

# Adolescents, AOD Use, and Learning

Scott Caldwell

*In-service presentation to Deerfield High School Staff  
September 19, 2008*

# Goals for this presentation:

1. Deepen understanding of adolescent development
2. Increase knowledge of Deerfield youth and AOD use
3. Identify ways to increase school-based protective influences to reduce teen risks

Where do you stand?  
[activity]

What's going on during  
adolescence? Characteristics of  
teen development?

# Key adolescent developmental tasks:

- Individuation
- Autonomy development
- Relationship building
- Competency
- Identity formation

# Adolescent Neuroscience

- New science

## 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.

### Nerve Proliferation ...



By age 25 the billions of neurons in the brain have formed the circuitry of the central nervous system. The brain has seen a surge of these cells in the past.

### Corpus Callosum

Though it is the most prominent feature of the brain, the corpus callosum is made of white matter, not gray matter. It is a thick band of nerve fibers that connects the two hemispheres of the brain. It is made up of myelin sheaths and axons. It is the largest white matter structure in the brain.

### Prefrontal Cortex

The CEO of the brain, the prefrontal cortex is the seat of executive thought. It is the part of the brain that is most involved in planning, decision-making, and impulse control. It is the part of the brain that is most affected by drugs and alcohol.

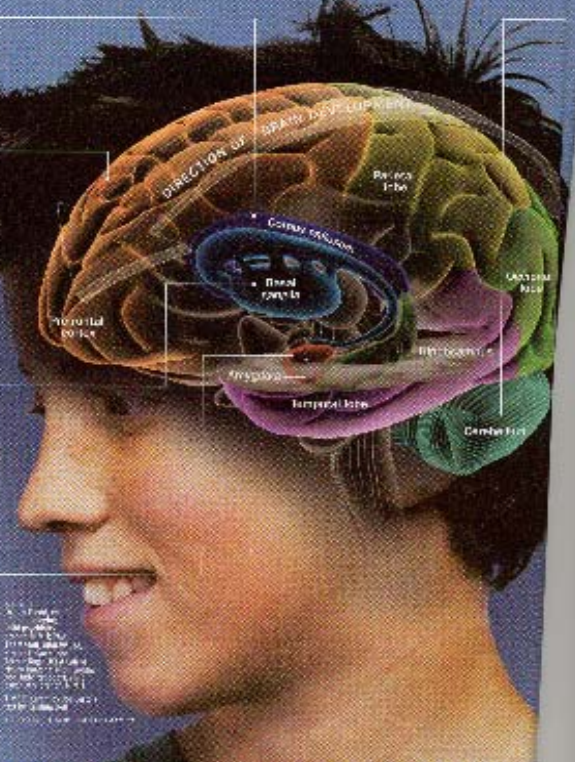
### Basal Ganglia

Large in size, the basal ganglia is a part of the brain that is involved in movement, learning, and emotion. It is the part of the brain that is most affected by Parkinson's disease and Huntington's disease.

### Amygdala

One of the most important parts of the brain, the amygdala is involved in emotion, memory, and decision-making. It is the part of the brain that is most affected by stress and anxiety.

© 2010, The McGraw-Hill Companies, Inc.



# Imaging technology provides windows into the developing brain



# Adolescent Neuroscience

- New science
- Insights into teen behaviors
- Implications for parents, educators, and counselors

## 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.

**Nerve Proliferation ...**

By age 13 the billions of neurons in the brain have formed the basis of the central nervous system. The brain has some 100 billion neurons, most of them in the cerebral cortex.

**Corpus Callosum**

Though it is the most prominent feature of the brain, the corpus callosum is not a single structure. It is a bundle of fibers that connects the two hemispheres of the brain. It is made up of white matter, the myelin sheath and processes, arranged in a regular and precise pattern.

**Prefrontal Cortex**

The CEO of the brain, the prefrontal cortex is the seat of executive thought. In the early part of the teen years, the prefrontal cortex is still developing. It is the last part of the brain to mature, and it is the last to be fully developed. It is the seat of executive thought, and it is the last to be fully developed.

**Basal Ganglia**

Large in size, the basal ganglia is a part of the brain that is involved in the control of voluntary movements. It is the seat of executive thought, and it is the last to be fully developed.

