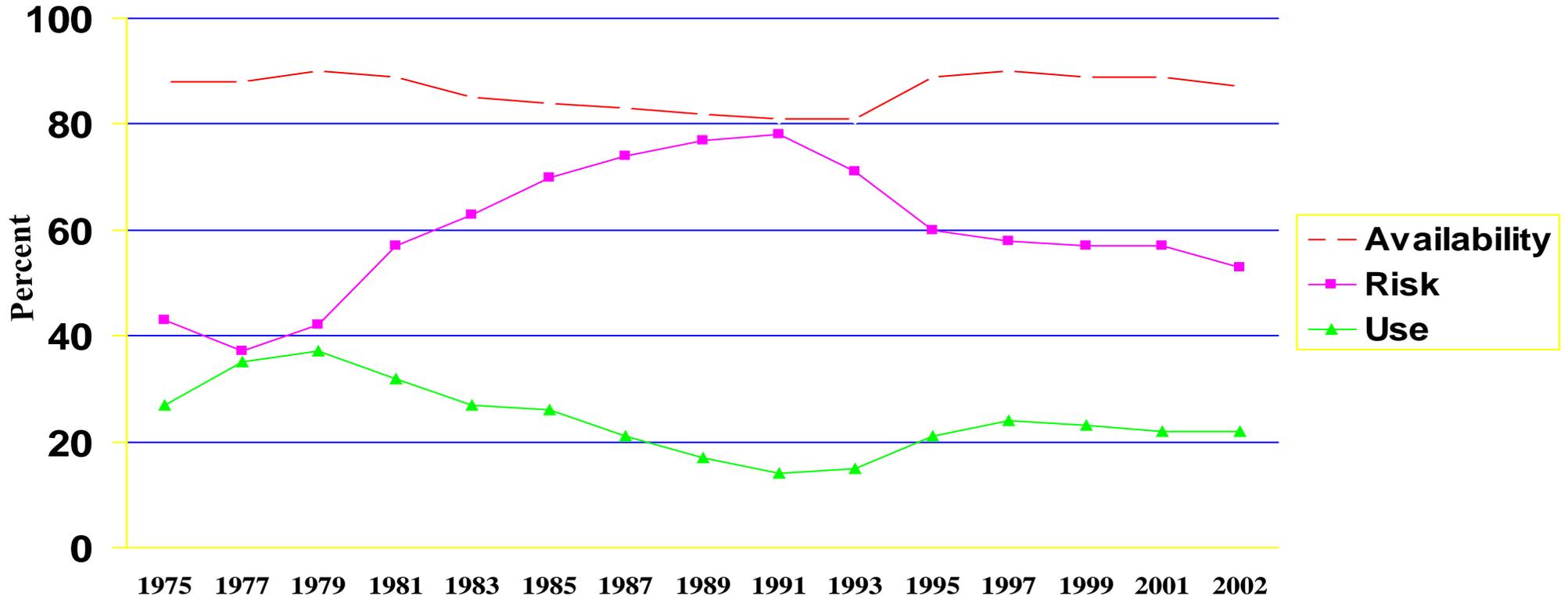
# 2012 Monitoring the Future Study

## Prevalence of Past Year Drug Use Among 12<sup>th</sup> Graders

Drug	Prev. (%)	Drug	Prev. (%)
Alcohol	63.5	MDMA (Ecstasy)	3.8
Marijuana/Hashish	36.4	Cocaine (any form)	3.4
Amphetamine*	7.9	Inhalants	3.4
Adderall*	7.6	Cocaine Powder	3.0
Vicodin*	7.5	Ritalin*	2.6
Cough Medicine*	5.6	LSD	1.9
Tranquilizer*	5.3	Ketamine	1.7
Sedatives*	4.5	Steroids	1.5
Salvia	4.4	Crack	1.3
OxyContin*	4.3	Methamphetamine	1.2
Hallucinogens	4.0		

\* Nonmedical use, or not prescribed by a doctor

# Marijuana: Trends in Perceived Availability, Perceived Risk, and Use for 12th Graders



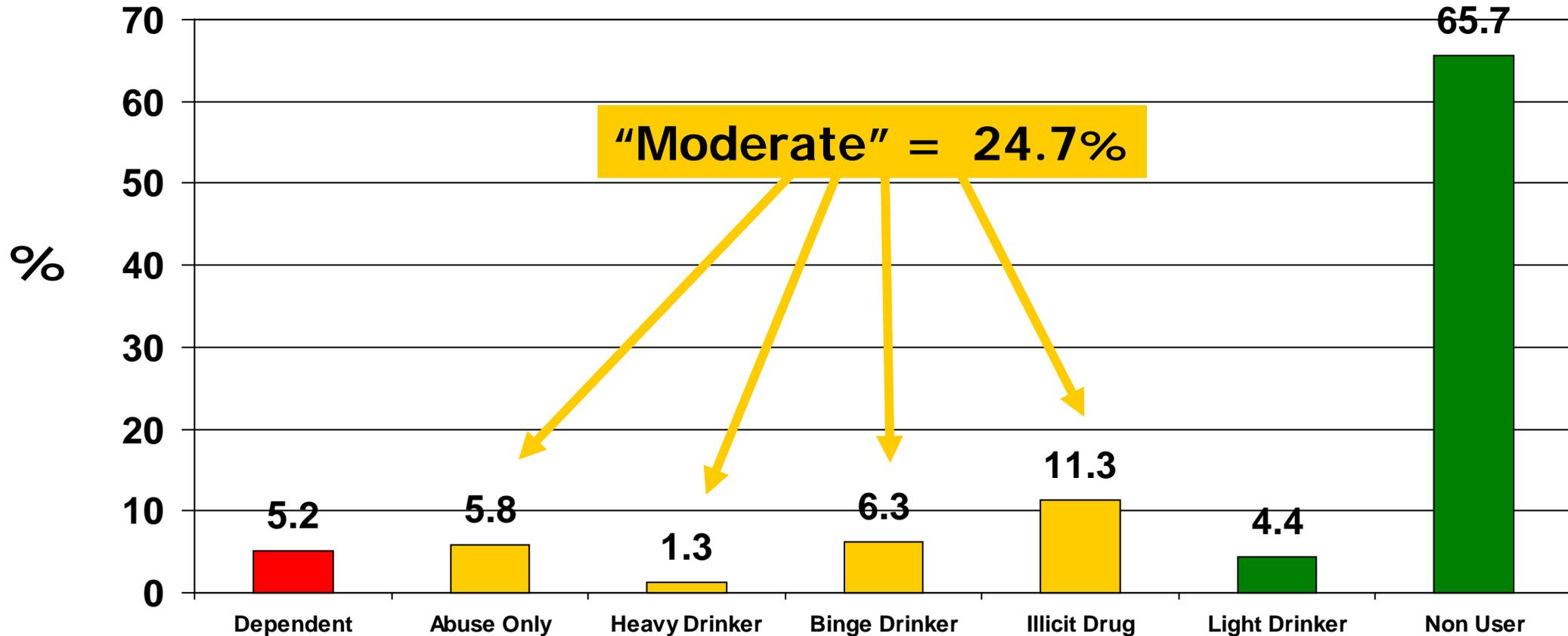
**Availability** = Fairly easy or very easy to get

**Risk** = Great risk of harm in regular use

**Use** = Once or more, past 30 days

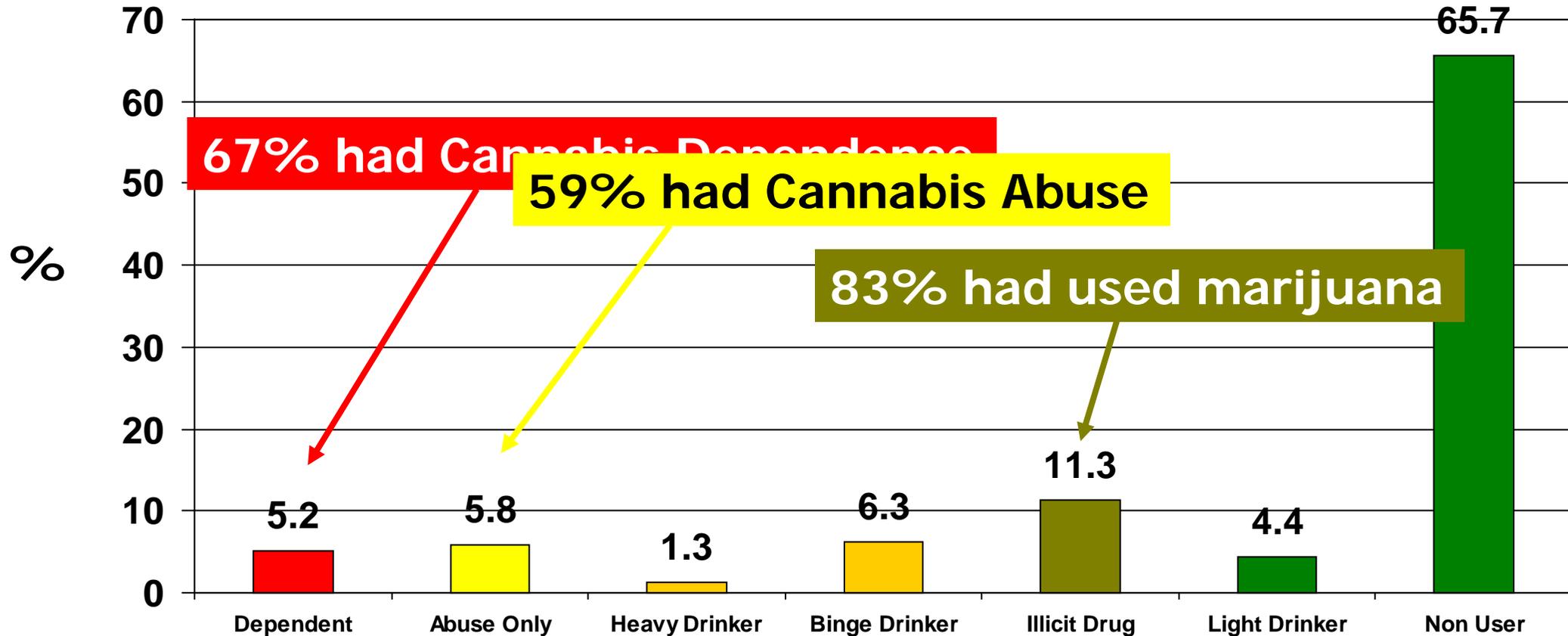
# Estimates of Mutually Exclusive Drug Abusing Adolescent Groups, Ages 12-18-year-old

(based on data from SAMHSA, 2005)



Heavy, Binge, and Light Drinkers: prior 30 days  
Dependence, Abuse only, Illicit Drug Use and No Drug Use: prior year

# Estimates of Mutually Exclusive Drug Abusing Adolescent Groups, Ages 12-18-year-old (based on data from SAMHSA, 2005)

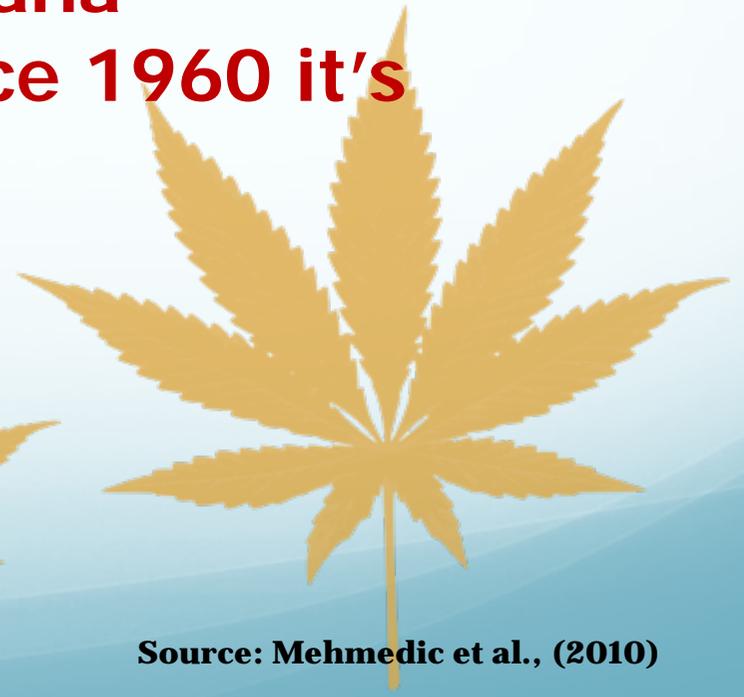


Heavy, Binge, and Light Drinkers: prior 30 days  
Dependence, Abuse only, Illicit Drug Use and No Drug Use: prior year

