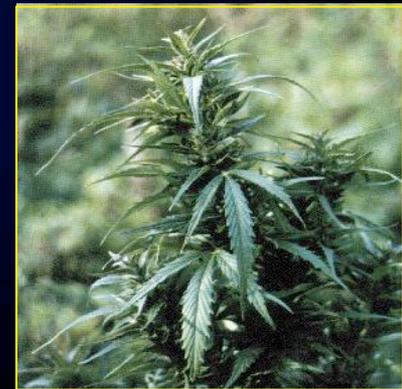


Marijuana: What we Know and What we Don't

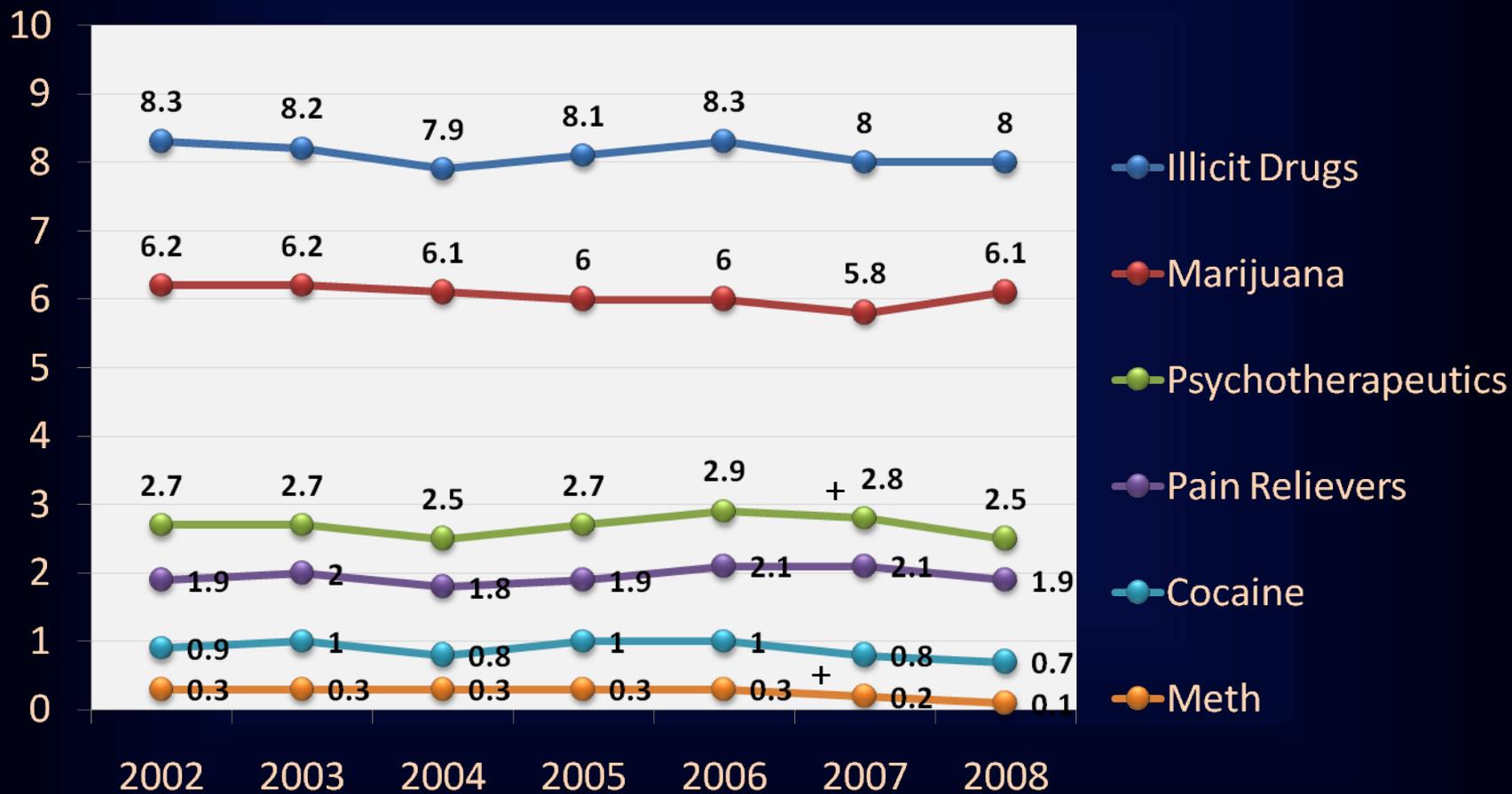
Susan Weiss, Ph.D.

Science Policy Branch, NIDA, NIH

April, 2010

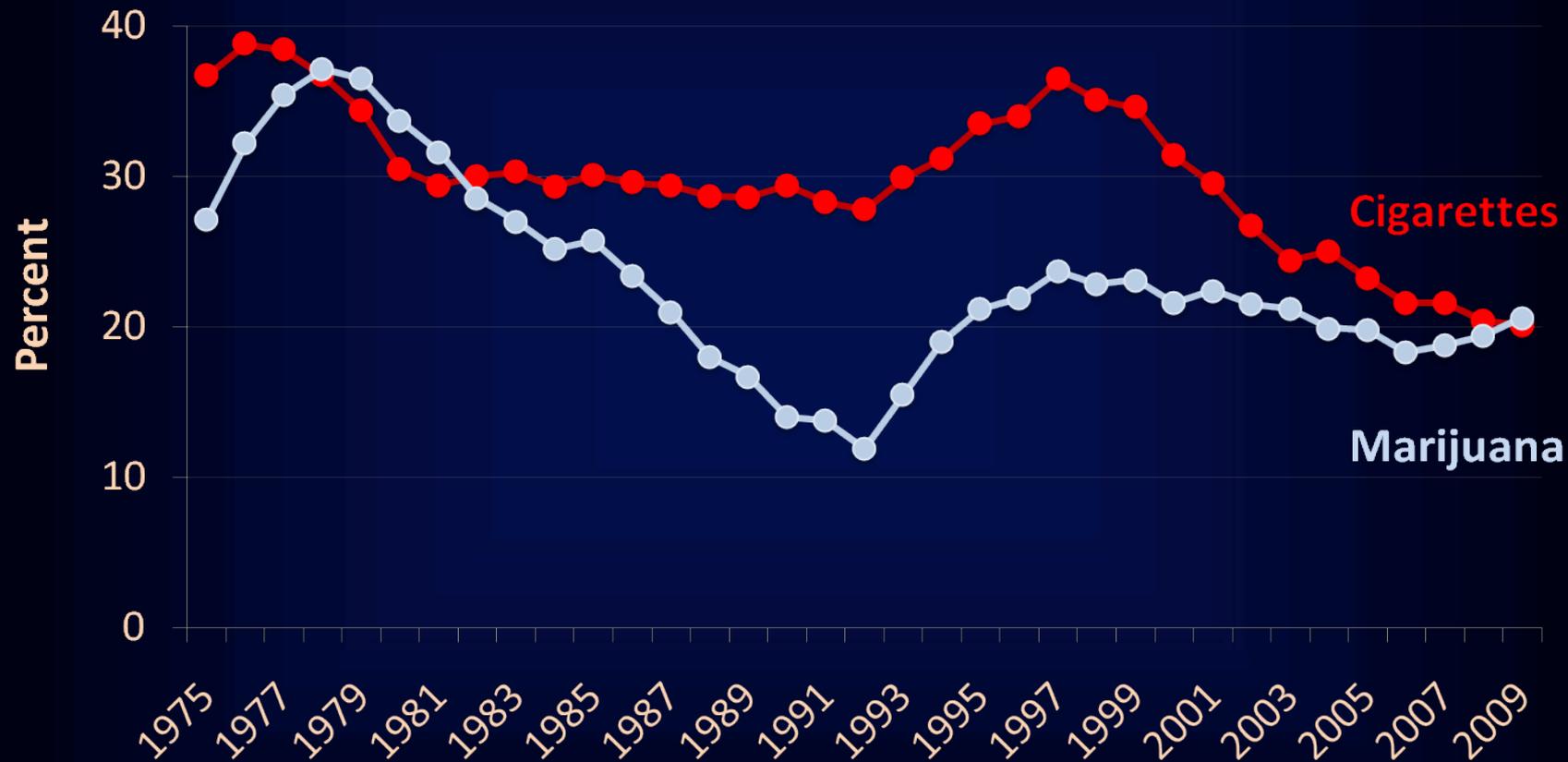


Past Month Use of Selected Illicit Drugs Among Persons Aged 12 or Older: 2002-2008



+ Difference between this estimate and the 2008 estimate is statistically significant at the .05 level.

Percentage of U.S. 12th Grade Students Reporting Past Month Use of Cigarettes and Marijuana, 1975 to 2009

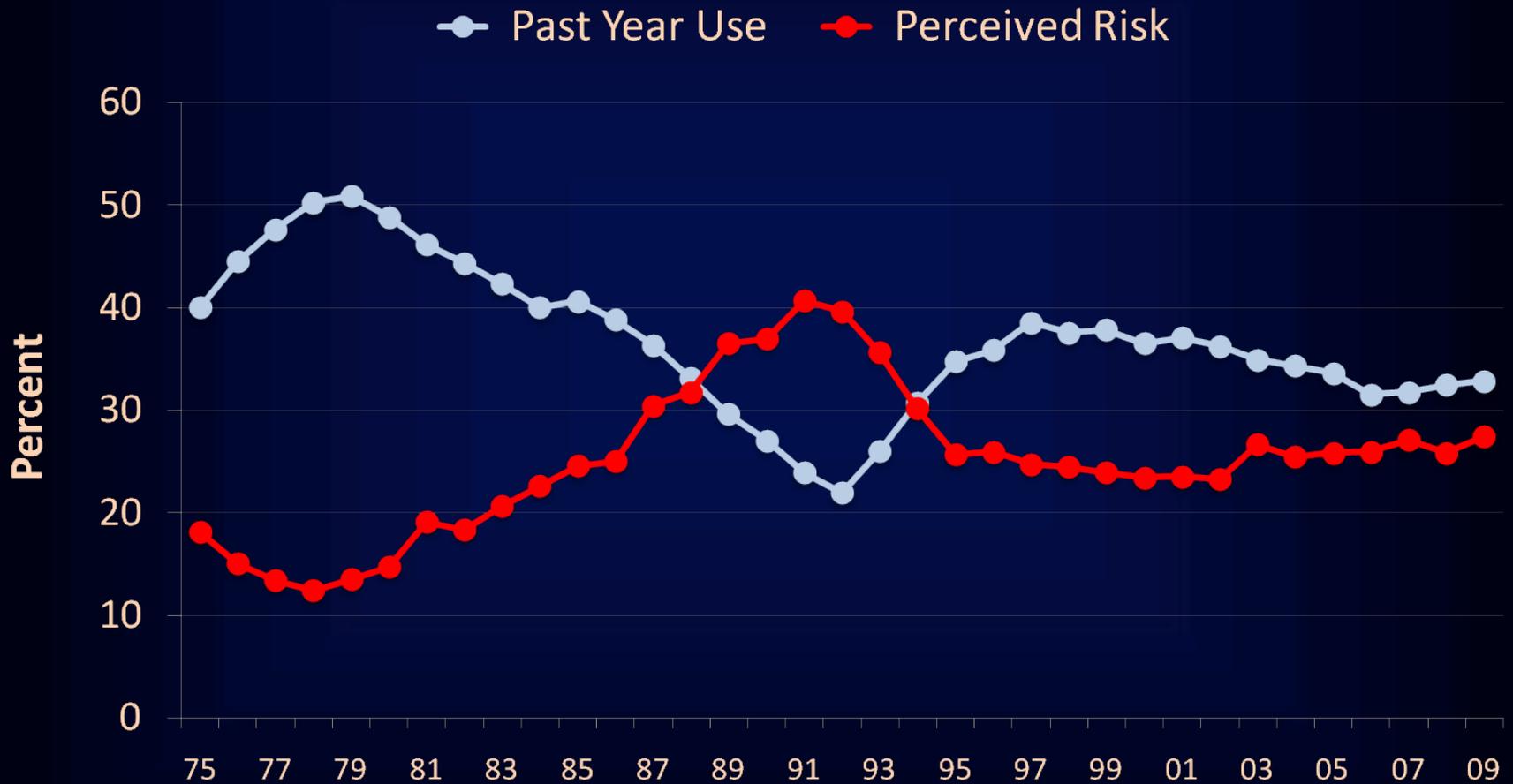


Source: The Monitoring the Future study, the University of Michigan

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Changes in Attitude Lead to Changes in Use