**Amygdala**

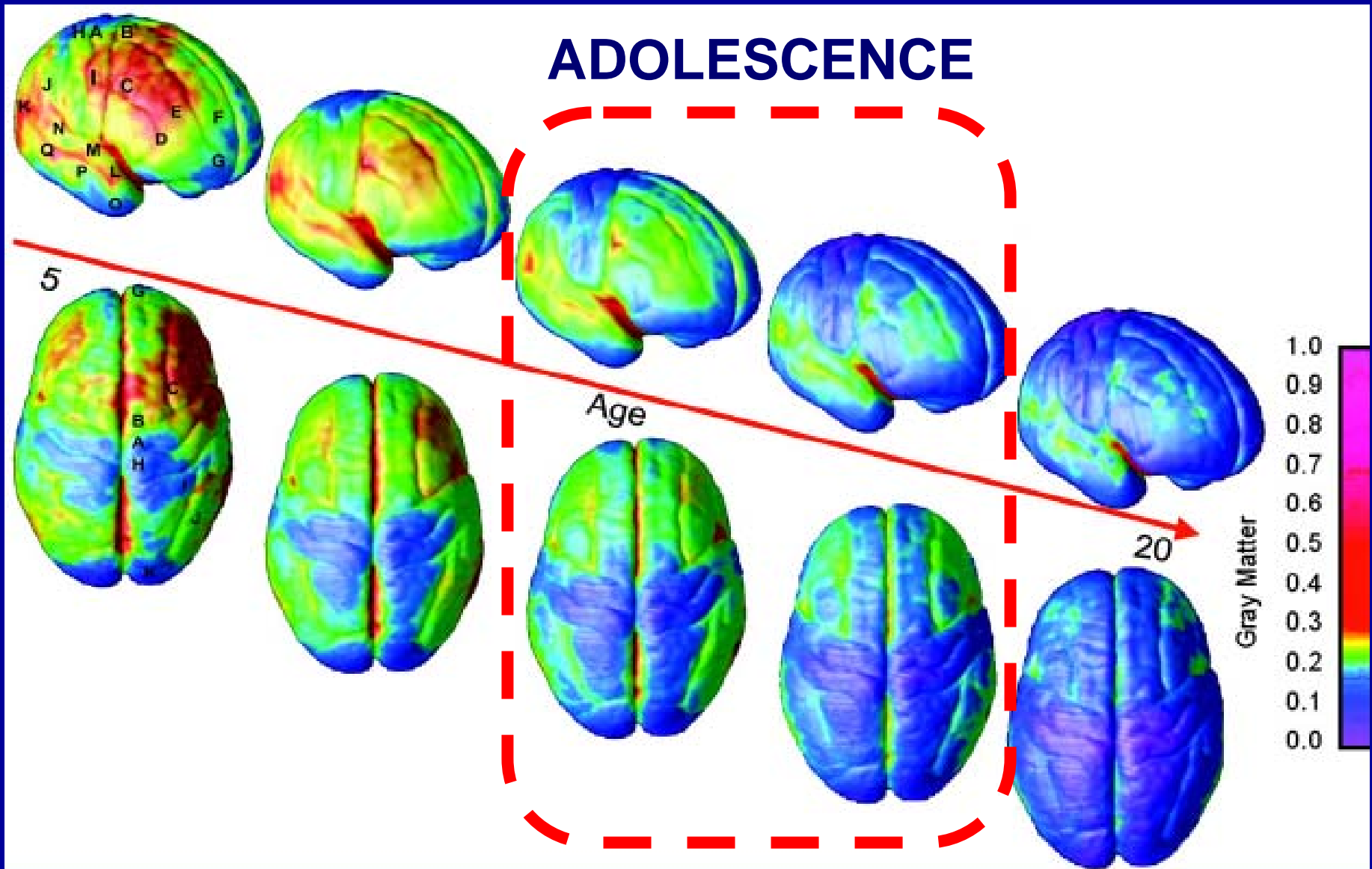
One of the most important parts of the brain, the amygdala is the seat of emotion. It is the seat of executive thought, and it is the last to be fully developed.