# Increased Potency

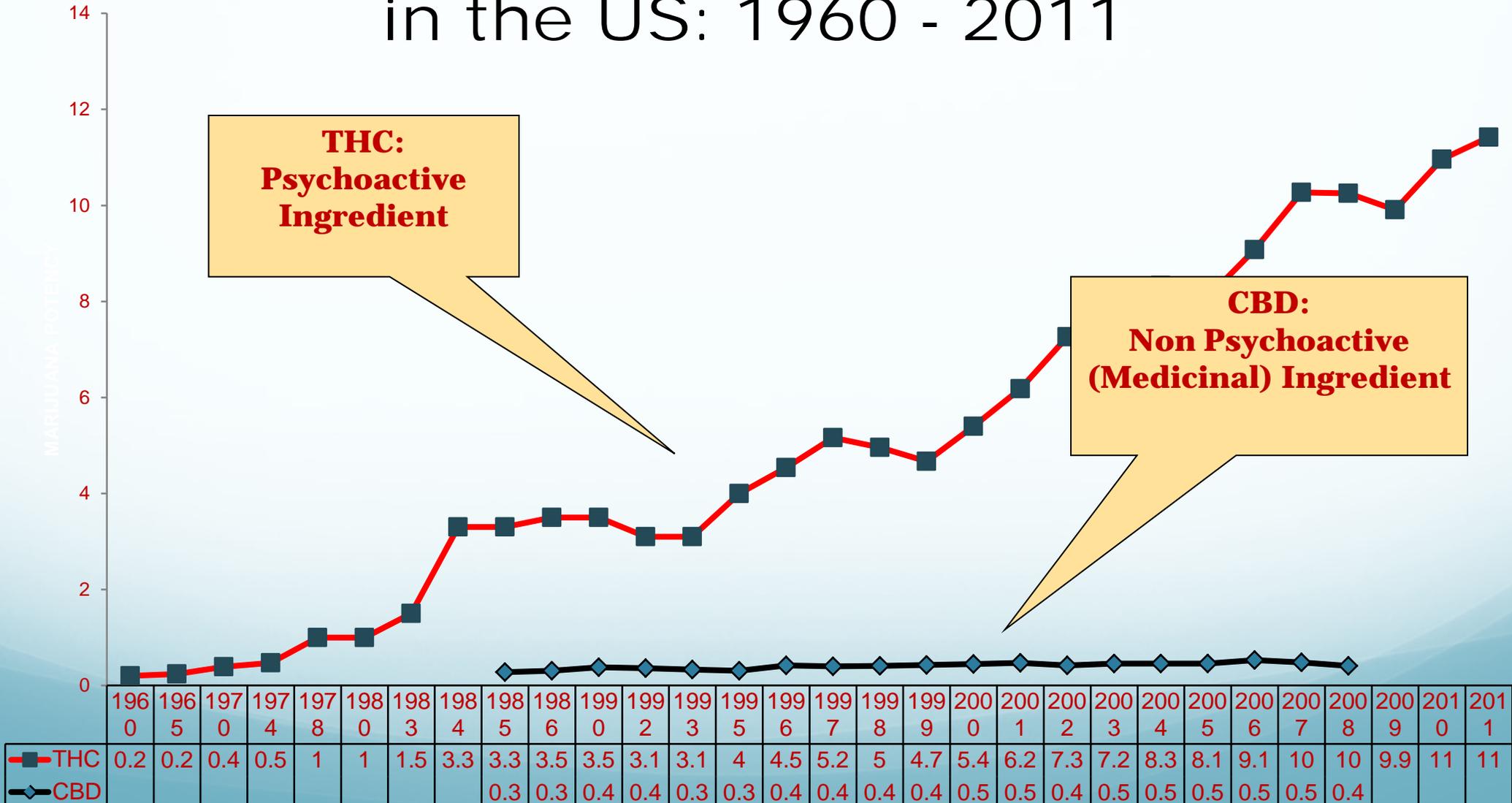
**Today's marijuana is not the marijuana of the 1960s.**

- **In the past 15 years, marijuana potency has tripled, and since 1960 it's grown 5 times stronger.**



Source: Mehmedic et al., (2010)

# Average THC and Cannabidiol (CBD) Levels in the US: 1960 - 2011



**1. Brain development**

6. Summary



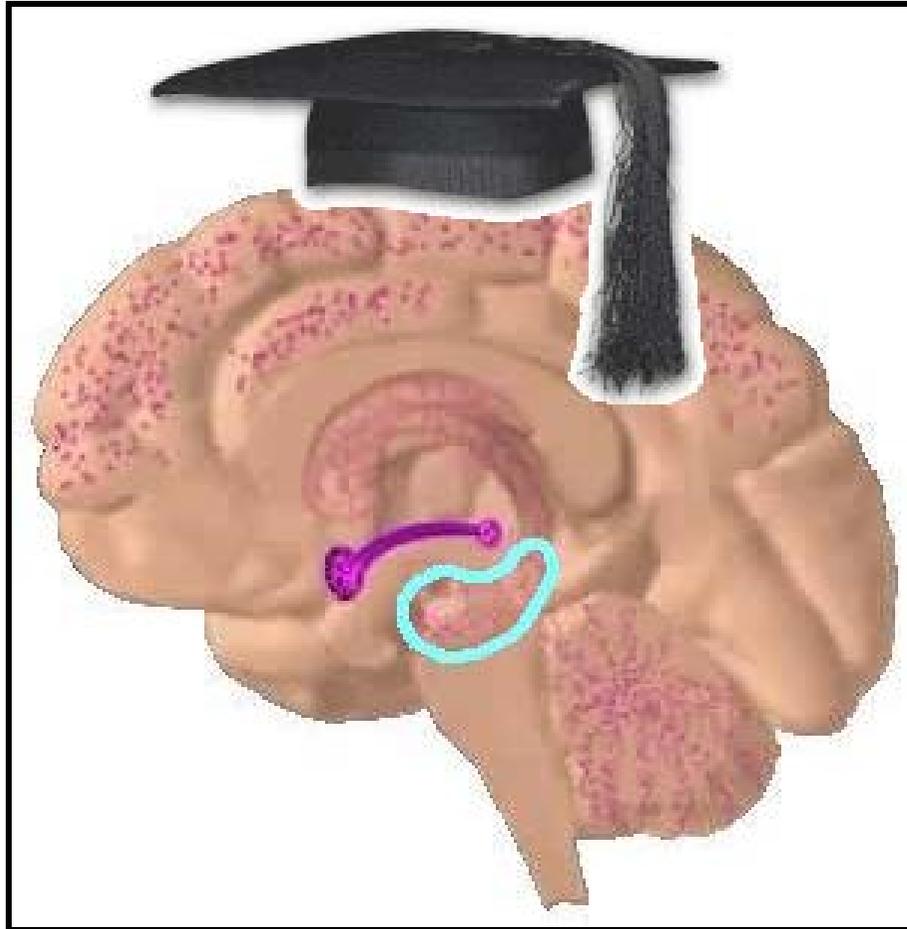
**2. Marijuana use**

5. Public policy

**3. Marijuana & youth vulnerability**

4. Marijuana myths

# A. Marijuana's Effects on Cognitive Functioning



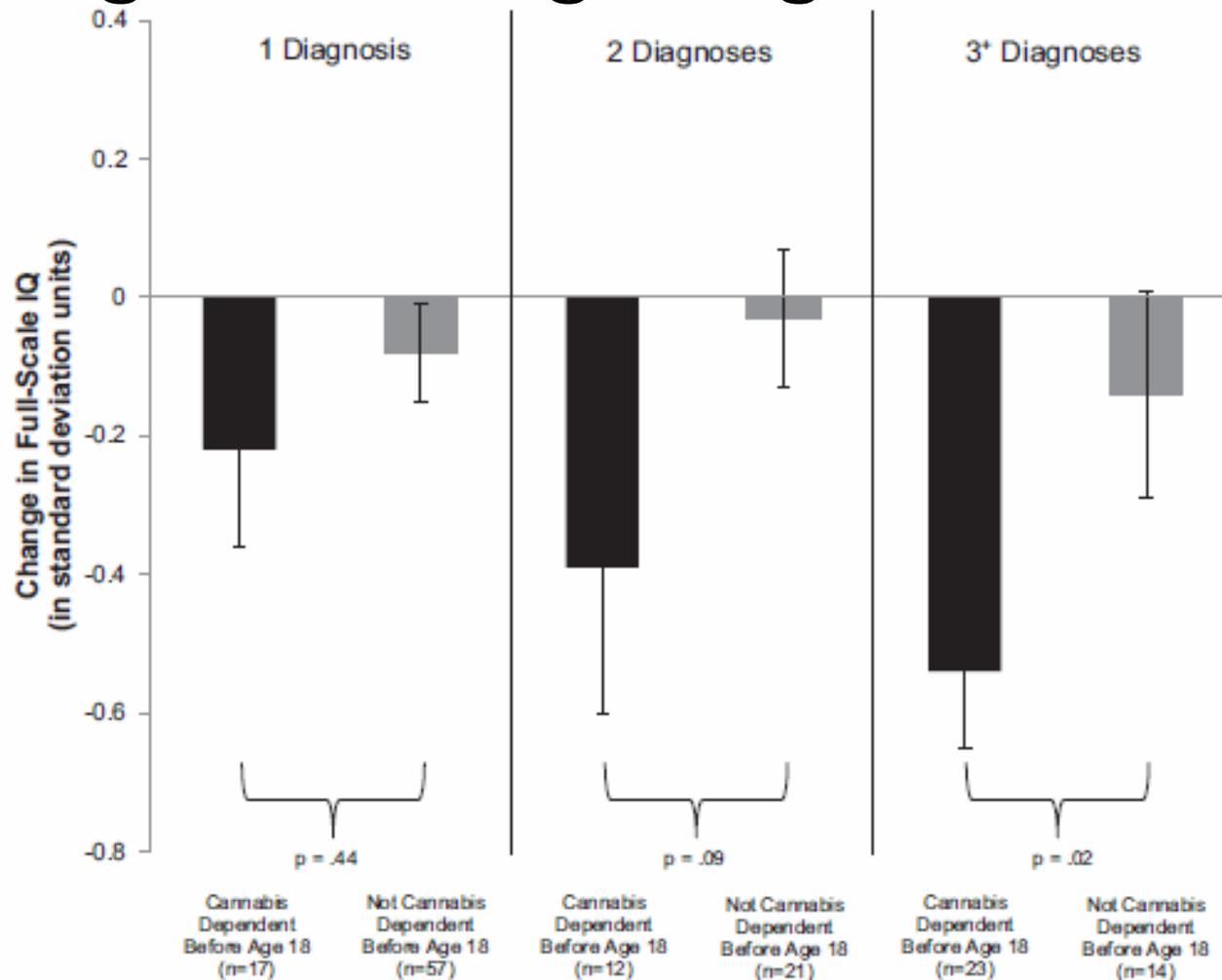
# Persistent cannabis users show neuropsychological decline from childhood to midlife

Madeline H. Meier<sup>a,b,1</sup>, Avshalom Caspi<sup>a,b,c,d,e</sup>, Antony Ambler<sup>e,f</sup>, HonaLee Harrington<sup>b,c,d</sup>, Renate Houts<sup>b,c,d</sup>, Richard S. E. Keefe<sup>d</sup>, Kay McDonald<sup>f</sup>, Aimee Ward<sup>f</sup>, Richie Poulton<sup>f</sup>, and Terrie E. Moffitt<sup>a,b,c,d,e</sup>

<sup>a</sup>Duke Transdisciplinary Prevention Research Center, Center for Child and Family Policy, <sup>b</sup>Department of Psychology and Neuroscience, and <sup>c</sup>Institute for Genome Sciences and Policy, Duke University, Durham, NC 27708; <sup>d</sup>Department of Psychiatry and Behavioral Sciences, Duke University Medical Center, Durham, NC 27710; <sup>e</sup>Social, Genetic, and Developmental Psychiatry Centre, Institute of Psychiatry, King's College London, London SE5 8AF, United Kingdom; and <sup>f</sup>Dunedin Multidisciplinary Health and Development Research Unit, Department of Preventive and Social Medicine, School of Medicine, University of Otago, Dunedin 9054, New Zealand

- **Participants were members of the New Zealand (Dunedin) Study, a prospective study of a birth cohort of 1,037 individuals followed from birth (1972/1973) to age 38 years.**
- **Cannabis use was ascertained in interviews at ages 18, 21, 26, 32, and 38 years.**
- **Neuropsychological testing was conducted at age 13 years, before initiation of cannabis use, and again at age 38 years, after a pattern of persistent cannabis use had developed.**

# IQ Changes Among Diagnosed Users



Major New Study Shows Heavy Marijuana Use Lowers IQ

**Fig. 2.** Adolescent vulnerability. Shown is change in full-scale IQ (in SD units) from childhood to adulthood among study members with 1, 2, or 3+ diagnoses of cannabis dependence as a function of age of onset of cannabis dependence. Individuals with adolescent-onset cannabis dependence (black bars) experienced greater IQ decline than individuals with adult-onset cannabis dependence (gray bars). IQ decline of approximately  $-0.55$  SD units among individuals with adolescent-onset cannabis dependence in the 3+ group represents a decline of 8 IQ points. Error bars = SEs.