Marijuana Use and Perceived Risk among 12th Graders, 1975 to 2009

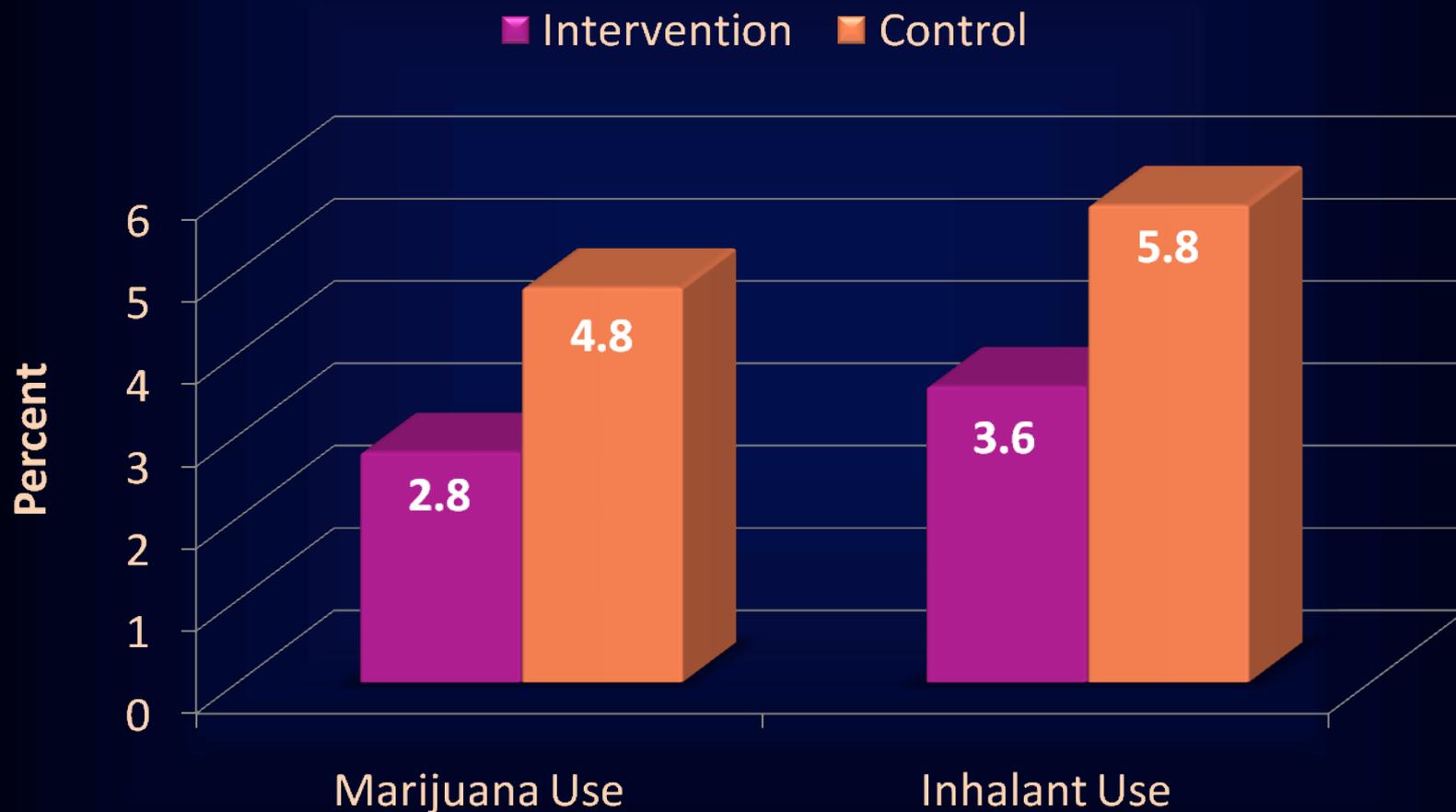


Source: The Monitoring the Future study, the University of Michigan

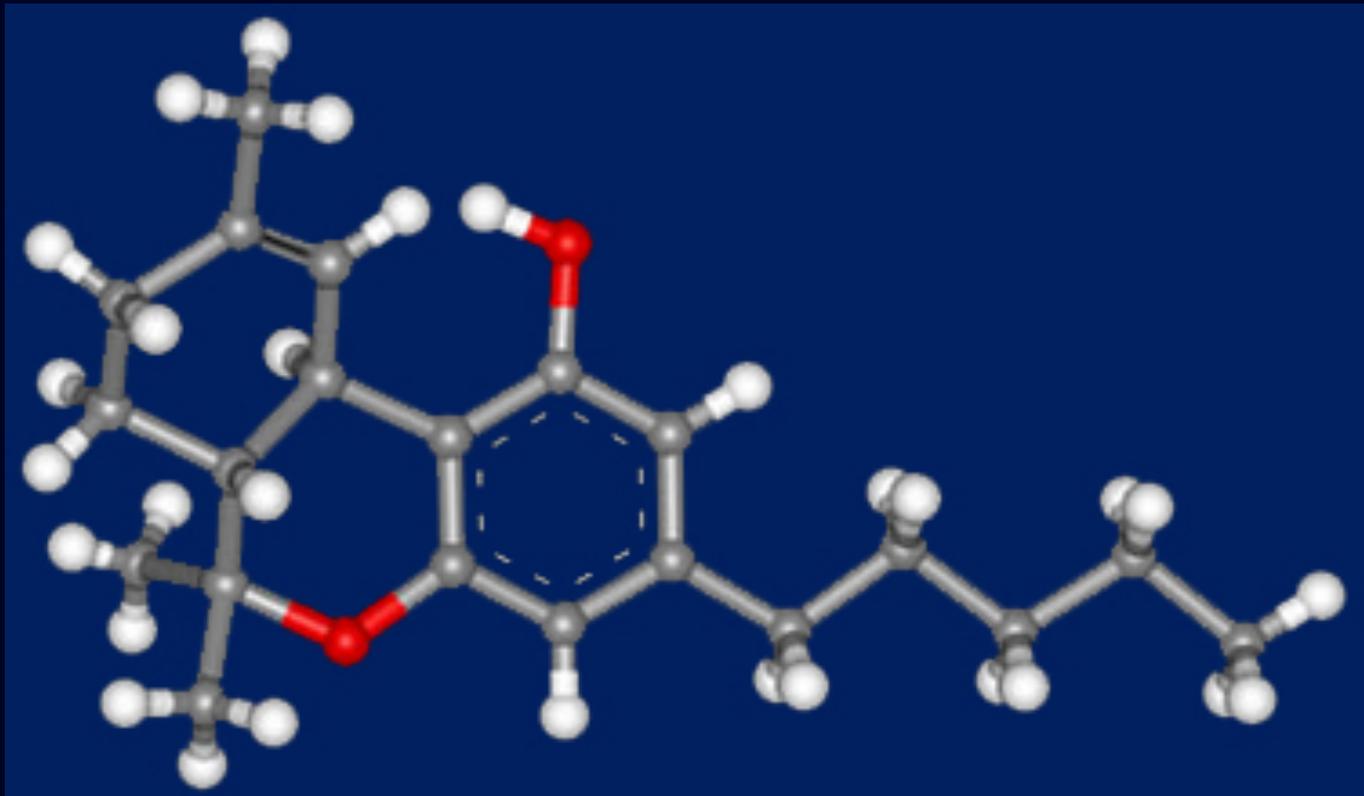
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Prosper Multisite Community Study: Less MJ & Inhalants 1.5 Yrs Past Baseline

Past Year Use

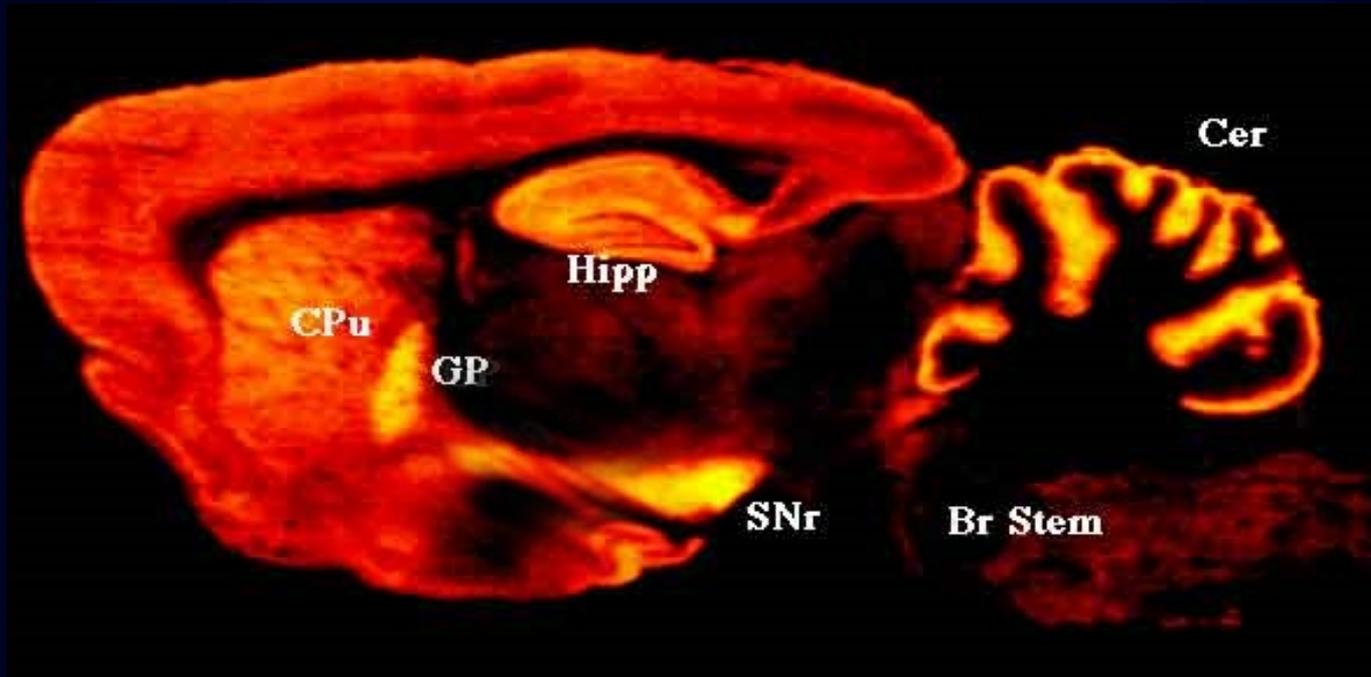


Spoth, Redmond, Shin, Greenberg, Clair, Feinberg (2007).
American Journal of Preventive Medicine, 32(5), 395-402.