## General findings:

- Adolescence is a period of profound and unique brain maturation

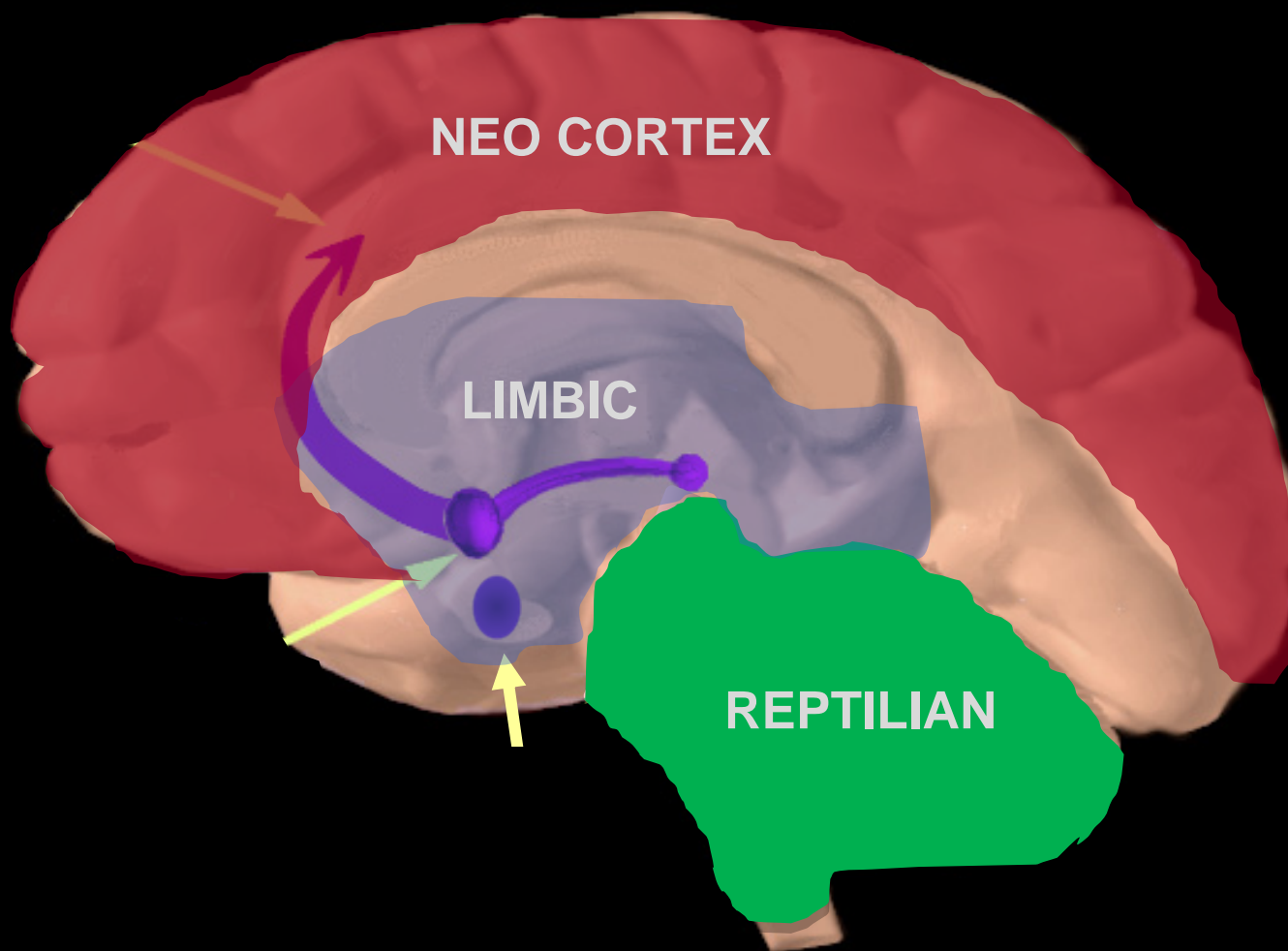
# Brain development

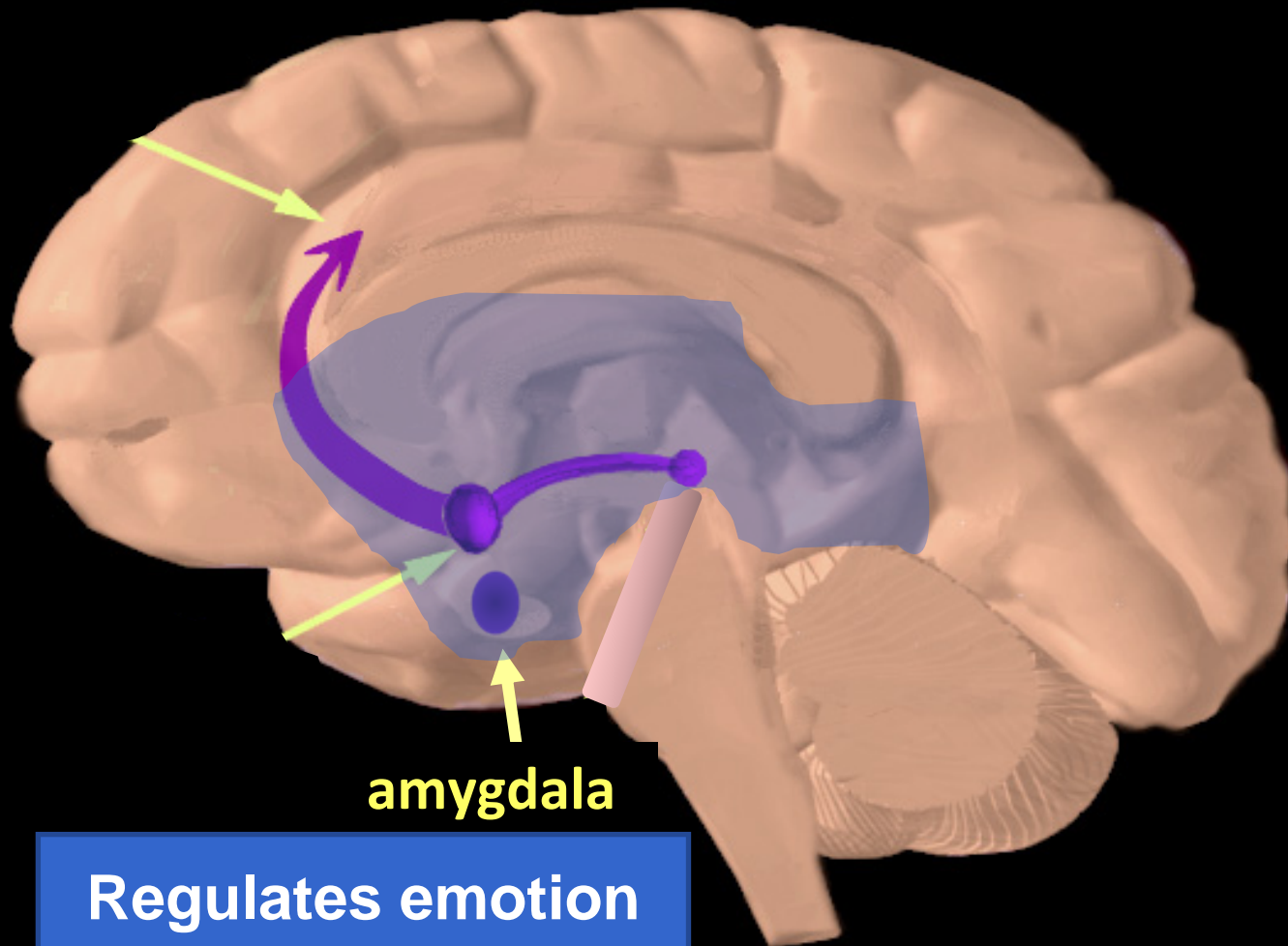


## General findings:

- Adolescence is a period of profound and unique brain maturation
- Remodeling of basic structure
- The brain maturation process is not complete until about age 24!!