# Impact on Real Life Functioning



Major New Study Shows Heavy Marijuana Use Lowers IQ

Table 5. Cognitive problems outside the laboratory

Age 38 y informant reports	Never used, never diagnosed, n = 228	Used, never diagnosed, n = 457	1 diagnosis, n = 71	2 diagnoses, n = 31	3+ diagnoses, n = 35	Linear trend t test*	P
Informant-reported attention problems <sup>†</sup>	-0.21	-0.07	0.31	0.64	0.96	7.74	<0.0001
Informant-reported memory problems <sup>†</sup>	-0.27	-0.03	0.38	0.78	0.75	7.65	<0.0001

Shown are informant reports of cognitive problems at age 38 y as a function of the number of study waves between ages 18 y and 38 y for which study members met criteria for cannabis dependence. Scores are standardized means adjusted for baseline (childhood) full-scale IQ assessed before the onset of cannabis use. These means can be interpreted as effect sizes, with values of 0.20, 0.50, and 0.80 reflecting small, medium, and large effects, respectively. Cognitive problems among persistent cannabis users were apparent to the "naked-eye."

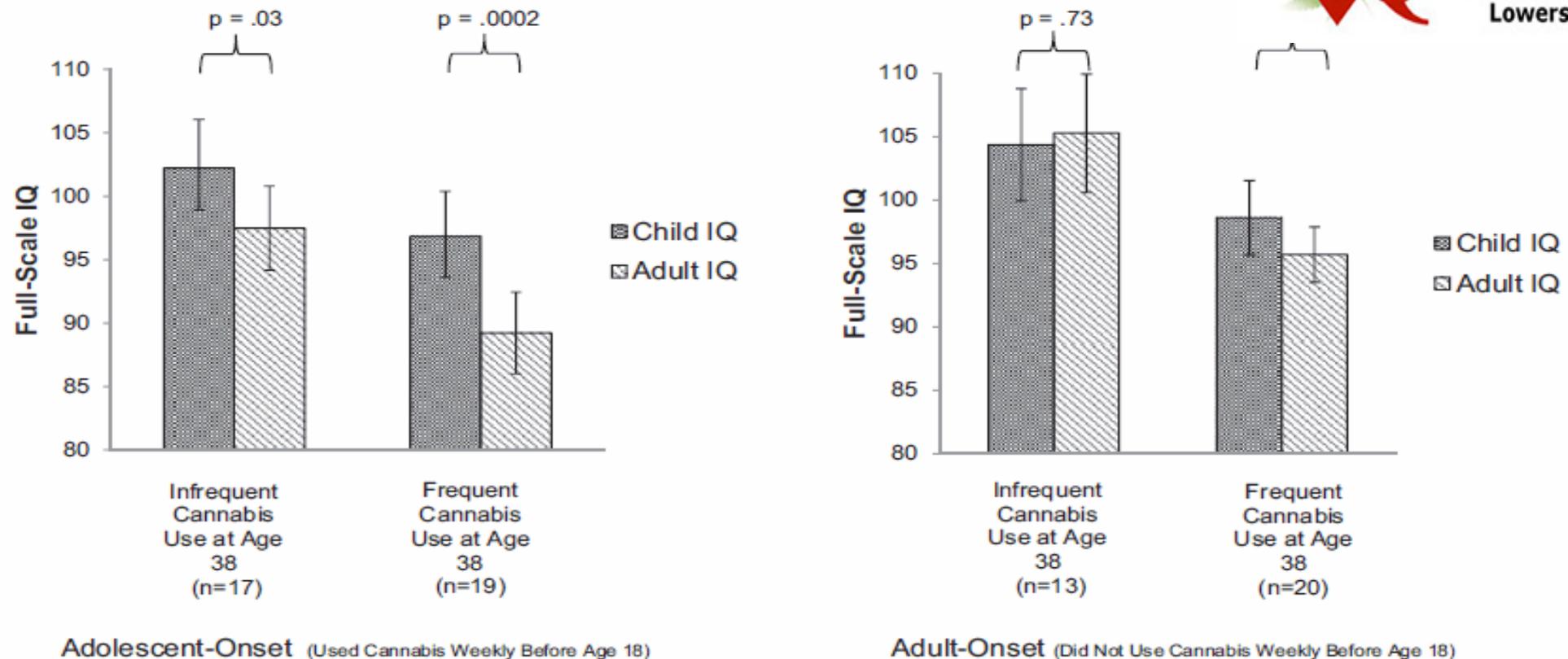
\*To test for a dose-response effect, we conducted an ordinary least-squares regression, estimating the linear trend controlling for childhood full-scale IQ and sex.

<sup>†</sup>Higher score indicates worse everyday problems.

# IQ Changes Among Former Persistent Users



Major New Study Shows Heavy Marijuana Use Lowers IQ

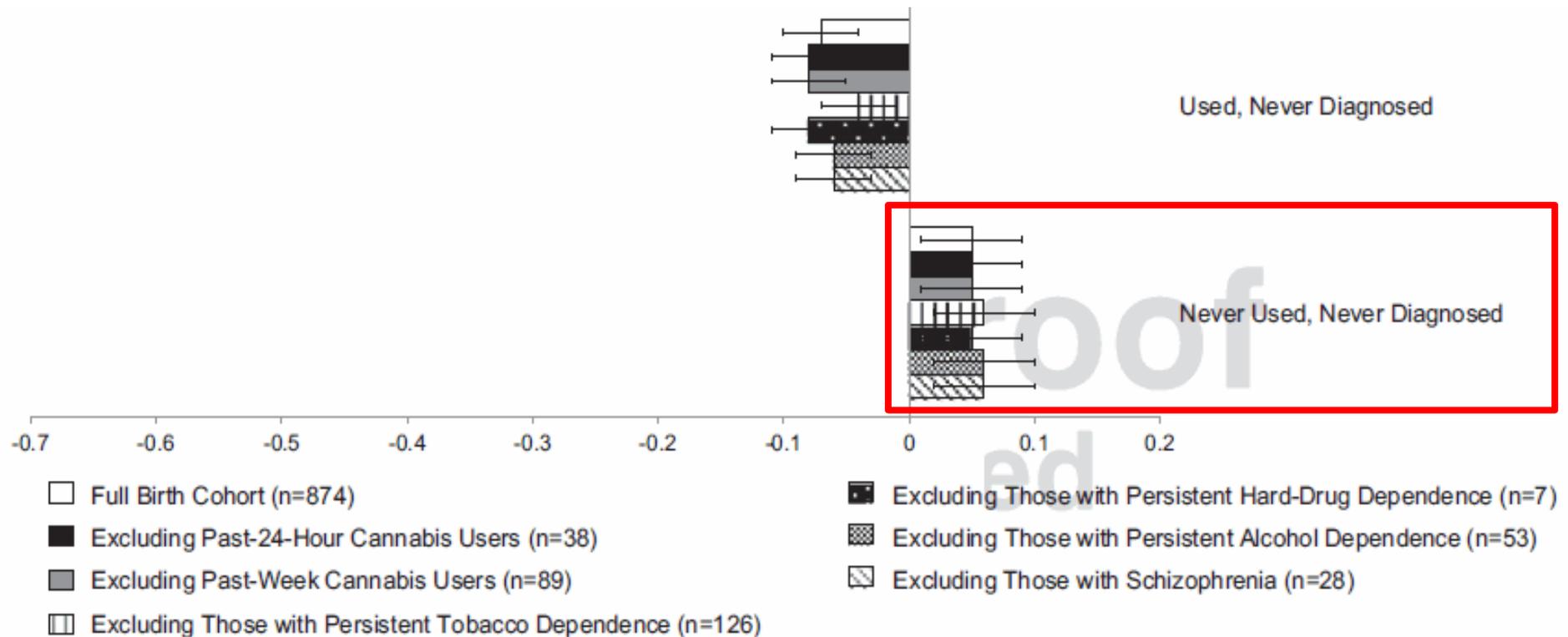


**Fig. 3.** Postcessation IQ among former persistent cannabis users. This figure is restricted to persistent cannabis users, defined as study members with two or more diagnoses of cannabis dependence. Shown is full-scale IQ in childhood and adulthood. IQ is plotted as a function of (i) age of onset of at least weekly cannabis use and (ii) the frequency of cannabis use at age 38 y. Infrequent use was defined as weekly or less frequent use in the year preceding testing at age 38 y. Median use among infrequent and frequent adolescent-onset cannabis users was 14 (range: 0–52) and 365 (range: 100–365) d, respectively. Median use among infrequent and frequent adult-onset cannabis users was 6 (range: 0–52) and 365 (range: 100–365) d, respectively. IQ decline was apparent even after cessation of cannabis use for adolescent-onset former persistent cannabis users. Error bars = SEs.

# IQ Changes Among Non-Diagnosed Users and Non-Users



Major New Study Shows Heavy Marijuana Use Lowers IQ



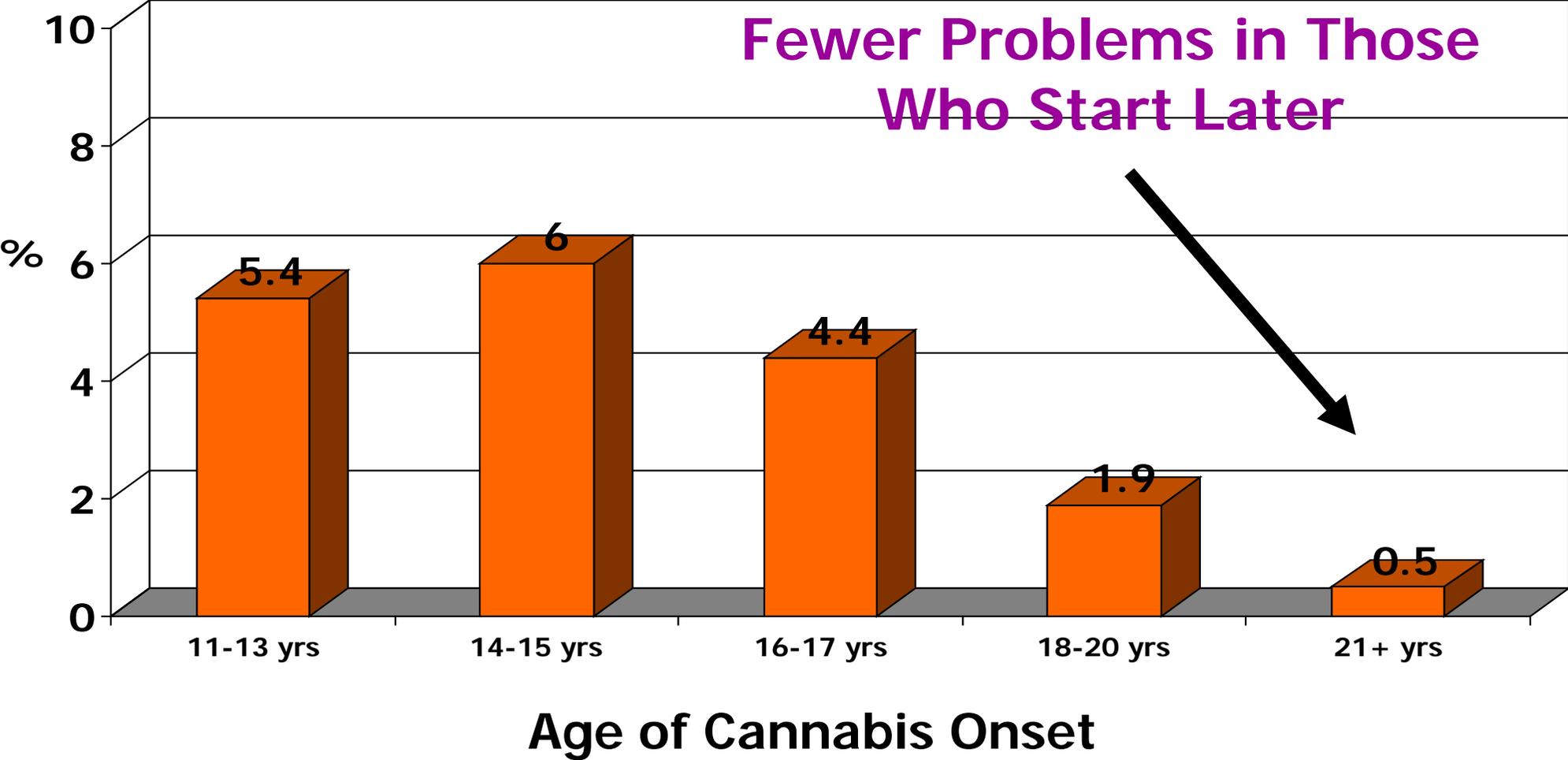
**Fig. 1.** Ruling out alternative explanations. Shown is change in full-scale IQ (in SD units) from childhood to adulthood as a function of the number of study waves between ages 18 y and 38 y for which a study member met criteria for cannabis dependence. Change scores are presented for the full birth cohort and the cohort excluding (i) past 24-h cannabis users, (ii) past-week cannabis users, (iii) those with persistent tobacco dependence, (iv) those with persistent hard-drug dependence, (v) those with persistent alcohol dependence, and (vi) those with lifetime schizophrenia. Persistent tobacco, hard-drug, and alcohol dependence were each defined as dependence at three or more study waves. IQ decline could not be explained by other factors. Error bars = SEs.