Tetrahydrocannabinol (THC)

Cannabinoid Receptor Localization (rat)

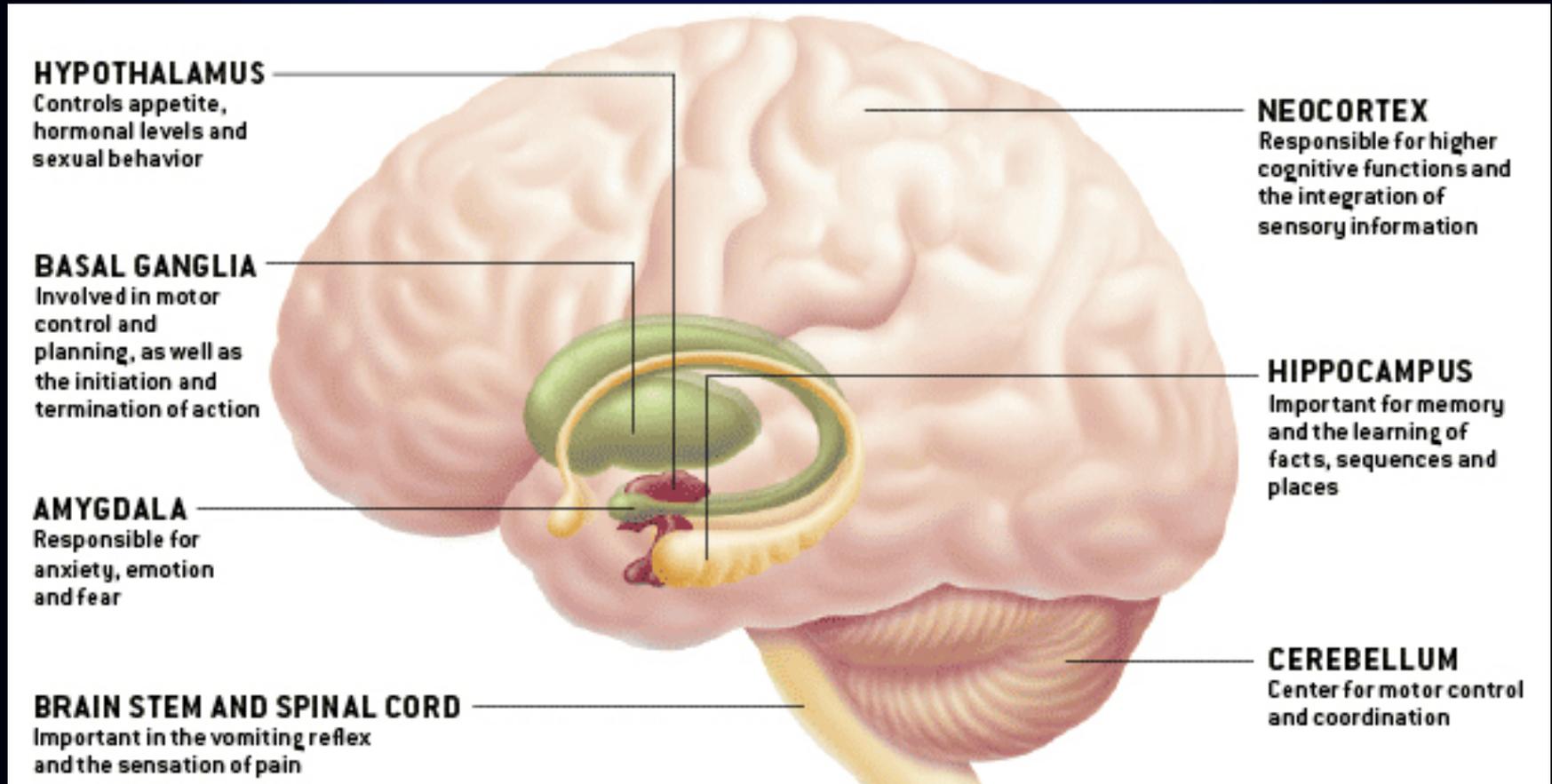


Herkenham, M. J. Neurosci. 11:563 (1991)

Herkenham, M. J. Neurosci. 11:563 (1991)

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Where Marijuana Acts in the Human Brain



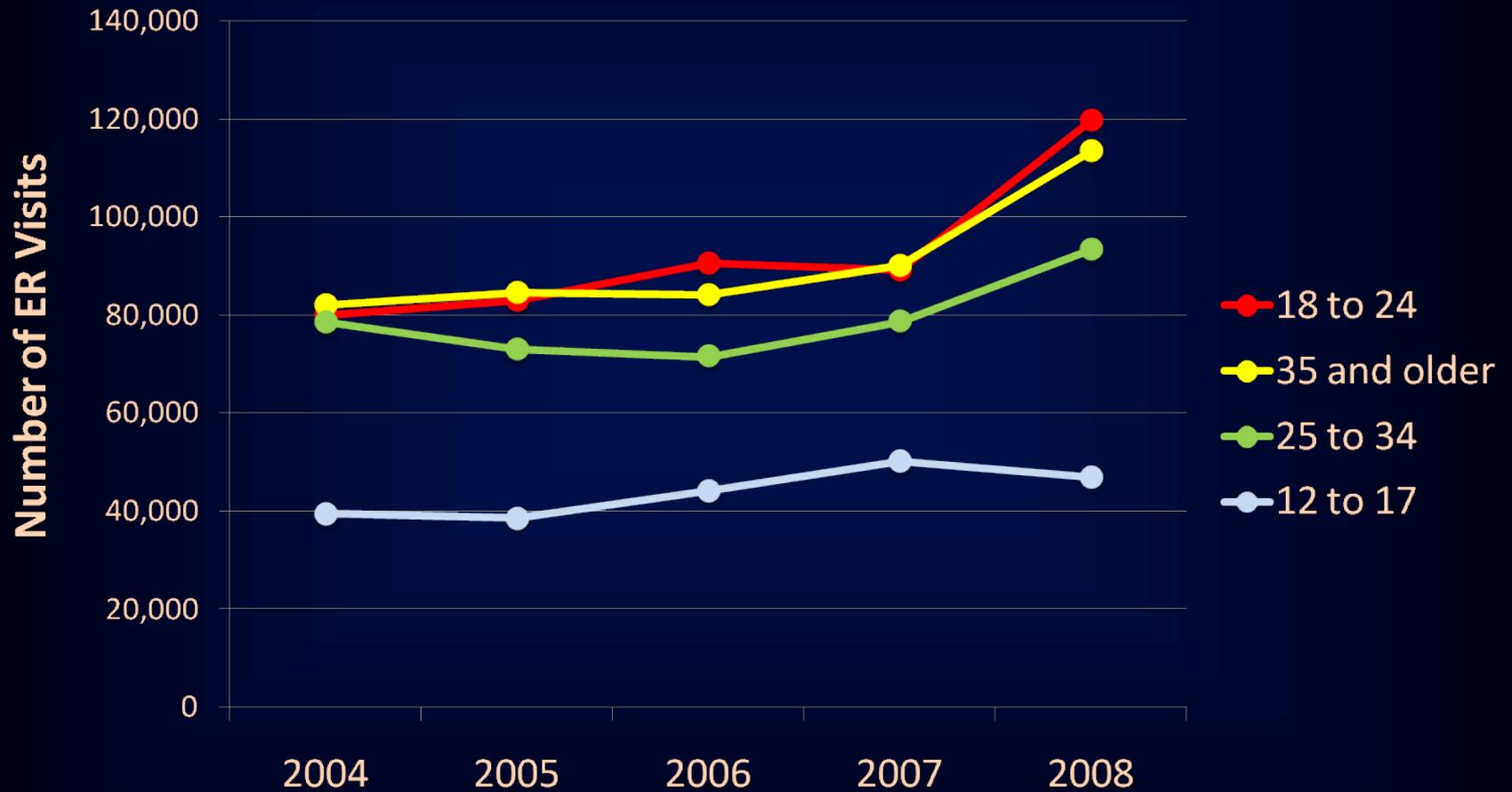
Acute Effects of Marijuana – During Intoxication

- Euphoria
- Calmness
- Appetite stimulation
- Altered perception of time
- Impairs coordination and balance
- Increases heart rate: 20 - 100%
 - Some evidence for increased risk of heart attack, may be exacerbated in vulnerable individuals (e.g., baby boomers)

Acute Effects of Marijuana – During Intoxication

- Cognitive Dysfunction
 - Impaired short-term memory
 - Difficulty with complex tasks
 - Difficulty learning
 - Impaired decision-making
 - Increased risky sexual behavior – HIV
- Increased risk of injuries – 30% higher according to one Kaiser study
 - Because of the drug's effects on perception and reaction time, users are at higher risk of involvement in vehicular accidents

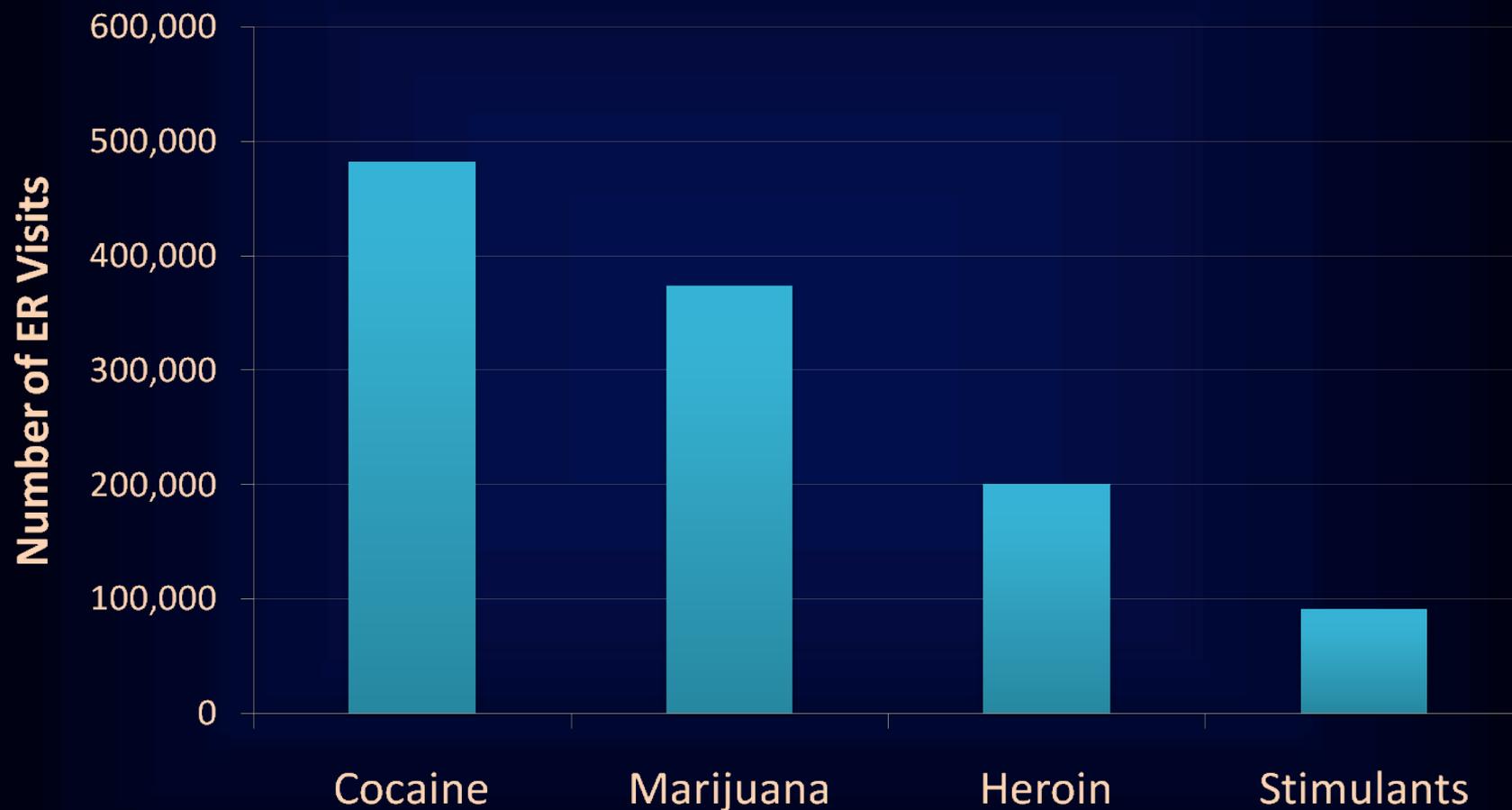
Emergency Department Marijuana Mentions 2004-2008



Source: SAMHSA, DAWN

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Emergency Department Visits Involving Selected Drugs: 2008



Source: SAMHSA, 2008 DAWN

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Long-Term Effects of Marijuana

- **Cognitive Impairment**
 - Deficits in learning, memory, attention, executive function
 - Greater impulsivity, less cognitive flexibility
 - Reversible with prolonged abstinence
- **Poorer Educational Outcomes**
 - General dissatisfaction with life achievement, mental health, social relationships
- **Brain effects**
 - Structural abnormalities have not been consistently identified.
 - But chronic users show consistent alterations in brain activation of higher cognitive networks.
 - Emerging preliminary evidence suggests that heavy cannabis use during adolescence may affect normal brain development.

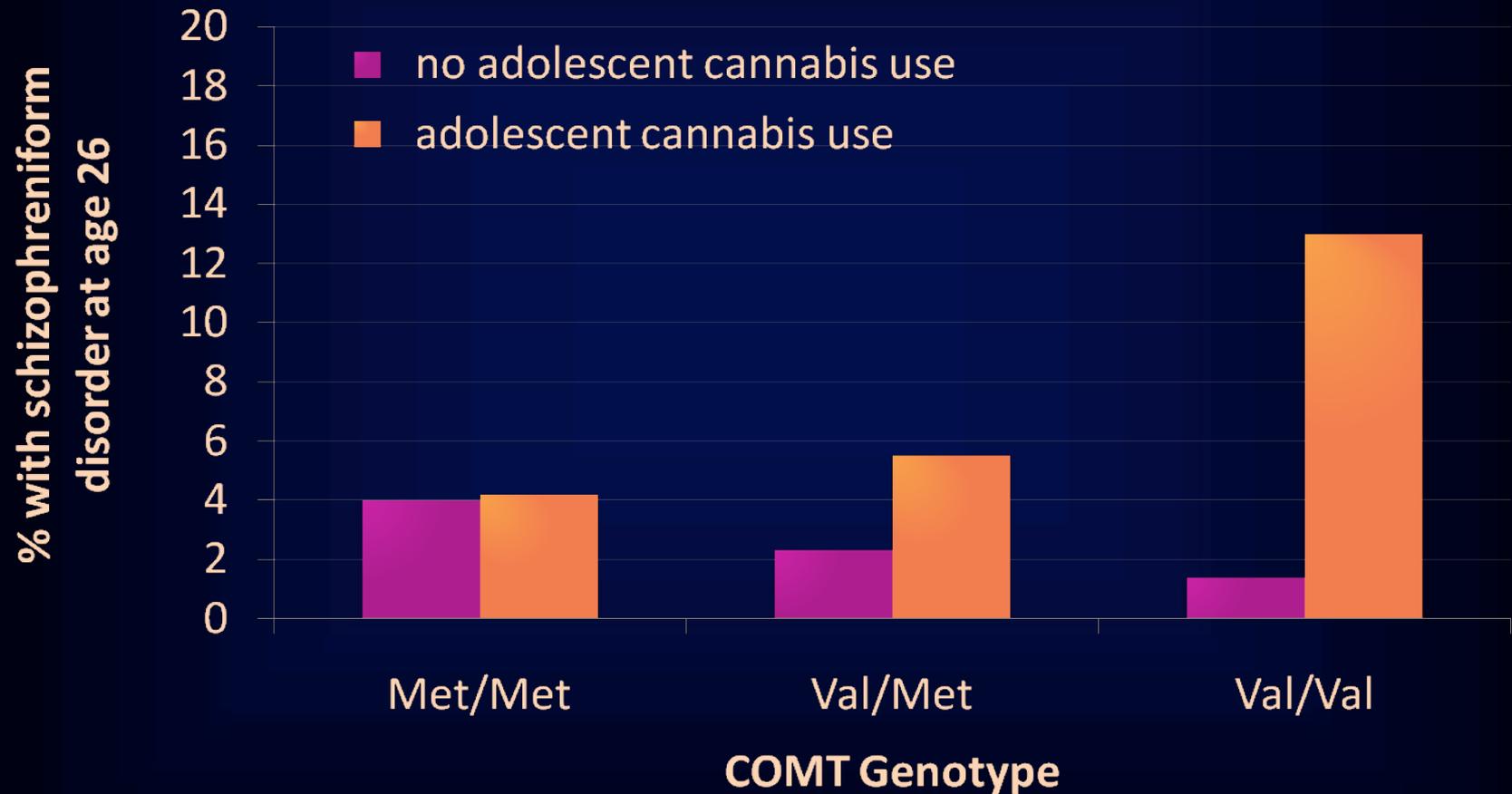
Long-Term Effects of Marijuana

- Respiratory system
 - Increases cough, phlegm production, and wheezing.
 - Increased bronchitis, worsening of asthma symptoms or cystic fibrosis symptoms
 - Increased risk of lung cancer??

Long-Term Effects of Marijuana

- **Mental illness** — Population studies have found evidence of an association between cannabis use and increased risk of schizophrenia (and/or psychotic symptoms), and to a lesser extent, depression, anxiety, and suicidal behavior/ideation.
 - There are now sufficient data indicating that marijuana use is a risk factor for psychosis—it may trigger the onset or relapse of schizophrenia in predisposed people, perhaps also exacerbating the symptoms.
 - One study suggests that some people may be genetically predisposed to the deleterious effects of early cannabis use. But even though 1 in 4 people carry the “risky” variant, the overwhelming majority of cannabis users do not develop psychosis.
 - The data are insufficient to link marijuana with depression, anxiety, or suicidal ideation.

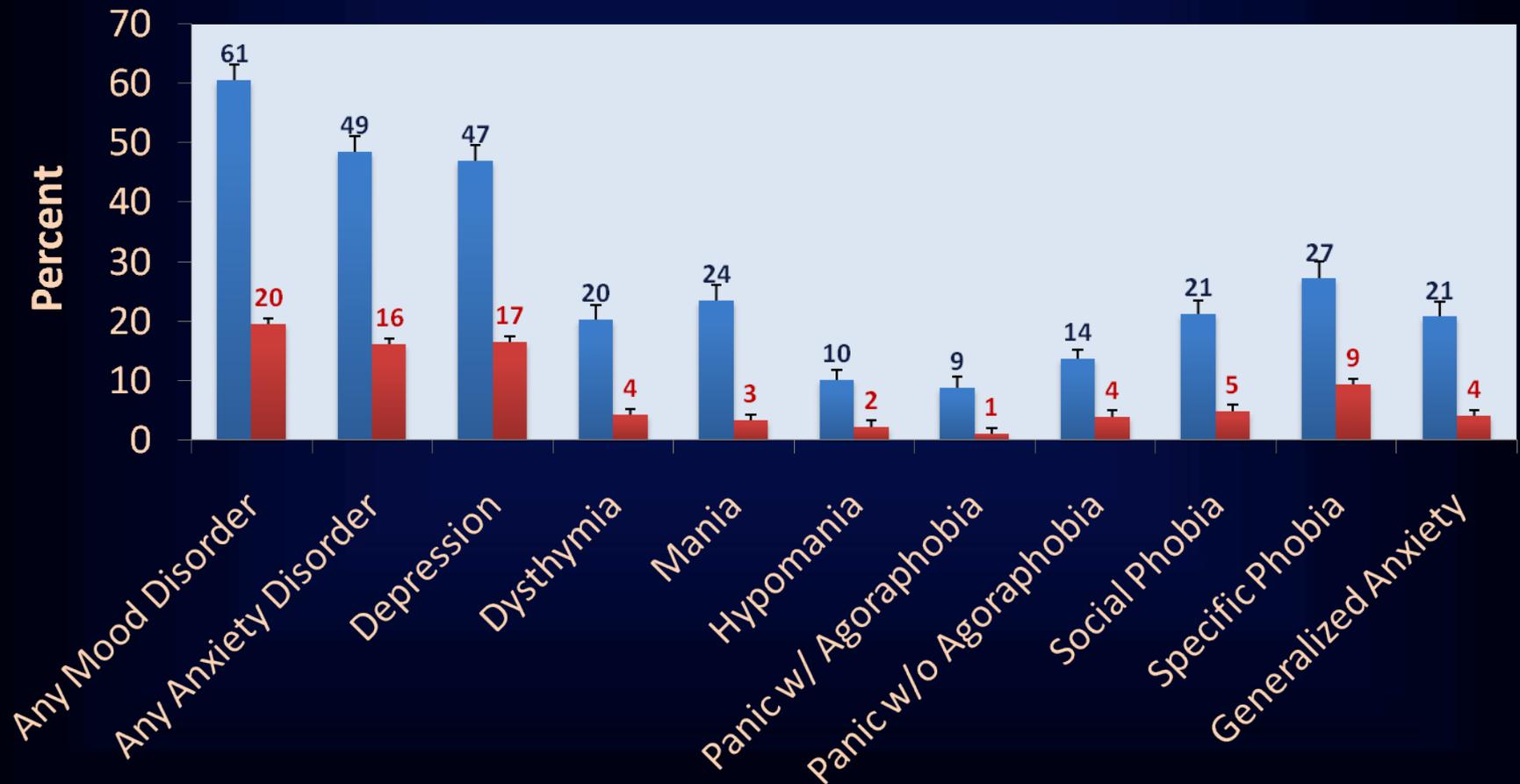
Adolescent Cannabis Use Increases the Risk for Adult Psychosis in Genetically Vulnerable Individuals



Source: Caspi, A. et al. *Biol. Psychiatry*, 57: 1117-1127; 2005.