## B. Early Marijuana Use and Risk for Substance Use Disorder

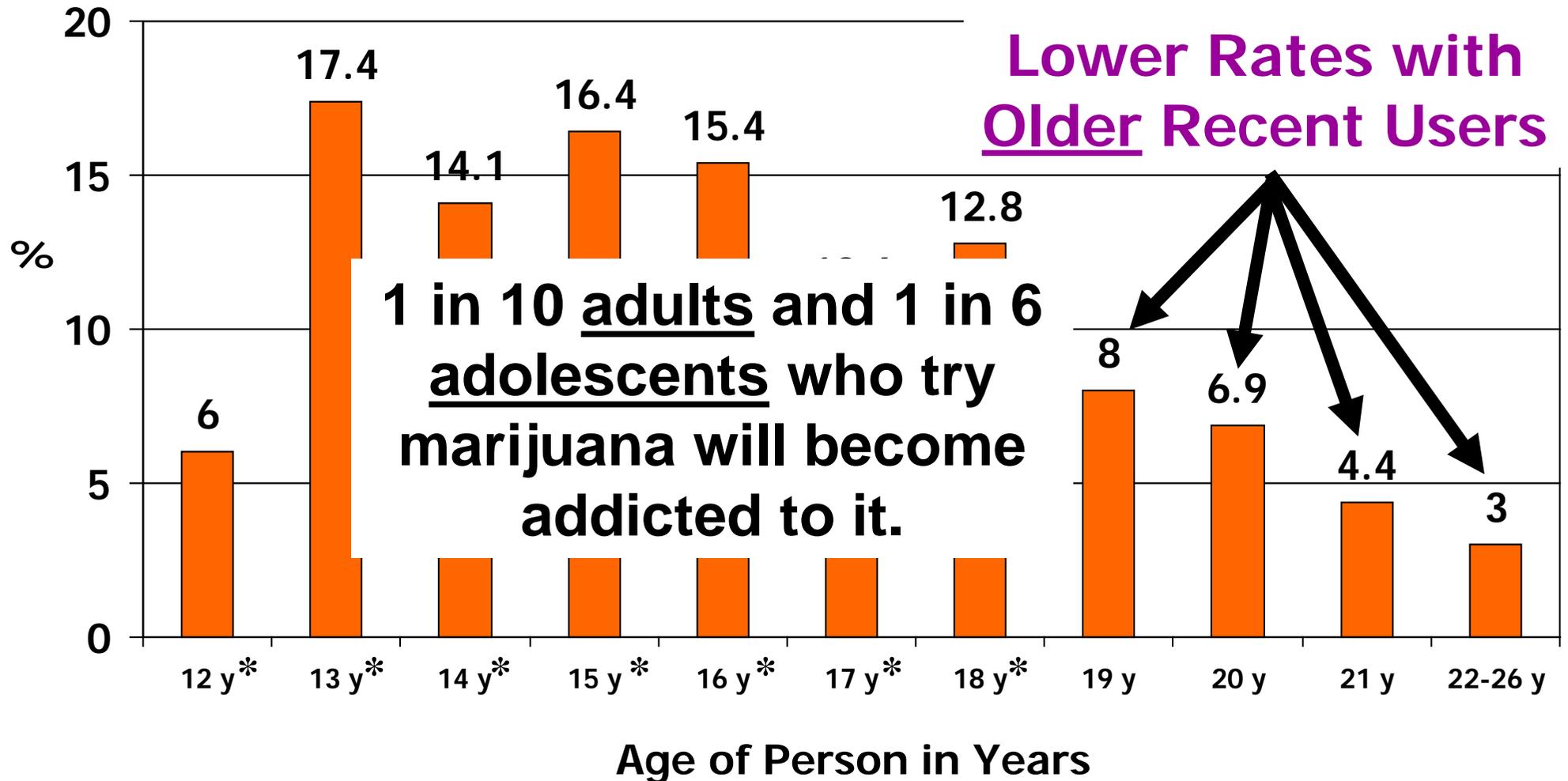
Drug abuse starts early and peaks in teen years



# Percentages of Adult Cannabis Dependence as Function of Age of Onset of Use (National Household Survey on Drug Abuse, 2000-2001)



Percentages of past year cannabis use disorder among those with a recent onset (prior 2 Years;  $n = 2176$ ) of cannabis use (Winters & Lee, 2007)



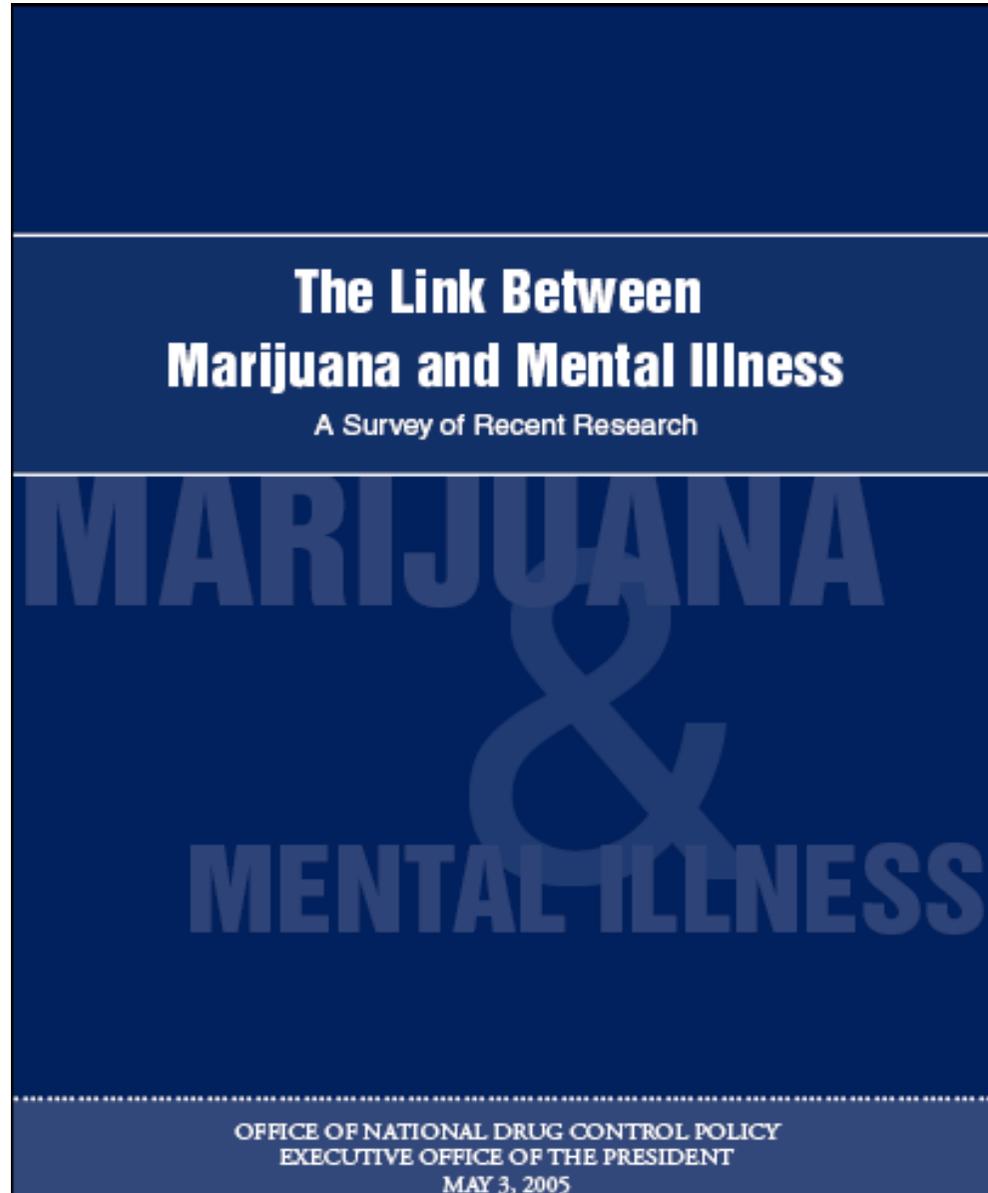
\*  $p \leq .05$ ; compared to 22-26y group

# Cannabis and Progression to Substance Use in Young Adults

(Swift et al., 2010)

- **13-year longitudinal cohort study with recruitment in secondary school students in Victoria, Australia.**
  - There were six waves of adolescent data collection (mean age 14.9 - 17.4 years) followed by three in young adulthood (mean age 20.7, 24.1 and 29.0 years).
- **Never use of marijuana provided the strongest protection from use of all other drugs.**
- **Weekly cannabis users during adolescence had two to three times the rates of **illicit drug use** uptake during young adulthood, while daily users had six times the rate of uptake of **cigarette smoking**.**

# C. Early Marijuana Use and Risk for Mental Illness



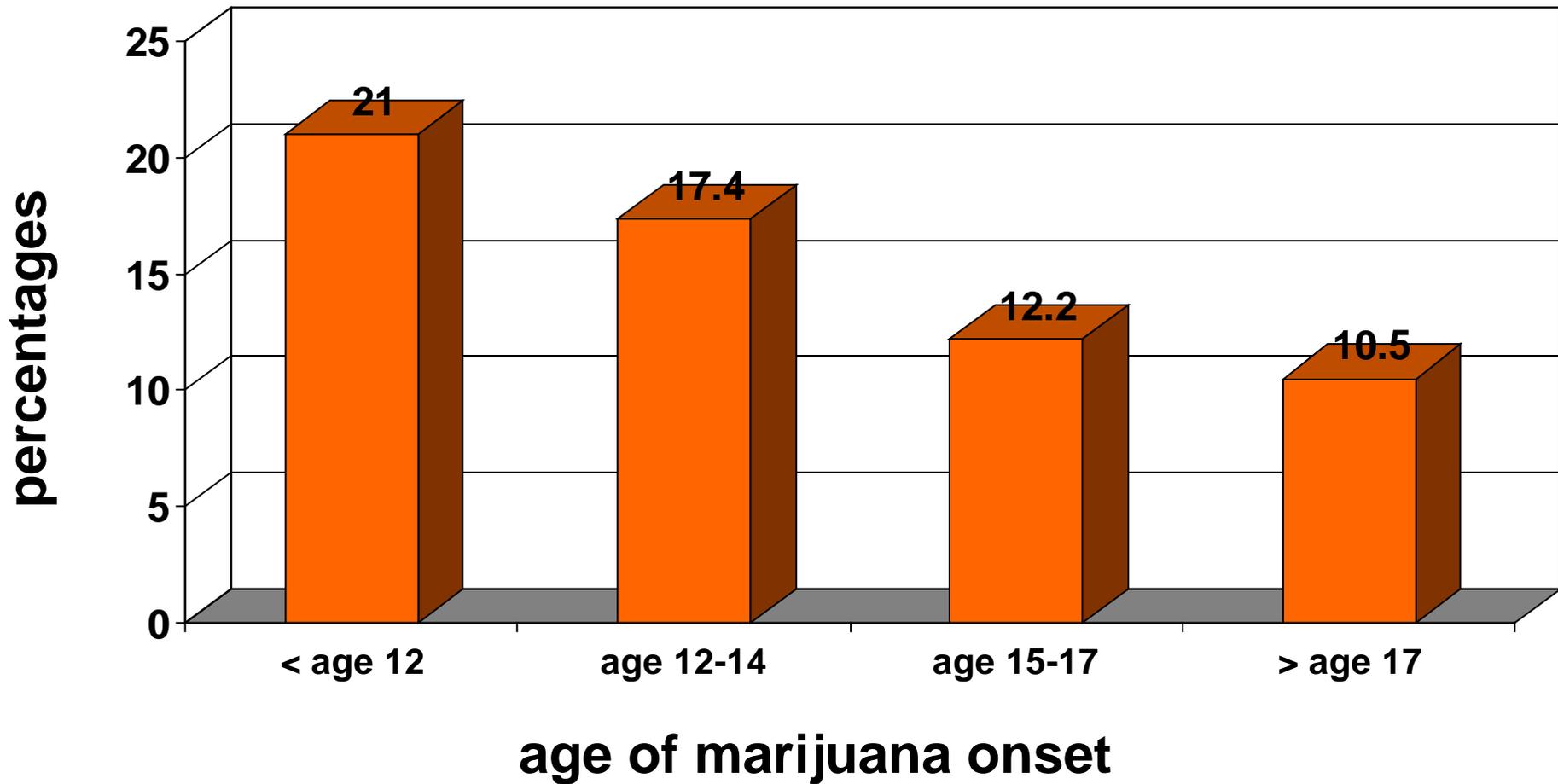
# Harmful Effects on Mental Health



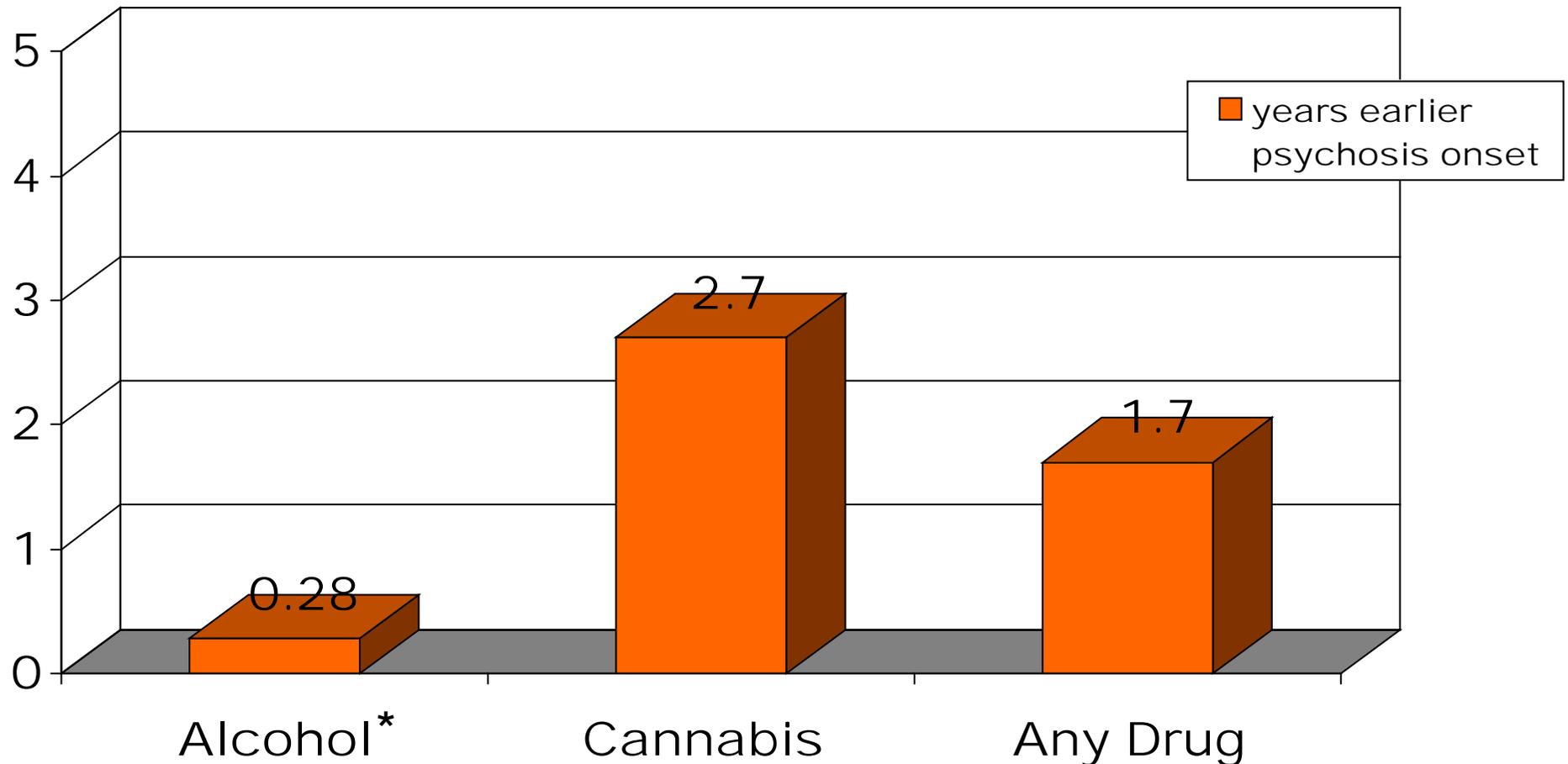
- **Increased risk of mental illness among cannabis users**
  - **Schizophrenia (6 fold)**
  - **Psychosis**
  - **Depression**
  - **Anxiety**

# Psychosis: Prevalence of Past Year Serious Mental Illness Among Lifetime Marijuana Users Aged 18+

(SAMHSA, 2005; data collected 2002-2003)



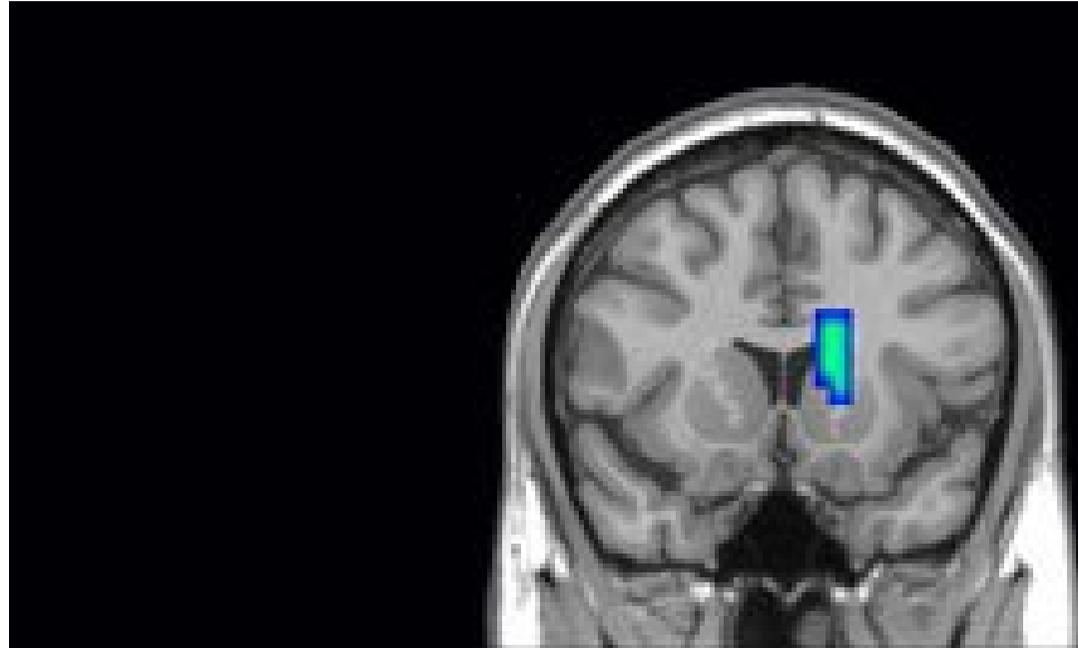
# Drug Use and Age at Onset of Psychosis Based on a Meta-Analysis (Large et al., 2011)



mean years earlier of age at onset of psychosis compared to non-drug using controls

\* = nonsig. with controls

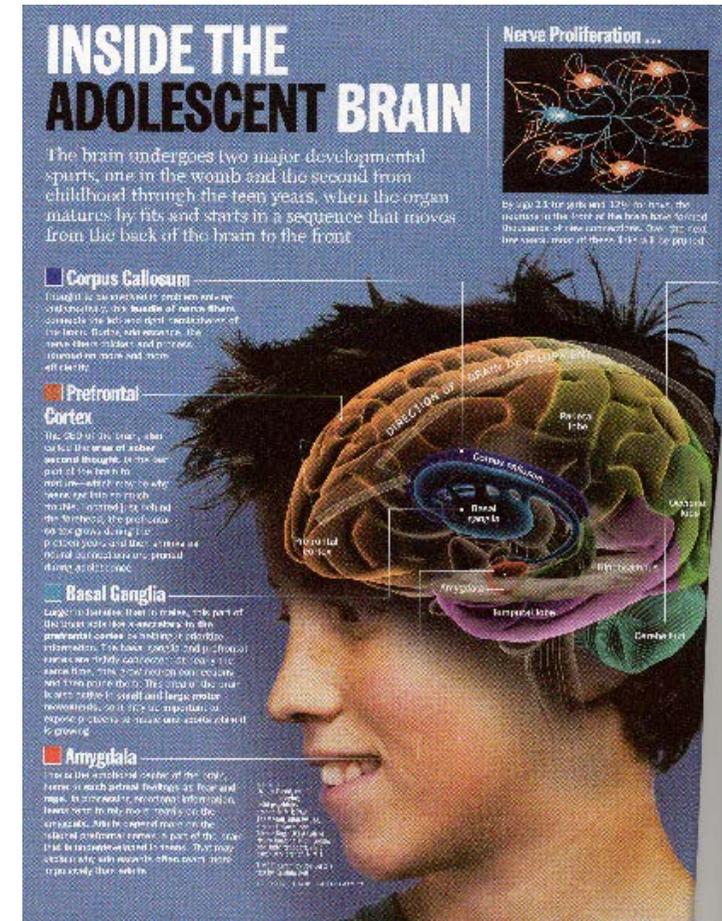
THC decreases the normal activation in the striatum (blue area)



**THC significantly weakened the activation of the striatum and increased the activation of the lateral prefrontal cortex. The effect in the striatum was a result of THC increasing individuals' response to normally insignificant stimuli, and decreasing its response to significant stimuli. The findings help explain why smoking cannabis can result in feelings of paranoia, or in the most extreme cases, psychotic episodes, as individuals attach special importance or meaning to normally insignificant experiences or stimuli.**

# How Does Early Marijuana Use Alter Risk Probabilities?

- **Marijuana use may...**
  - **potentiate neurobiological functioning in the youth with pre-existing genetic predisposition.**
  - **alter normal neurobiological functioning in the youth.**
  - **contribute to exposure to accumulating psychosocial risk factors.**



**1. Brain development**

6. Summary



**2. Marijuana use**

5. Public policy

**3. Marijuana & youth vulnerability**

**4. Marijuana myths**



**Director, Kevin Sabat**

**Chair, Patrick J. Kennedy**

**Launched January 10<sup>th</sup>, 2013**

**Public Health Board of Trustees**

**10 state-wide affiliates**

# Project SAM

- 1. To inform public policy with the science of today's marijuana.**
- 2. To have honest conversations about reducing the unintended consequences of current marijuana policies, such as lifelong stigma due to arrest.**
- 3. To prevent the establishment of Big Marijuana that would market marijuana to children — and to prevent Big Tobacco from taking over Big Marijuana. Those are the very likely results of legalization.**
- 4. To promote research of marijuana's medical properties and produce pharmacy-attainable medications.**

Myth 1:

Smoked or Eaten

Marijuana is Medicine

# Is Marijuana Medicine?

**Marijuana has medical properties, BUT we don't need to smoke or eat it!**

**We don't smoke opium to derive the benefits of morphine.**

**So we don't need to smoke marijuana to receive its potential benefits.**

- **A distinction must be made between raw, crude marijuana and marijuana's components**

# Is Marijuana Medicine?

**No: smoked or inhaled raw marijuana is not medicine**

**Yes: there are marijuana-based pills available and other medications coming soon**

**Maybe: research is ongoing**

# Marijuana has Medicinal Properties

**Studies show that components or constituents within marijuana have medical value.**

- **For instance, *dronabinol* (also known as Marinol®) contains lab-made THC and is widely available at pharmacies as capsules to treat nausea/vomiting from cancer chemotherapy.**

# Marijuana-based Medicines are Being *Scientifically* Developed

- **However this process needs improvement.**
- **Research must be done on marijuana's *components*, not the raw, crude plant.**

# Marijuana-based Medicines



- **Cannabidiol (CBD):**  
**presumed medicine in THC**
- **Sativex<sup>®</sup> is in the process of being studied in the USA.**
  - **Administered via an oral mouth spray**
  - **Already approved in Canada and Europe**
- **Also Epidiolex<sup>®</sup>, pure CBD, not THC**