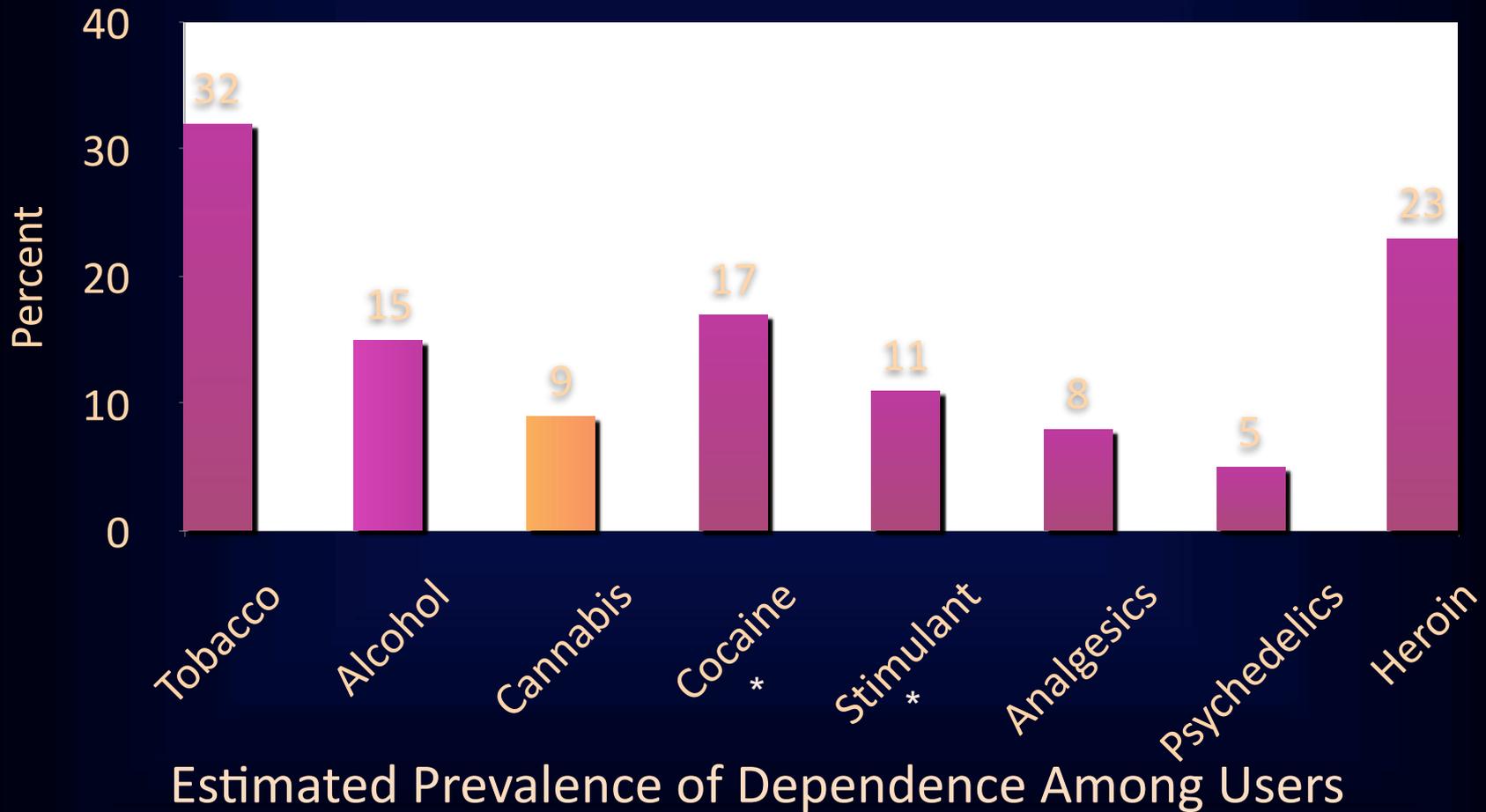
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High Rates of Comorbid Mood & Anxiety Disorders Among Respondents with Marijuana Dependence (NESARC)



Long Term Effects of Marijuana

Addiction: About 9% of users may become dependent, among daily users, rate may reach 25- 50%

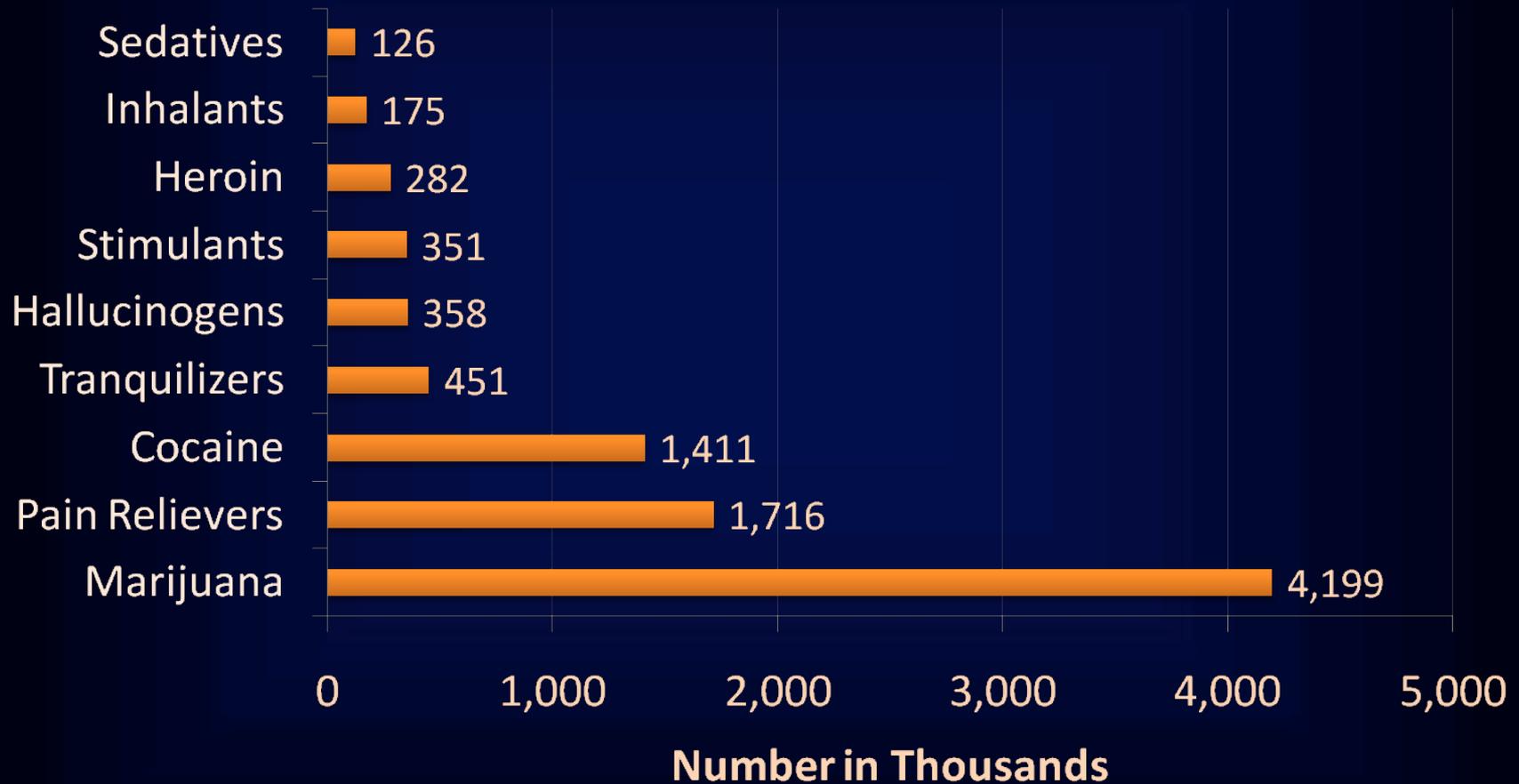


* Nonmedical Use

Source: Anthony JC et al., 1994

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Dependence on or Abuse of Specific Illicit Drugs in the Past Year Among Persons 12 or Older, 2008

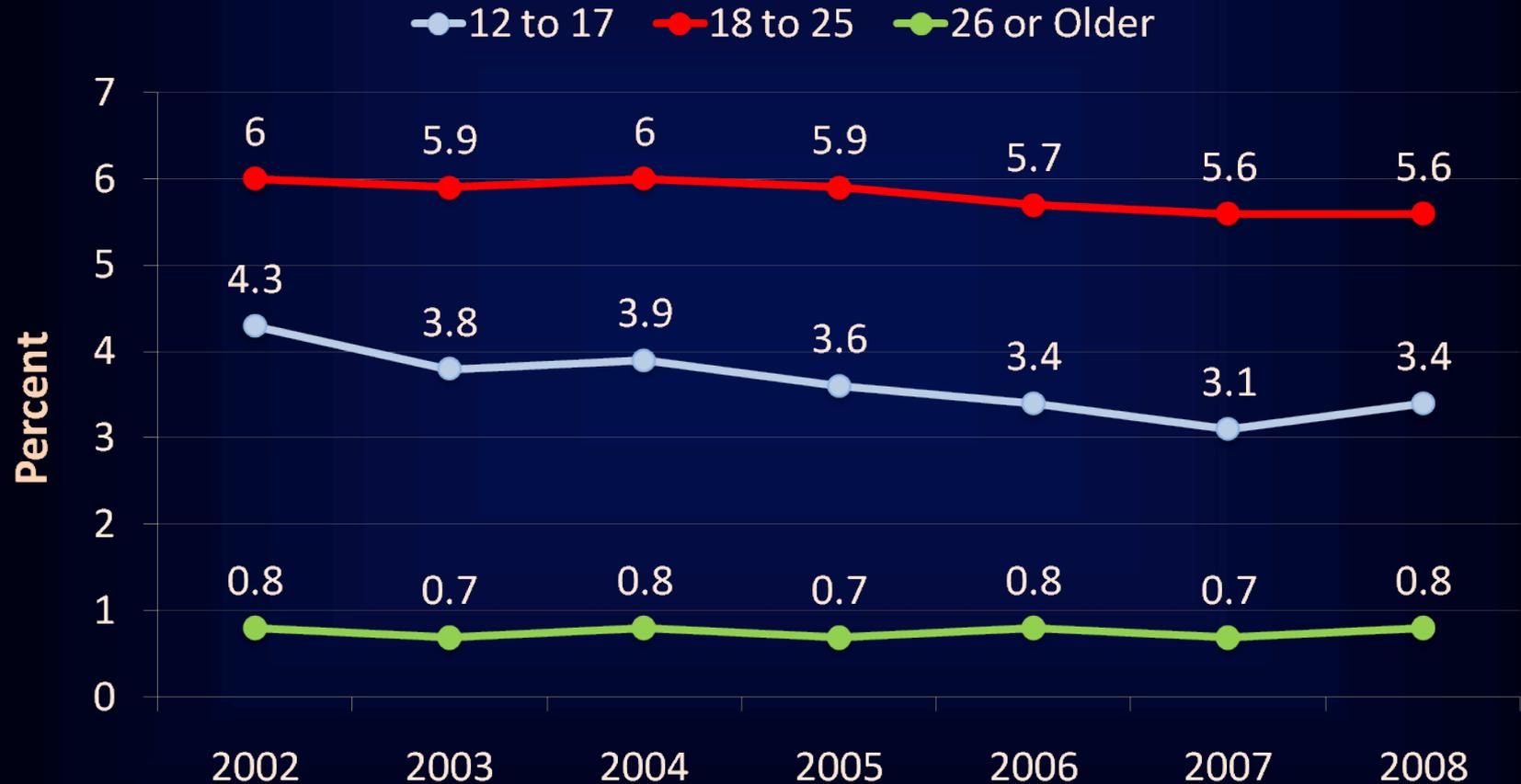


Source: SAMHSA, 2008 NSDUH

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Long-term Effects of Marijuana