# Average Medical Marijuana Patients

## Profile:

- **32-year old white male**
- **history of alcohol and substance abuse**
- **no history of life-threatening illnesses**
- **87.9% had tried marijuana before age 19**
- **75% of Caucasian patients had used cocaine and 50% had used methamphetamine in their lifetime.**



# Only a Small Proportion of Medical Marijuana Users Report any Serious Illness

- **In Colorado, 2% reported cancer, less than 1% reported HIV/AIDS, and 1% reported glaucoma as their reason for using medical marijuana.**
- **In Oregon, these numbers are less than 4%, 2%, and 1%, respectively.**



**Source: Colorado Department of Public Health and Environment, 2011; Oregon Public Health Authority, 2011**

# But Chronic Pain is Commonly Reported

**Majority of medical marijuana users report using marijuana to treat ‘chronic or severe pain.’**

- **96% in Colorado**
- **91% in Oregon**
- **93% in Montana**

**Source: Colorado Department of Public Health and Environment, 2011; Oregon Public Health Authority, 2011; Montana Department of Public Health and Human Services, 2011**

# Legalization Behind the Smokescreen

**“We will use [medical marijuana] as a red-herring to give marijuana a good name.” —Keith Stroup, head of NORML to the Emory Wheel, 1979**

- **Medical marijuana advocates have pushed their agenda through “medicine by popular vote” rather than the rigorous scientific testing system devised by the FDA.**

# Behind the Smokescreen

**After the Compassionate Use Act passed in California in 1996, Allen St. Pierre, the director of NORML admitted in a TV interview that “in California, marijuana has also been *de facto* legalized under the guise of medical marijuana”**

# Is Medical Marijuana Associated with Increased Use?

- **Early data: prevalence rates of cannabis abuse/dependence among adults are almost twice higher in states with medical marijuana laws compared to states with no laws.**
  - **Caution: not longitudinal data.**

# What About Teens?

***“If pot is medicine and sanctioned by the state, then it must be safe to use.”***

- **Among youth (12-17) marijuana use rates in states with medical marijuana laws is 8.6% compared to 6.9% in states without such laws.**
  - **Caution: not longitudinal data.**
- **In states with medical marijuana laws, adolescents’ perception of the harmful effects of marijuana have significantly decreased.**

- **Dispensaries – Are they serving the sick and dying??**



# Gupta, CBD, Epilepsy

- **Recent CNN Documentary not very balanced.**
- **True: some evidence CBD can help with epilepsy.**
- **Confusion:**
  - **Confused COMPONENTS w/HERBAL MATERIAL**
  - **Homegrown CBD w/unknown composition and untested strength very different than standardized CBD.**
- **Efforts moving forward to standardized CBD through special NIH research project if bona fide physician recommends it.**

# Myth 2:

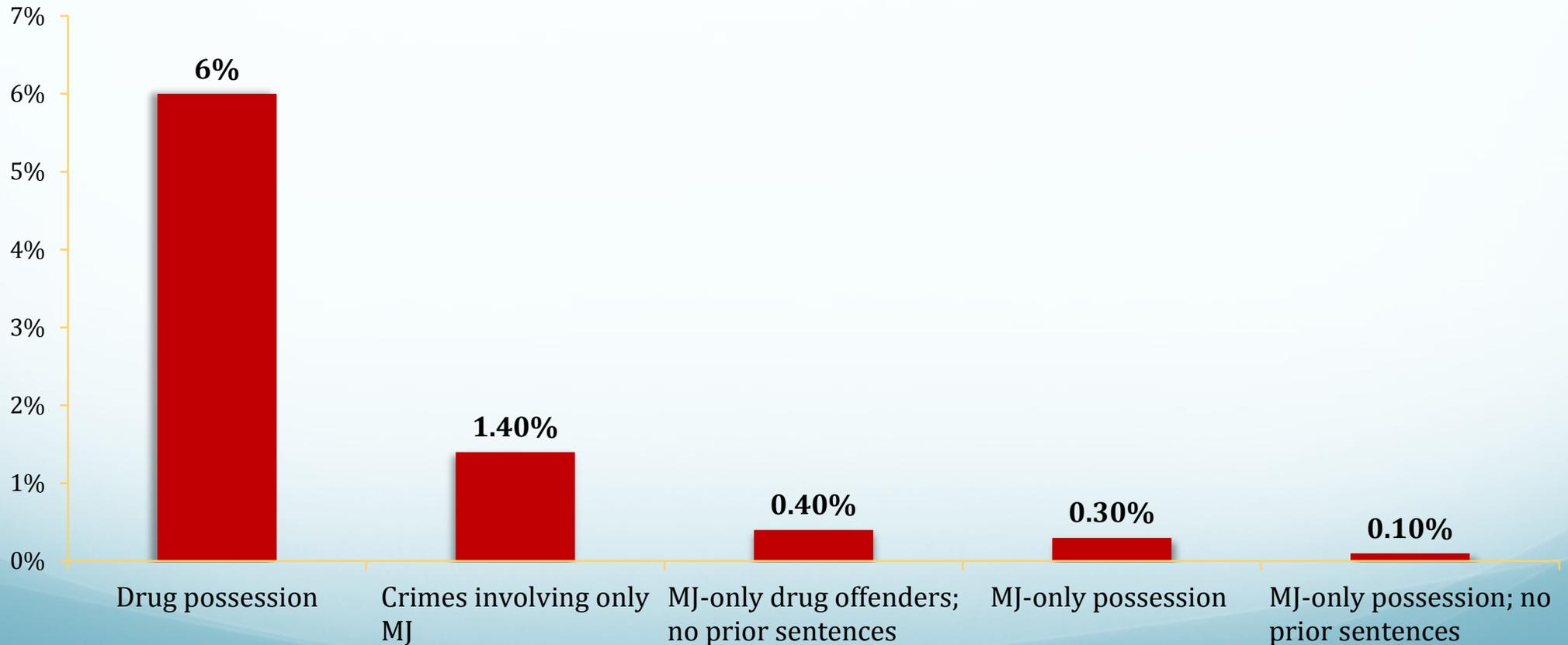
Countless People  
Are Behind Bars for  
Smoking Marijuana

# Countless People are NOT Behind Bars for Smoking Marijuana

- **Only 0.4% of prisoners with no prior offenses are in jail for marijuana possession.**
- **99.8% of Federal prisoners sentenced for drug offenses were incarcerated for drug trafficking**
- **The risk of arrest for each joint smoked is 1 for every 12,000 joints**

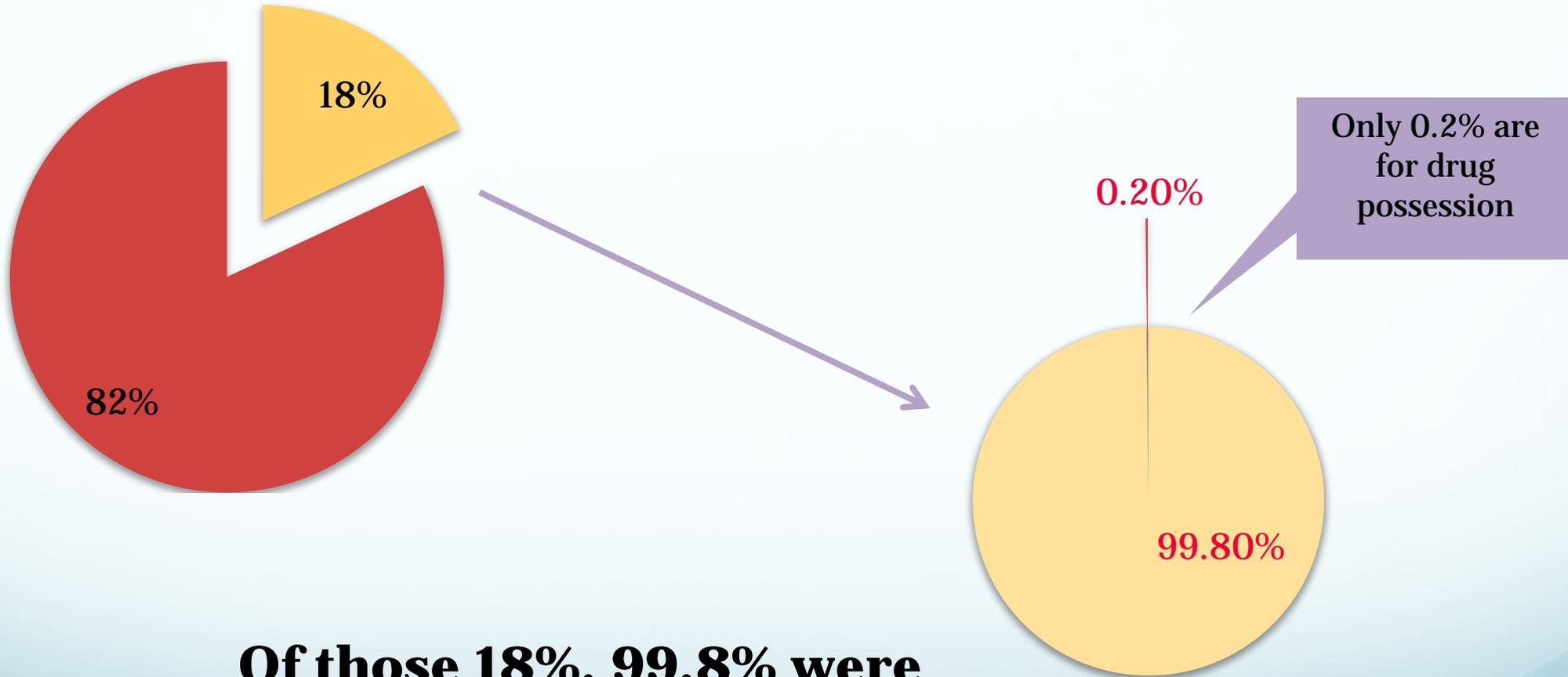
# Drug Possession Offenders in State Prisons

Percent of State Prisoners, 2004



Source: Bureau of Justice Statistics, 2004

Among sentenced prisoners under state jurisdiction in 2008, 18% were sentenced for drug offenses.



**Of those 18%, 99.8% were sentenced for *drug trafficking***

# Myth 3:

Portugal and Holland  
Provide Successful  
Examples of  
Legalization



**Neither Holland nor Portugal  
has Legalized Any Drug**

# Holland

**The Dutch established the Non-enforcement Policy in 1976 and saw the birth of “Coffee Shops”**



# Holland

- **The Dutch experienced a three-fold increase in marijuana use among young adults after commercialization expanded.**
- **The Dutch are currently rethinking their policies.**

# Holland

- **Experienced a three-fold increase in marijuana use among young adults.**
- **Before Non-Enforcement, the Dutch always had lower rates of drug use than the US.**
  - **Holland is now the #1 country in Europe with marijuana treatment needs.**
- **Scaling back policy**
  - **Coffee Shops Closing**
  - **Cannot sell to non-residents**

# Portugal

- **In 2001, Portugal changed policy to send users with small amounts of drugs to “*dissuasion panels*” – social worker panels who refer individuals to treatment, administer fine, etc.**
  - **they did not legalize**
- **Portugal also implemented robust treatment plan; results mixed**
  - **Youth use has increased since 2001, and fatalities have decreased.**
- **The impact of the policy is unclear, despite extreme rhetoric.**