Individuals Meeting Either Abuse or Dependence Criteria for Marijuana, by Age 2002-2008

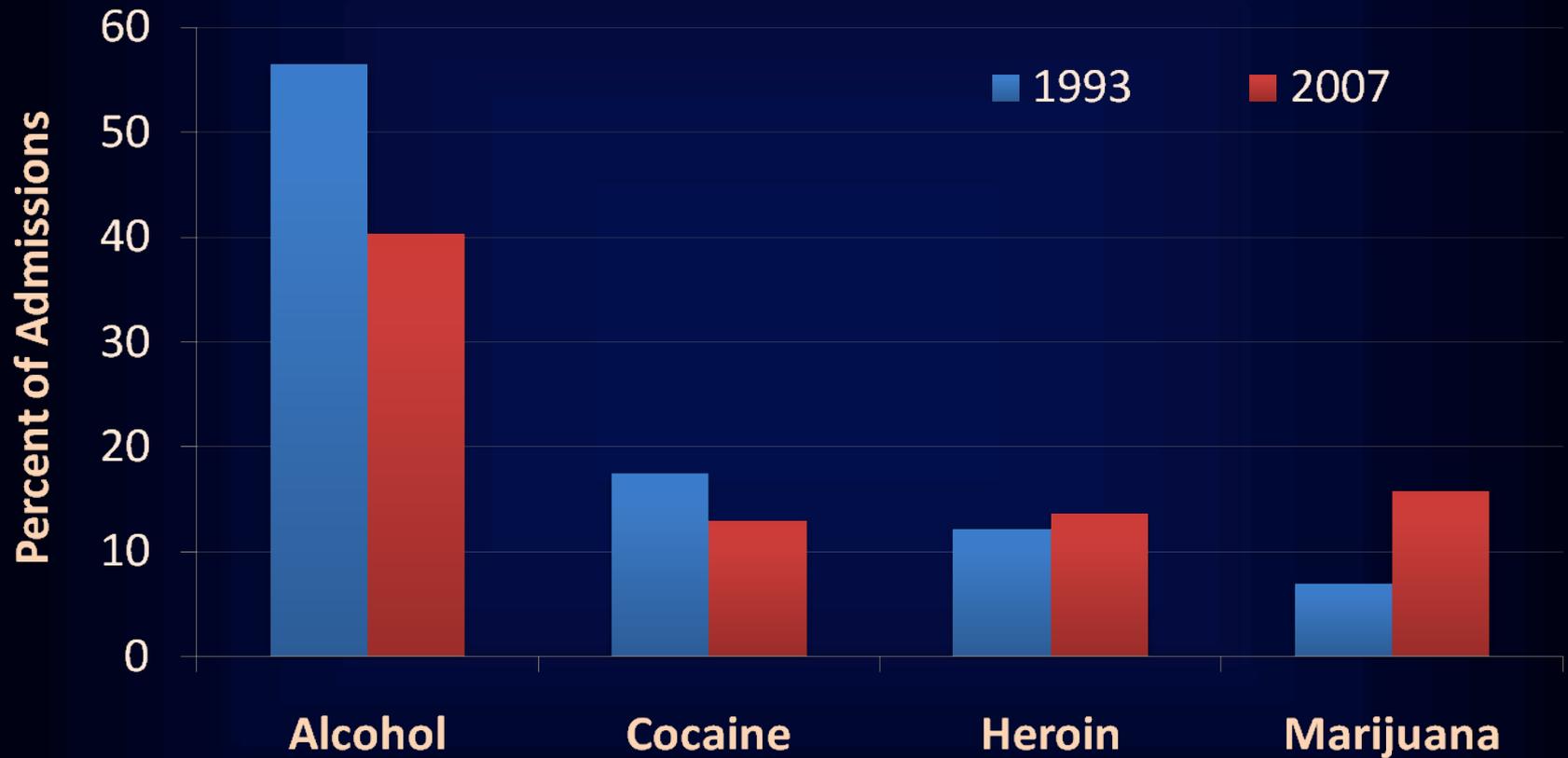


Note: Due to changes in the survey comparisons between years can only go back to 2002

Source: SAMHSA, NSDUH

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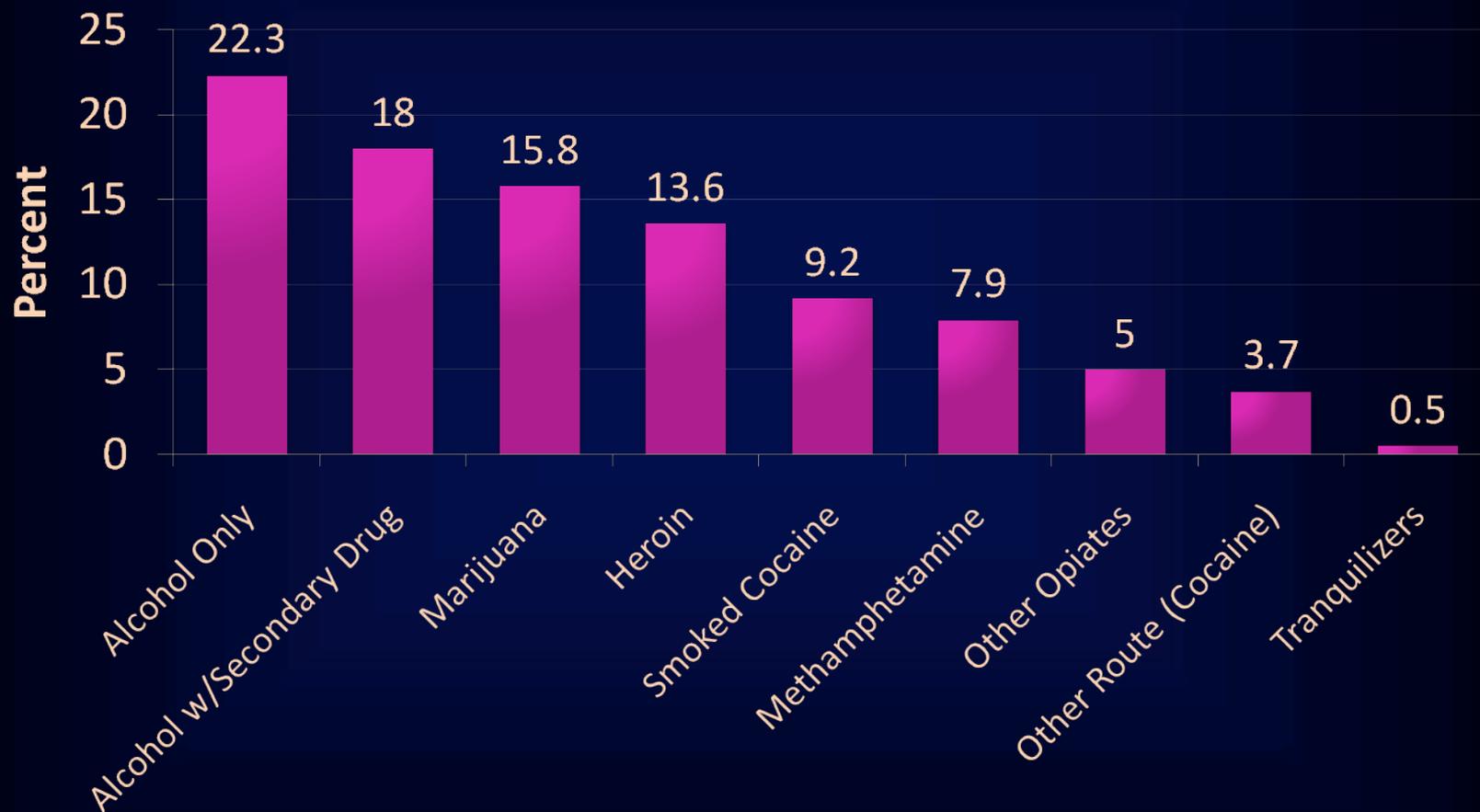
Increased Marijuana Treatment Admissions 1993 and 2007



Source: SAMHSA, TEDS 1993 & 2007

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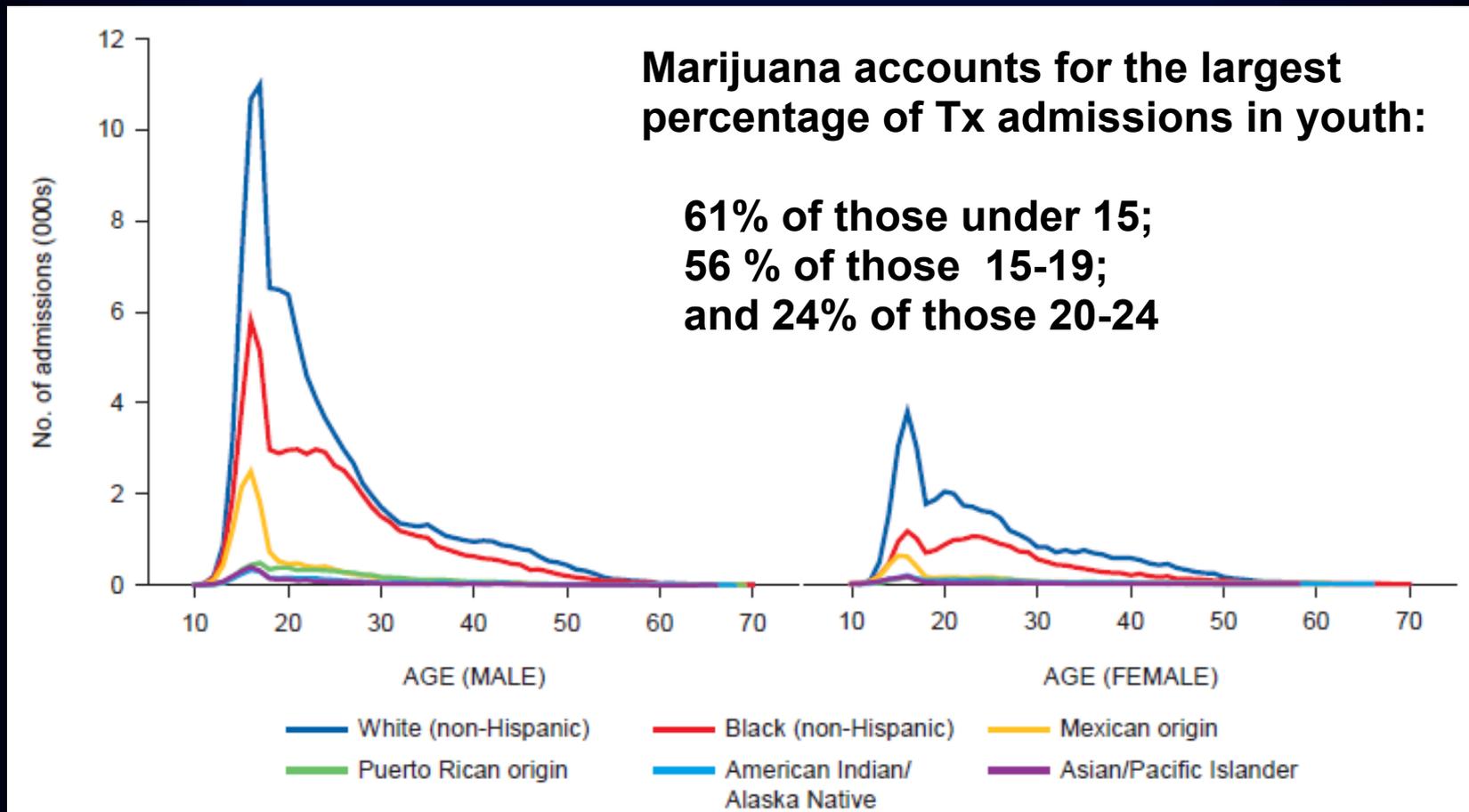
Treatment Admissions by Drug, 2007



Source: SAMHSA, TEDS 2007

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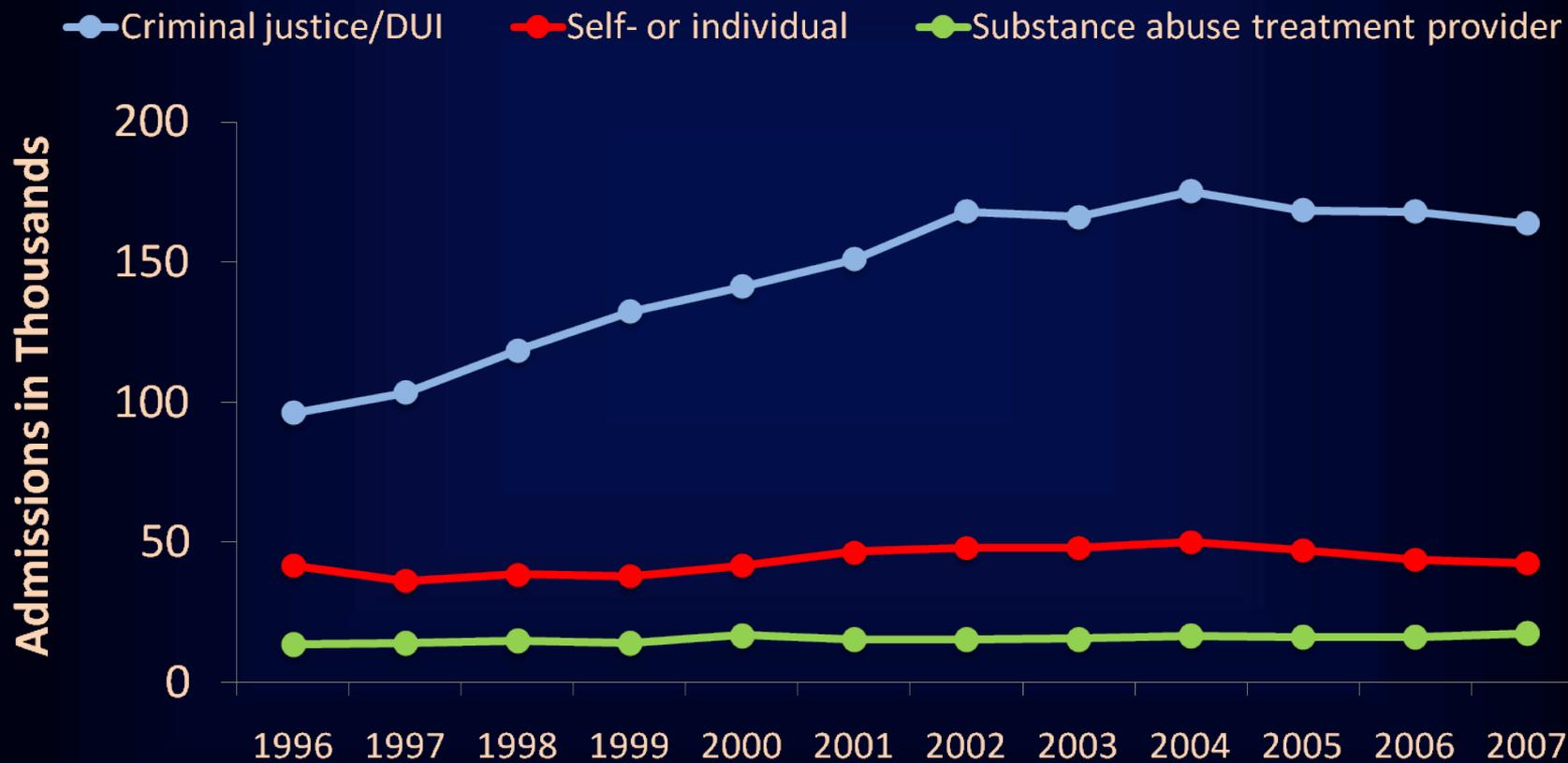
Marijuana Treatment Admissions by Gender, Age and Race/Ethnicity



Source: SAMHSA, TEDS 2006

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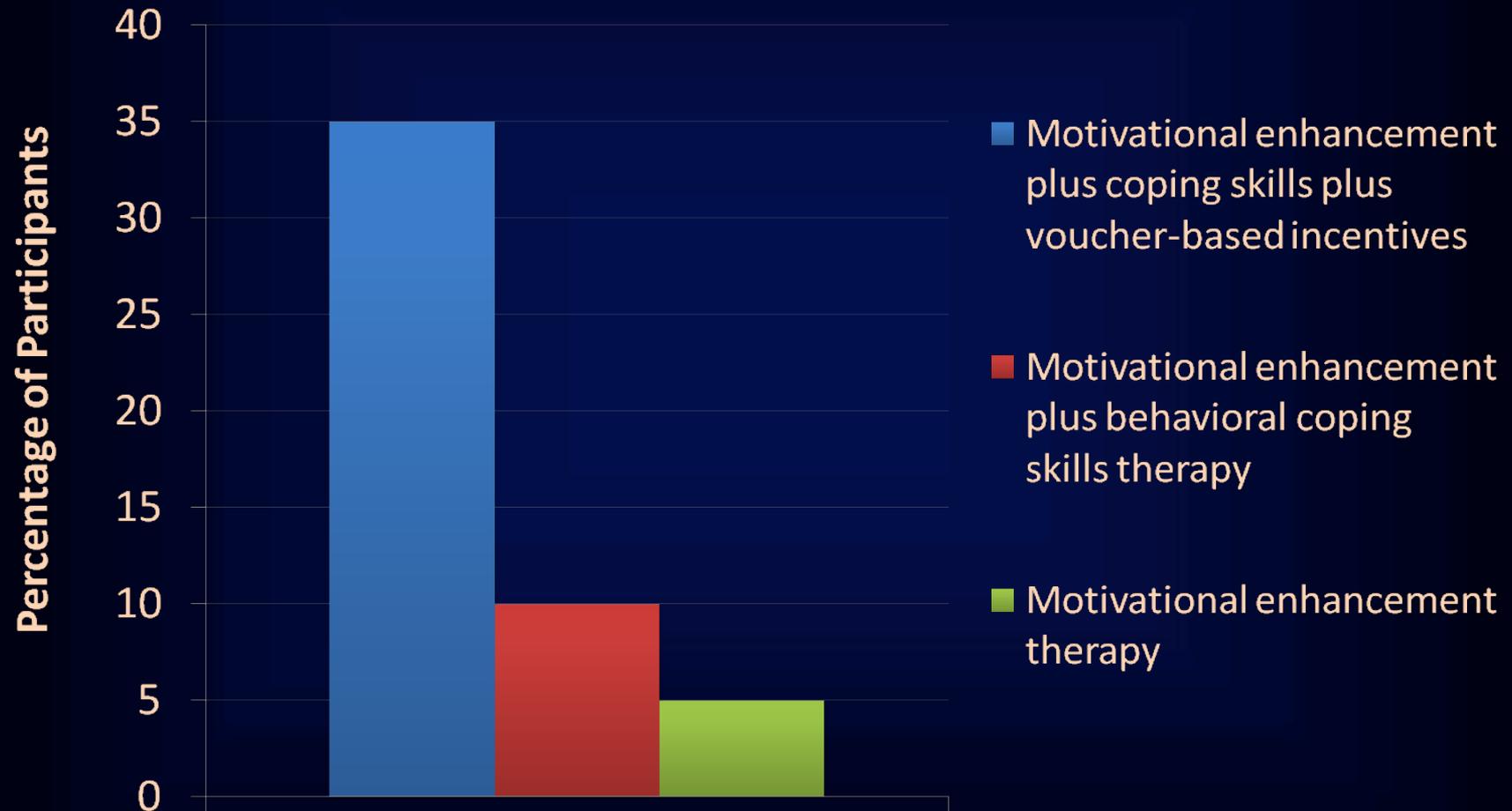
Marijuana Treatment by Referral Source, 1996-2007



Treatments for Marijuana Addiction

- Medications – None
- Behavioral Therapies
 - Motivational Incentives
 - Vouchers for clean urine
 - Cognitive behavioral therapy
 - teaching new coping strategies.