# Uruguay

- **Uruguay is currently setting up legalization for 2014**

**1. Brain development**

**6. Summary**



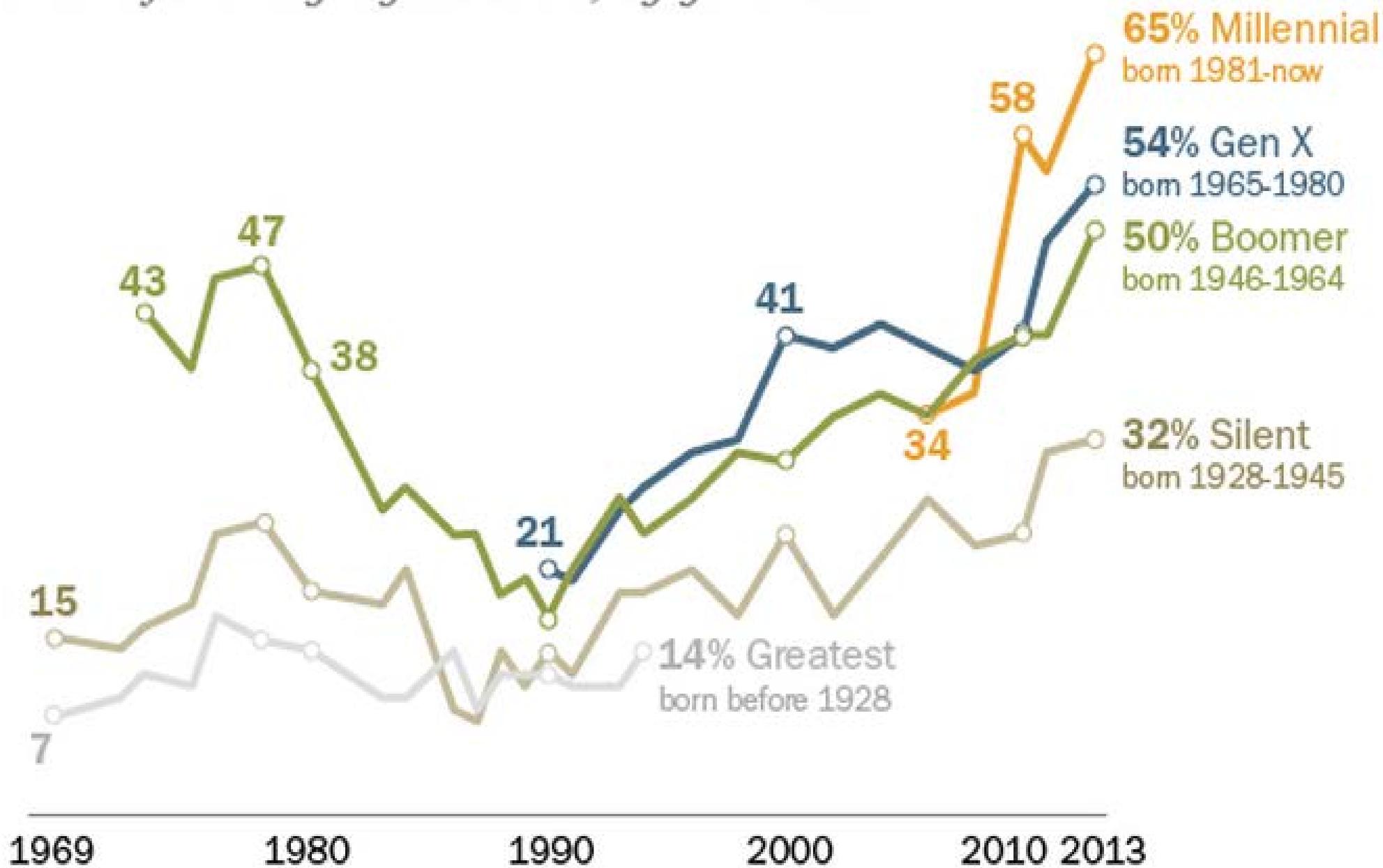
**2. Marijuana use**

**5. Public policy**

**3. Marijuana & youth vulnerability**

**4. Marijuana myths**

# Percent favoring legalization, by generation

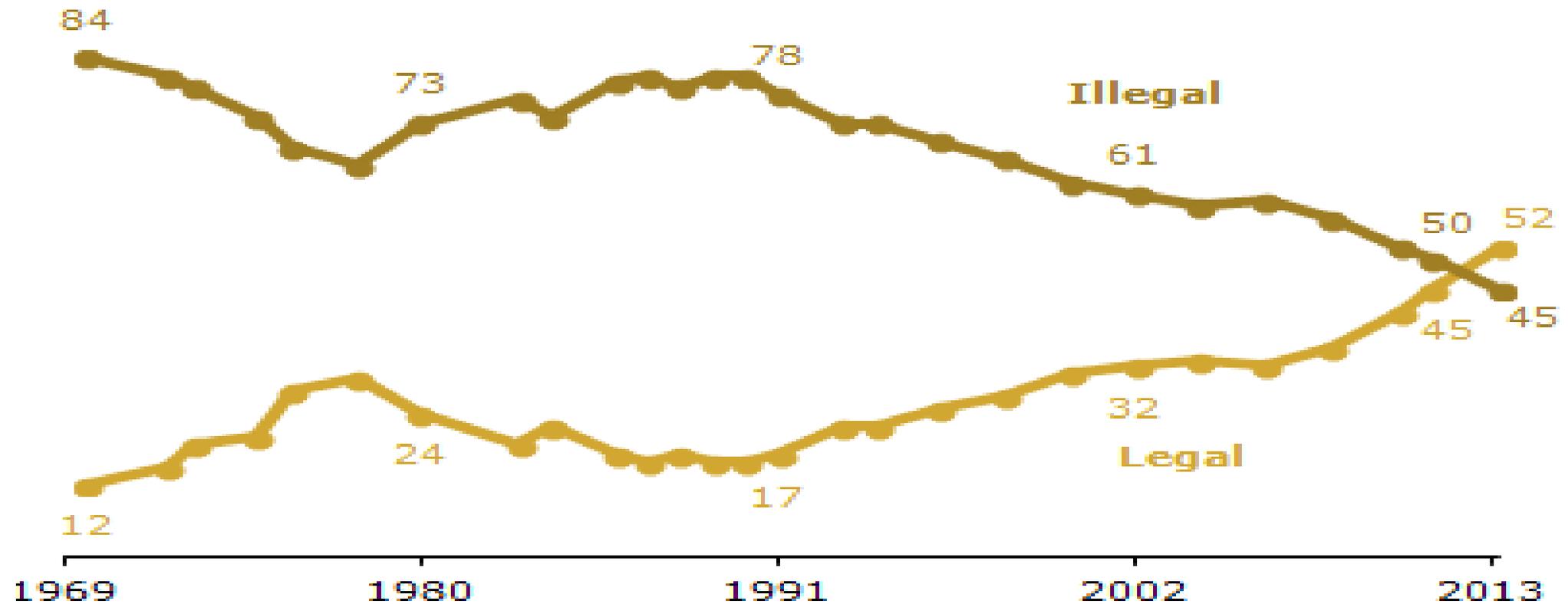


Generational lines shown when significant sample is available.

# Support for Marijuana Legalization in the United States Has Reached Unprecedented Levels

## Views of Legalizing Marijuana: 1969-2013

*% saying marijuana should be ...*



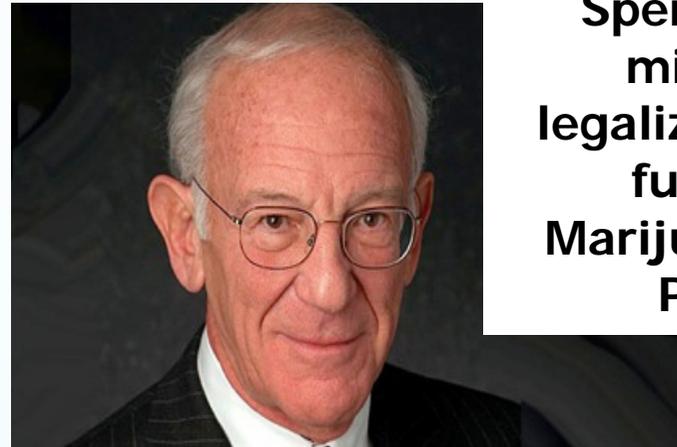
PEW RESEARCH CENTER March 13-17, 2013.  
1973-2008 data from General Social Survey; 1969 and 1972 data from Gallup.

# George Soros



Spent over  
\$250 million on  
legalization

# Peter Lewis



Spent \$50-70  
million on  
legalization; fully  
funds the  
Marijuana Policy  
Project

# State Policies

**After 50 years of a movement to legalize marijuana, 2 states have now done it – Colorado and Washington**

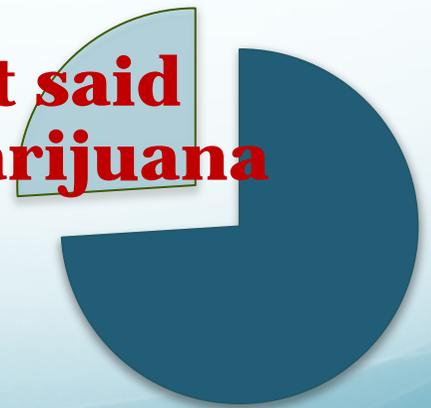
# Colorado

- **Passed medical marijuana in 2001**
- **But no dispensaries until the mid-2000s**
- **Between 2006 and 2012, medical marijuana cardholders rose from 1,000 to over 108,000**
- **The number of dispensaries rose from 0 to 532**



# Medical Marijuana is Easily Diverted to Youth

- **Teens who know somebody with a medical marijuana license are more likely than those who don't to report 'fairly' or 'very' easy access to marijuana.**
- **74% of Denver-area teens in treatment said they used somebody else's medical marijuana an average of 50 times.**



# Increased Adolescent Use

**Marijuana use among Colorado teenagers is currently:**

- **fifth highest in the nation**
- **50% above national average**



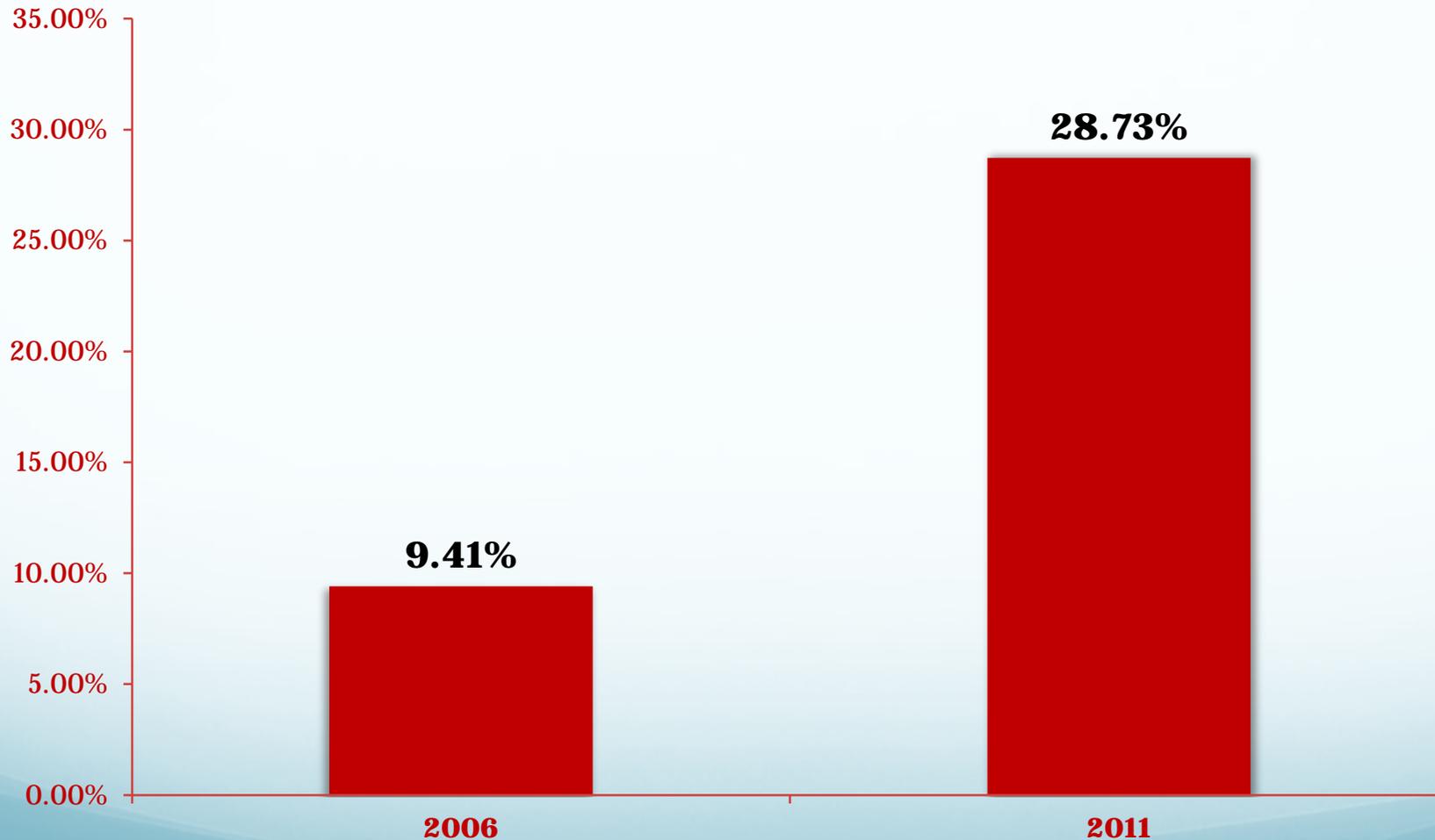
**Colorado**

**10.7%**

**7.6%**

**National average**

# Percent Difference Between National and Colorado Current Teen Marijuana Use Averages 2006 and 2011



# Denver High Schools

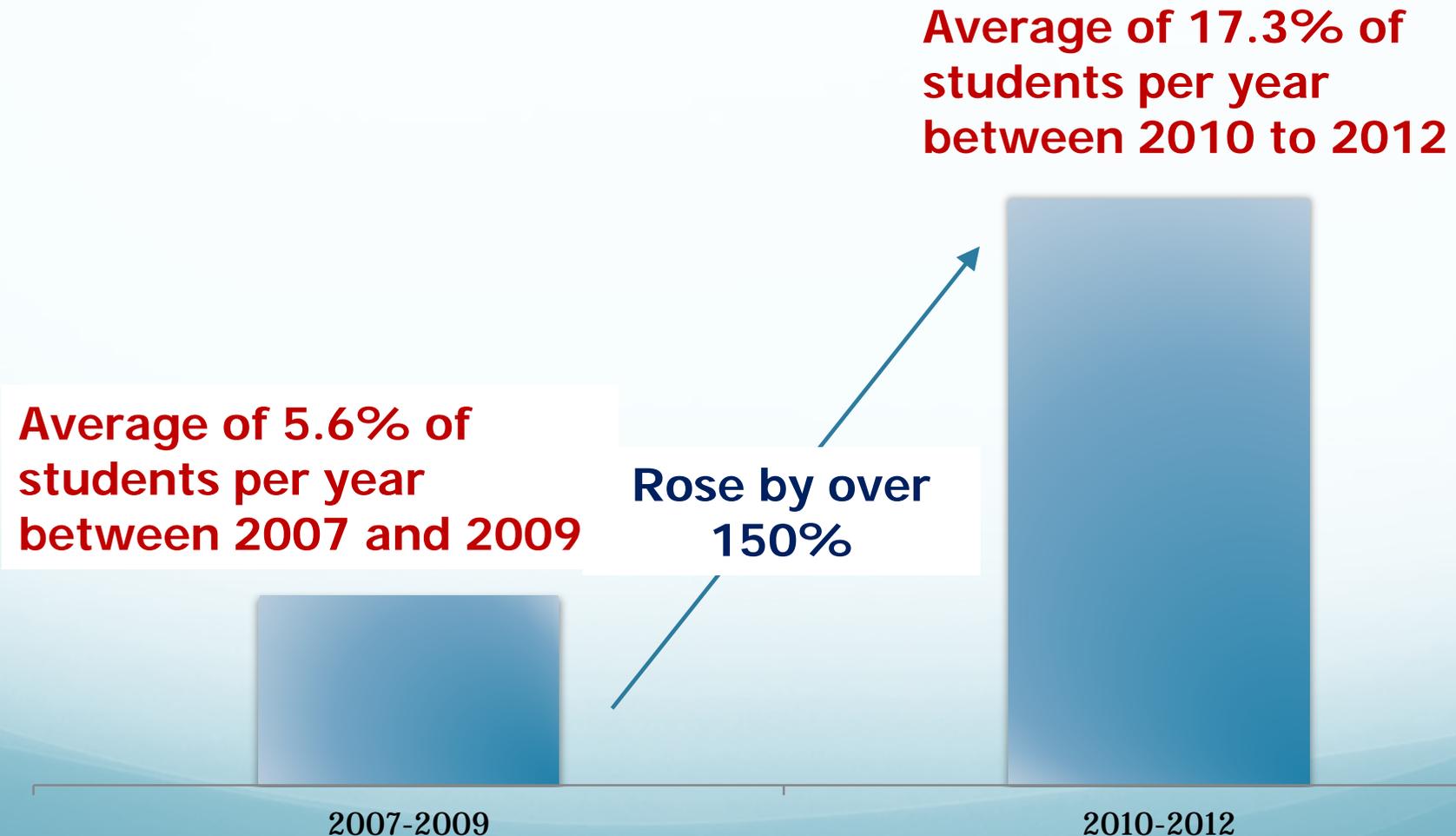
- **29% of Denver high school students used marijuana in the last month.**
- **If Denver were an American state, it would have the HIGHEST public high school current use rates in the country.**



# Testing Positive

- **In 2007, tests positive for marijuana made up 33% of the total drug screenings, by 2012 that number increased to 57%**

# Distribution to Minors: Drug-related Referrals for High School Students Testing Positive for Marijuana



# Increased Traffic Fatalities



**In Colorado, fatalities involving drivers testing positive for marijuana rose by 112%.**

**Source: Mu-Chen Li, J.E., et al., 2011;  
Colorado Department of Transportation, 2006**

While the total number of car crashes *declined* from 2007 to 2011, the number of fatal car crashes with drivers testing positive for marijuana rose sharply.



Source: Colorado Dept. of Transportation

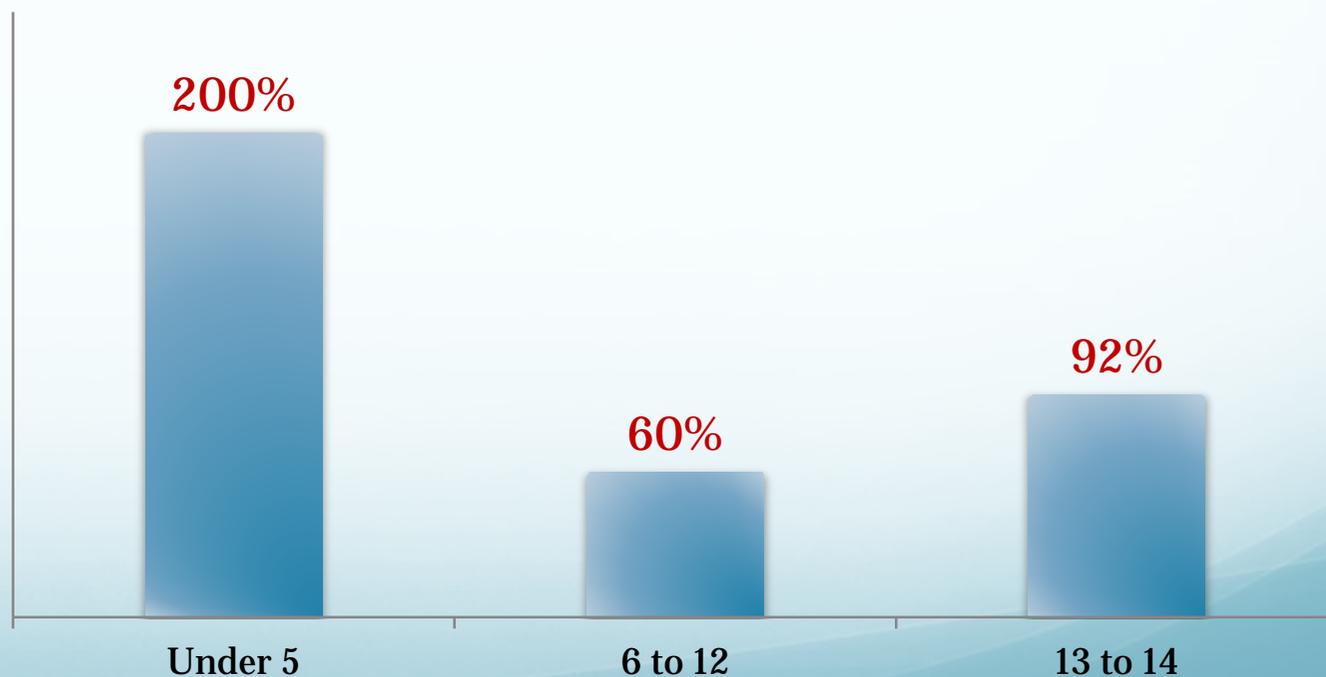
# Increased ER admissions

- **In 2011, marijuana-related incidents accounted for 26 percent of the total ER visits, compared to 21 percent nationally.**

# Increased ER admissions

## Rise in marijuana-related ER visits from 2006 and 2012:

- **200% for kids under 5**
- **60% for kids 6-12**
- **92% for kids 13-14**



# Does Legalization Affect Illegal Use and Diversion?

- **Anecdotal reports that illegal sales continue as long as market prices marijuana below the legal price.**
- **According to the El Paso Intelligence Center (EPIC) National Seizure System, in 2012, there were 274 Colorado marijuana interdiction seizures destined for other states compared to 54 in 2005.**

# Questionable Regulation

- **To independent reports released in August 2013 document how Colorado's supposedly regulated system is not well regulated at all.**
- **The Colorado State Auditor concluded that:**
  - **50% of all recommendations are made by only 12 physicians**

# Regulations Can Be Rigorous

- **Minnesota's law**
  - **Only prescribed by MDs and limited to a few bona fide and specific disorders**
  - **Produced by the state; only usable in pill, oil or vapor form**
  - **Dispensed in limited number of state-run sites**

# Washington Situation

- **Sales starting in May**
- **Many cities have banned or placed moratoria on marijuana businesses, but...**
- **LCB can still grant licenses to businesses in those areas, and LCB says there is nothing in 502 allowing towns to opt-out**
- **WA AG stunned state by ruling that cities can ban marijuana stores**

**1. Brain development**

**6. Summary**



**2. Marijuana use**

**5. Public policy**

**3. Marijuana & youth vulnerability**

**4. Marijuana myths**

# Summary

- **Adolescence is an extended period of transition from reliance on adults to independence**
- **Normal adolescence is characterized by....**
  - increase in conflicts with family members
  - desire to be with one's friends
  - resistance to messages from authority
  - irritability
  - proclamations of sheer boredom
  - risk taking
  - reward incentive-biased decision making



# Implications for Prevention and Treatment

- **I favor programs that focus on teaching skills associated with thoughtful and non-impulsive decision making**
  - **impulse control**
  - **“second” thought processes**
  - **social decision making**
  - **dealing with risk situations**
  - **taking healthy risks**

Could we have some day a new 12-Step Program  
for adolescents?

## **12-Steps of Self-Regulation**

1. **impulse control**
2. **"second thought" processes**
3. **social decision making**
4. **dealing with risk situations**
5. **taking healthy risks**
6. **attention regulation**
7. **anger control**
8. **modulating reward incentives**
9. **choosing options**
10. **considering consequences**
11. **minimizing arousal**
12. **dealing with peer influences**

# Parent Take Home Summary

**P** = Promote activities that capitalize on the strengths of the developing brain.

**A** = Assist children with challenges that require planning.

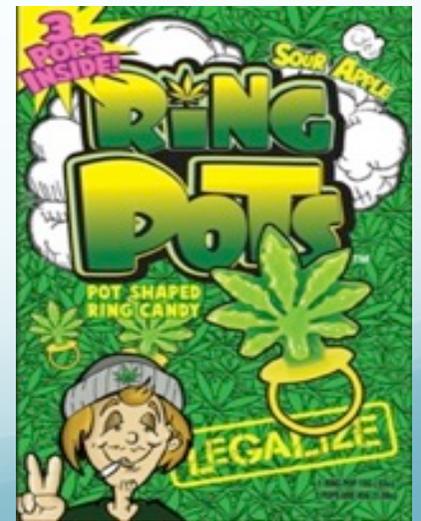
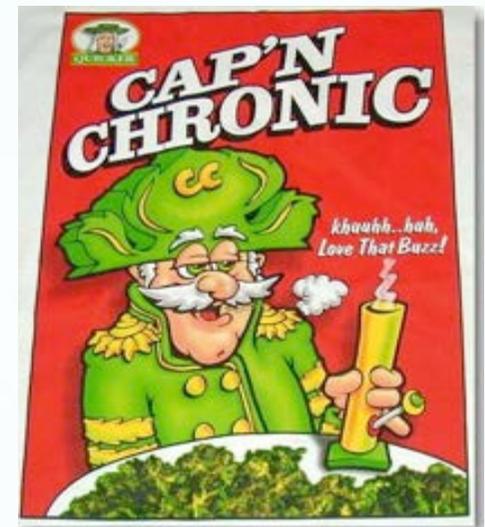
**R** = Reinforce their seeking advice from adults; teach decision making.

**E** = Encourage lifestyle that promotes good brain development.

**N** = Never underestimate the impact of a parent being a good role model.

**T** = Tolerate the “oops” behaviors due to an immature brain.







THANK YOU!

**winte001@umn.edu**

# Marijuana: Myth Buster



Many teenagers believe several pro-marijuana arguments. Among the following, which are myths? Which are facts?

1. Marijuana is not addictive. M or F?
2. Being high on marijuana does not impair driving. M or F?
3. Synthetic marijuana is legal. M or F?
4. Marijuana is medicine. M or F?
5. Smoking marijuana does not weaken lung capacity. M or F?
6. Alcohol contributes to aggression and violence; marijuana does not. M or F?
7. You can not overdose from marijuana. M or F?
8. Marijuana does not cause memory deficits. M or F?