Marijuana Abstinence at the End of Treatment

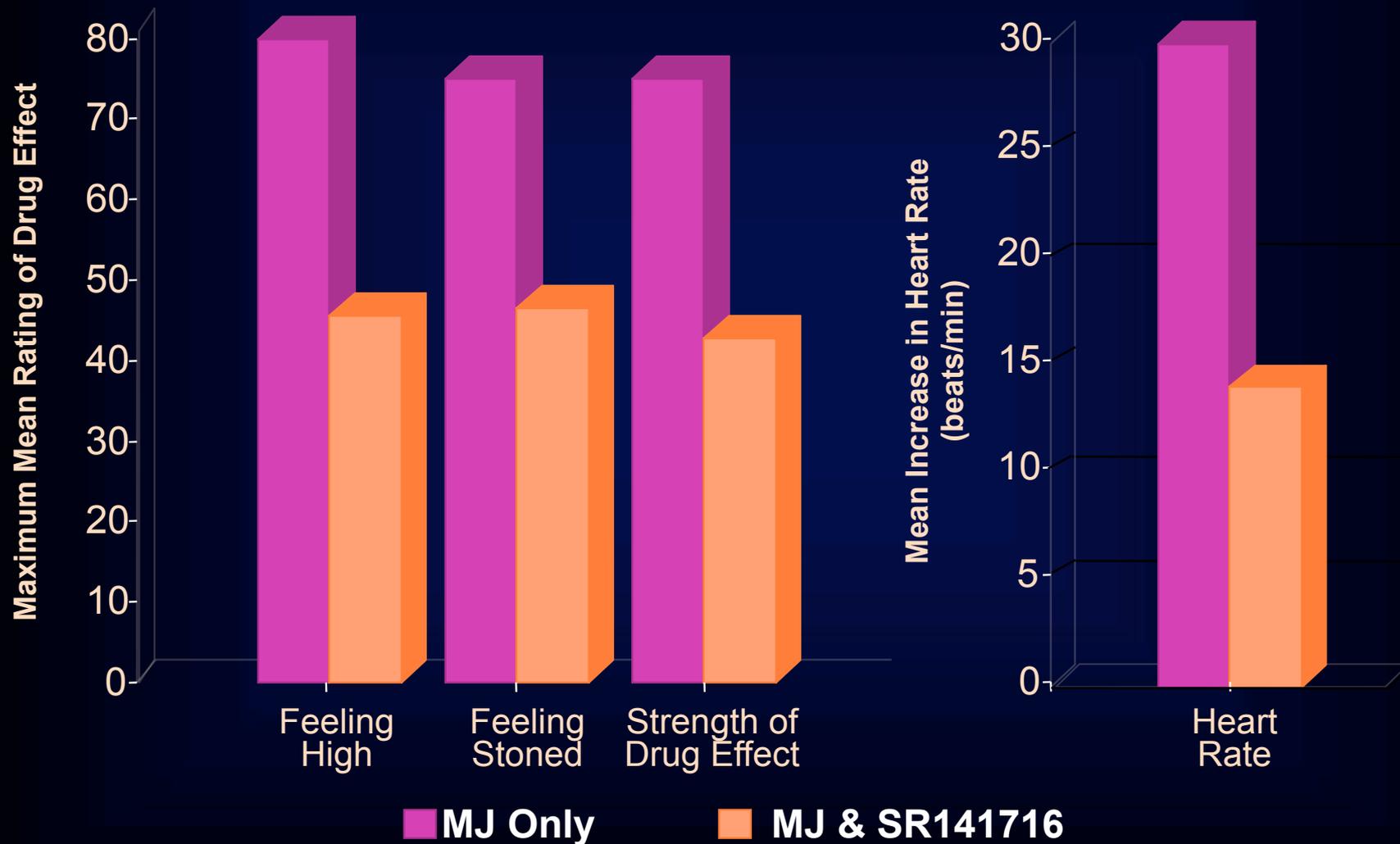


Budney, A.J. et al., Journal of Consulting and Clinical Psychology, December 2000.

Medications Development Research for Marijuana Addiction

- Oral THC combined with lofexidine (a noradrenergic agonist) – withdrawal
- Cannabinoid antagonist blocked MJ's subjective effects, but compliance may be an issue (early on) due to high depression/anxiety.
- Various CB-based medications, either approved or under investigation that harness the new knowledge and therapeutic potential of the cannabinoid system (Marinol, Rimonabant, sativex).

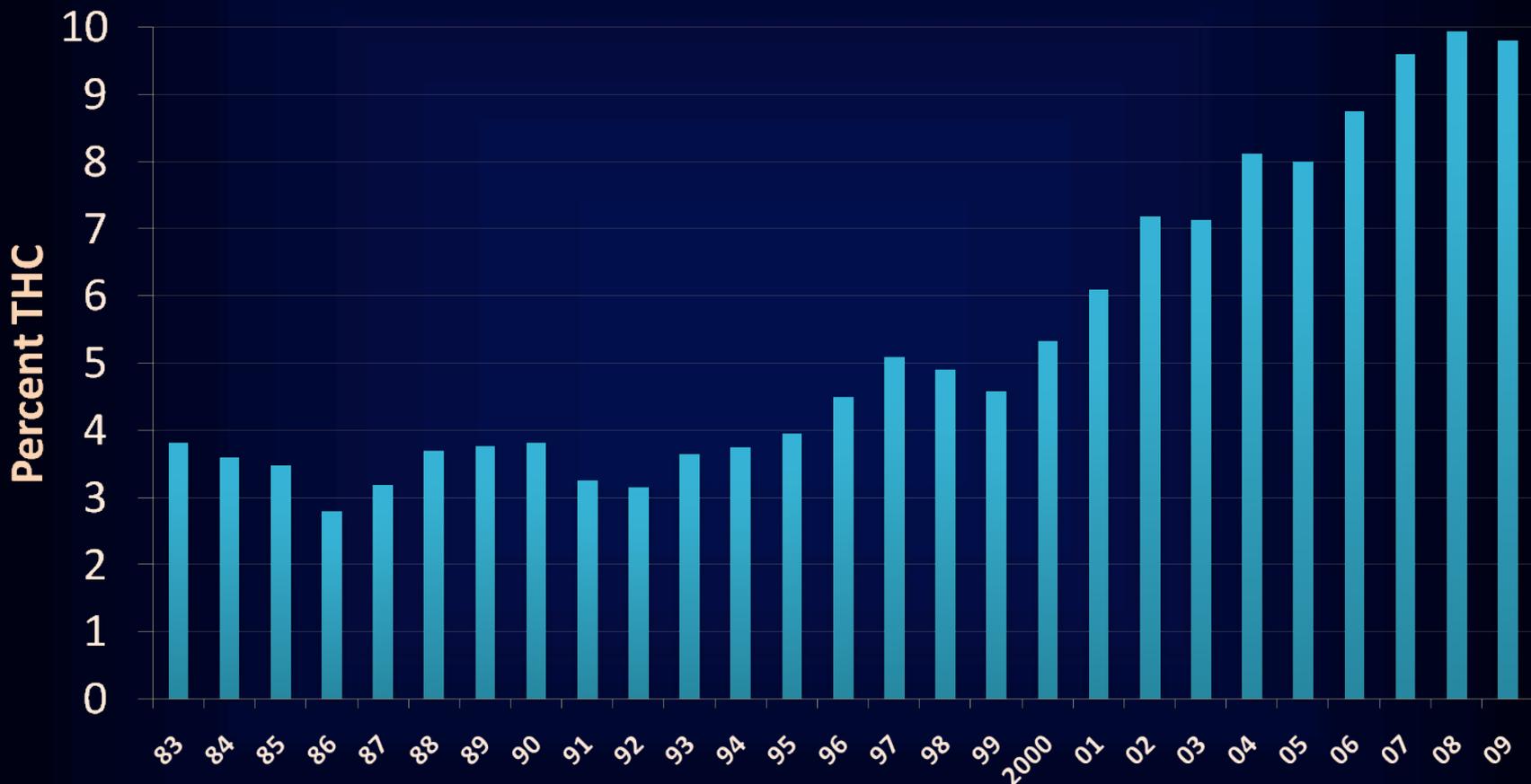
Cannabinoid Antagonist Reduces Marijuana's Effects



Huestis, M.A. Archives of General Psychiatry, 58(4), pp. 322-328, 2001.

Thorny Issues

Potency: Increased THC Content in Seized Marijuana, 1983-2009



Sources: The University of Mississippi Potency Monitoring Project

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What Does Increased Potency Mean?

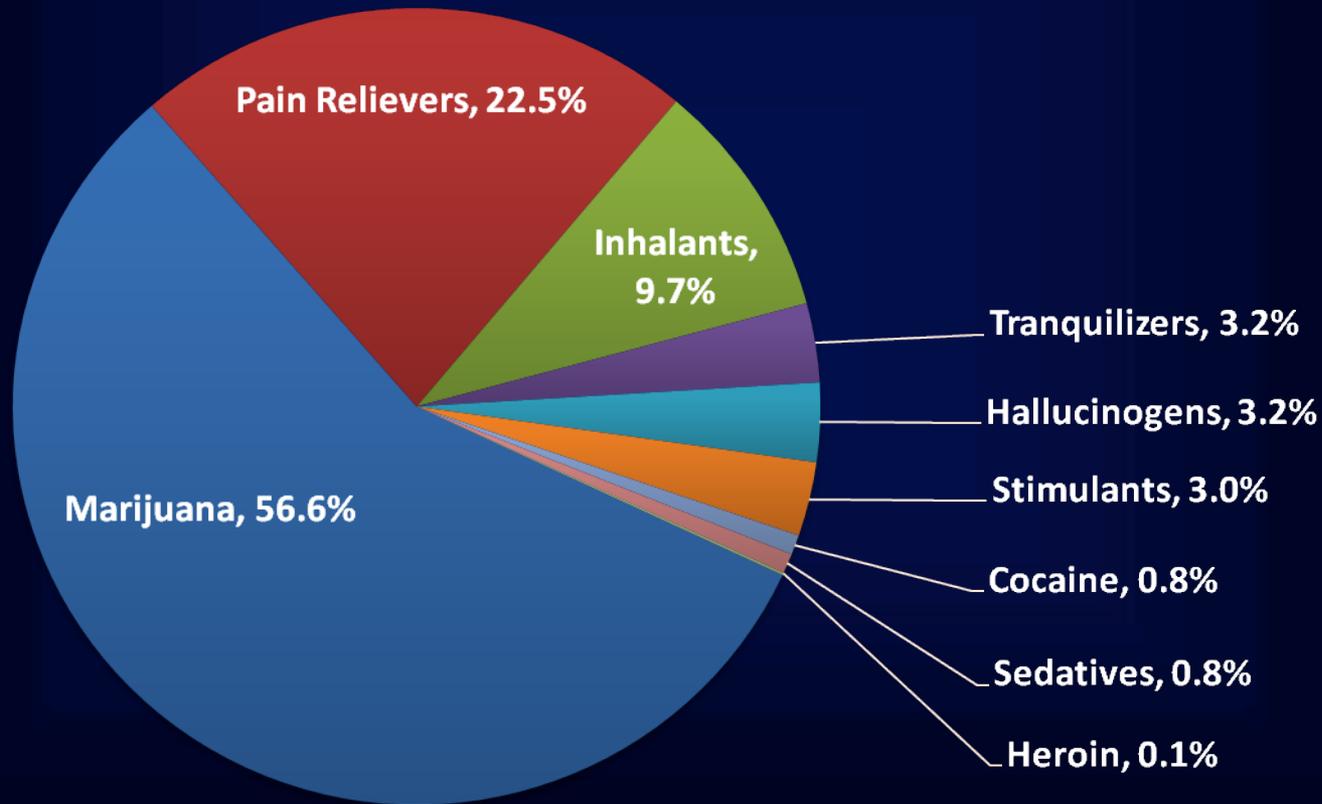
- Potential for greater exposure, more adverse health effects, higher rates of addiction
- ER visits involving marijuana have been going up
- Rates of abuse/dependence have been stable between 2002 and 2008*.
- Do users titrate their ingested dose in order to achieve an optimum effect?
- ❖ Rates increased between 1992-2002, but only in specific subgroups (Compton et al.)

Is Marijuana the Gateway to other drugs?

- Marijuana use usually precedes the use of other illicit substances.
- But the vast majority of marijuana users do not go on to use other drugs.
- Drug using propensity could explain use of marijuana and other illicit drugs—marijuana is just more accessible
- Marijuana could change the brain in ways that make someone more likely to use other drugs
- Because marijuana is illegal, users are more likely to interact with drug dealers who could provide opportunity for other illicit drug use

Specific Drug Used When Initiating Illicit Drug Use among Past Year Initiates of Illicit Drugs Aged 12 or Older: 2008

2.9 Million Initiates of Illicit Drugs



Note: The percentages do not add to 100 percent due to rounding or because a small number of respondents initiated multiple drugs on the same day.

Medical Marijuana

The IOM Report (ONDCP commissioned in 1999)

- Shows promise for treating pain, nausea, wasting
- Very few scientific studies to determine MJ's therapeutic utility.
- It is justified, however, to conduct research into MJ's active ingredients for conditions or diseases such as pain and nausea, as well as on alternative delivery systems.

Other considerations:

- Marijuana is not a benign drug. Many adverse consequences, including addiction.
- Improved knowledge of the endogenous CB system and its broad impact on health status warrants the development of a robust research agenda into the therapeutic potential of cannabinoids.