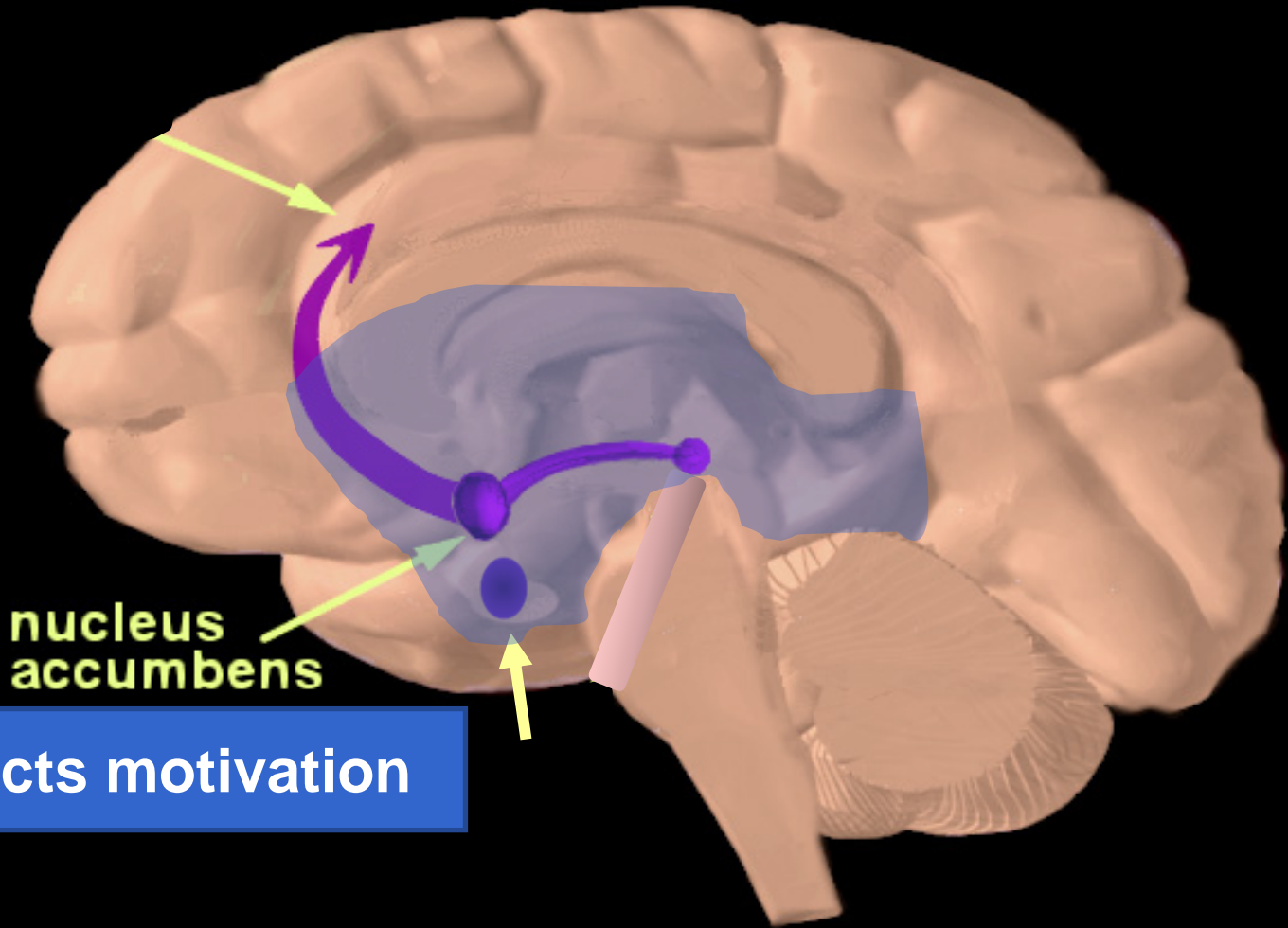
# *Three Brains in One*





amygdala

Regulates emotion

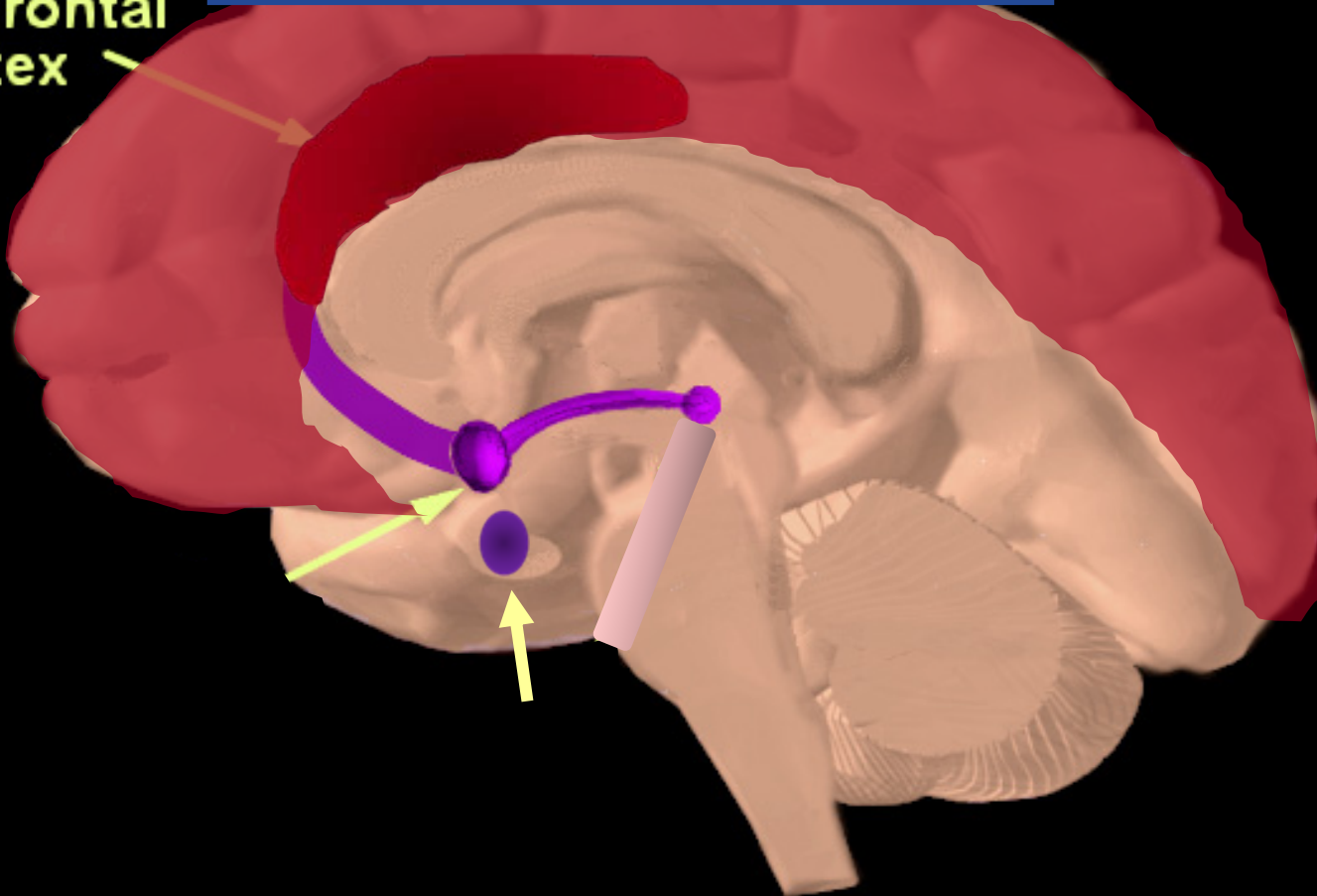


nucleus accumbens

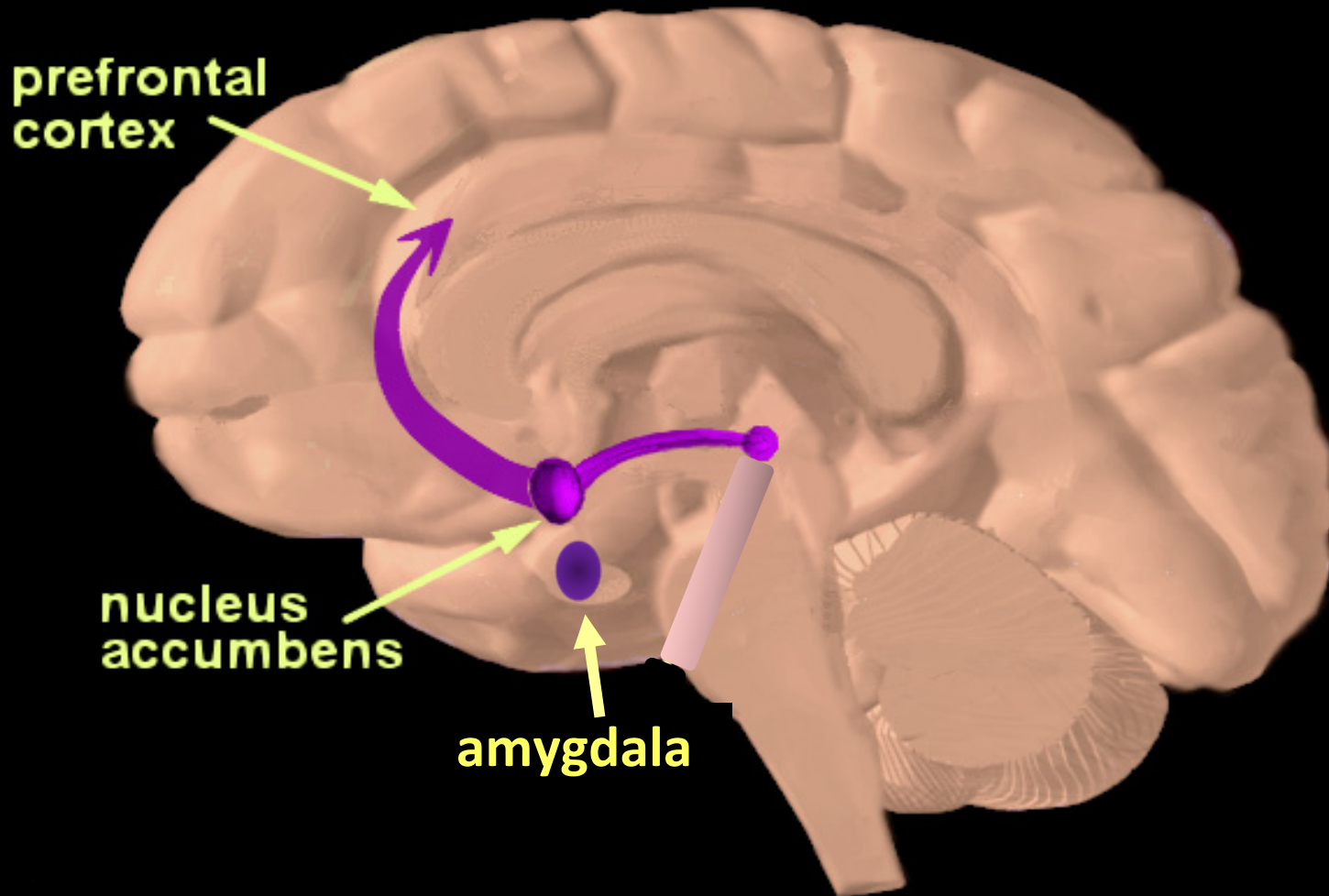
Directs motivation

**CEO: judgment, decision making, planning ahead**

**prefrontal cortex**



# Research: These areas are still developing during adolescence





# Understanding teenage behavior:

- Limits to motivation: preferences for low effort, high excitement activities
- Limits to emotional regulation: moodiness, quick to anger and “hot” emotions
- Limits to judgments: increased risk taking, decreased planning ahead

# Understanding teenage behavior:

- Limits to motivation:
- Limits to emotional regulation:
- Limits to judgments:

***These limits are  
normative,  
biologically-driven,  
and inevitable!***

**AOD use amplifies these  
vulnerabilities**

# Deerfield Youth & AOD Use

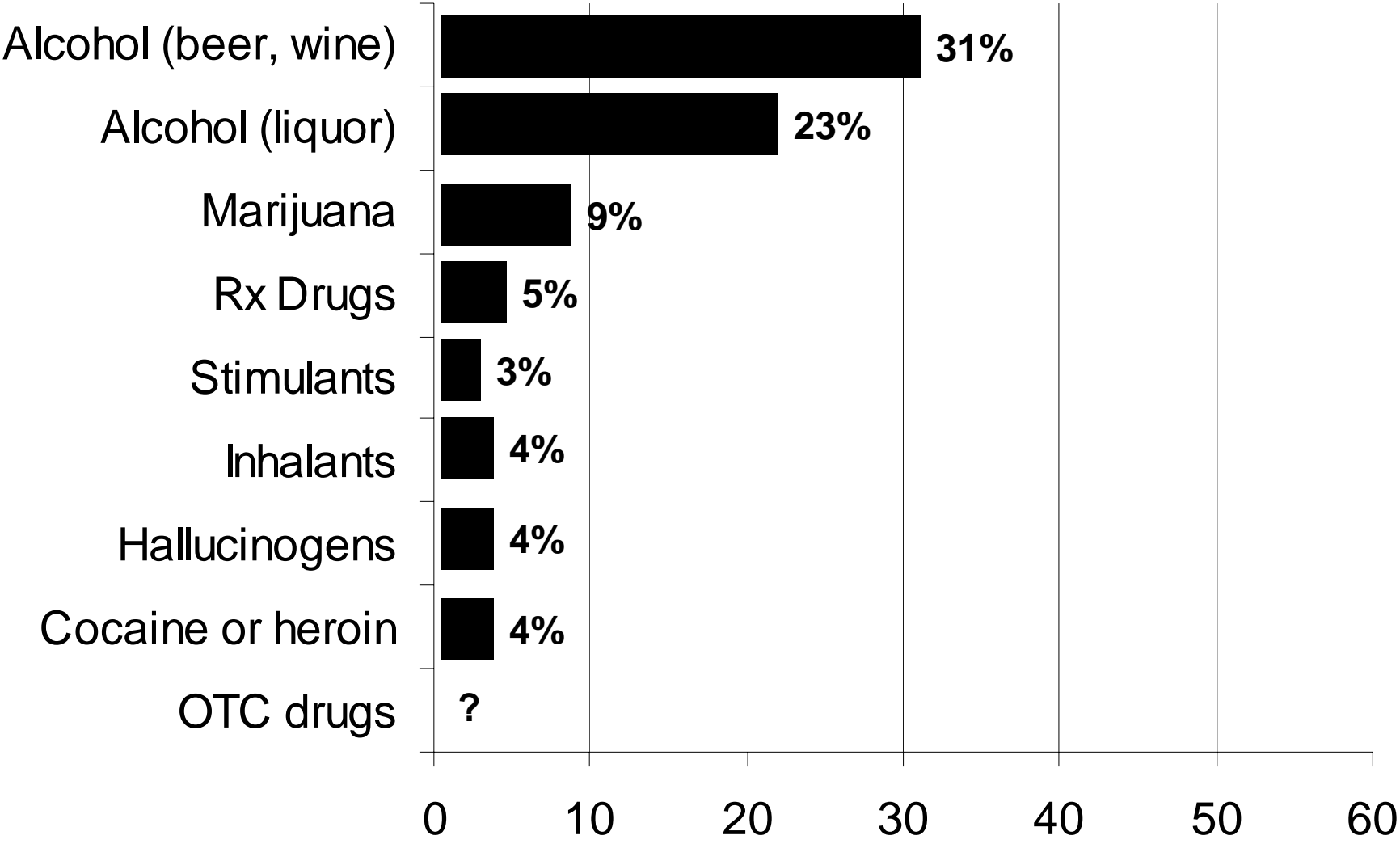


Dane County Youth  
Assessment

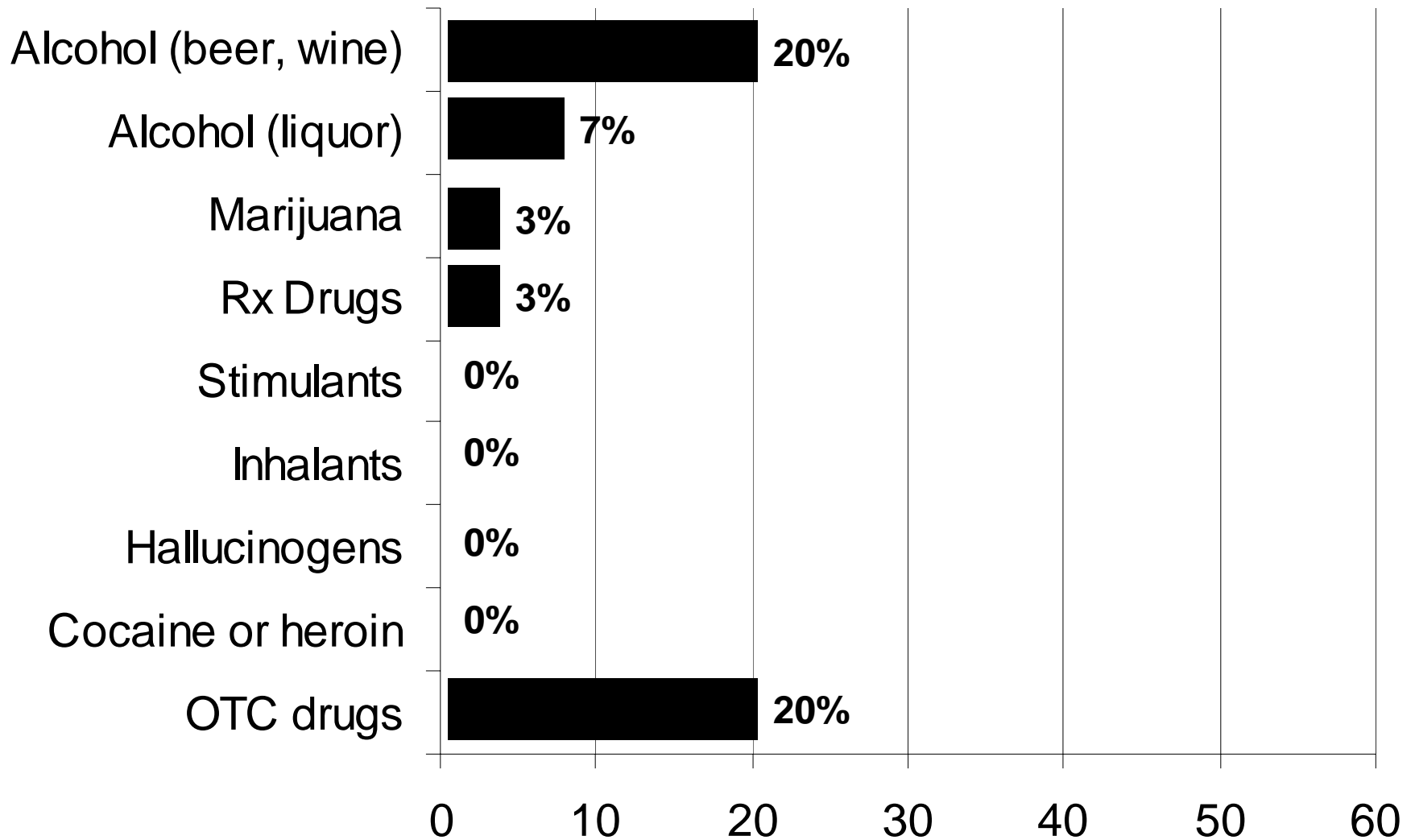
*Source: DCYA (2008)*

*Brian Koenig,  
Principal Investigator*

# Any past year use by 9-12<sup>th</sup> graders



# Any past year use by 7-8<sup>th</sup> graders



Alcohol

# Alcohol Use by Deerfield 9<sup>th</sup> – 12<sup>th</sup> graders

- Percentage drinking beer/wine past year: **31%**
- Percentage drinking liquor past year: **23%**
- Percentage drinking past 30 days: **20%**

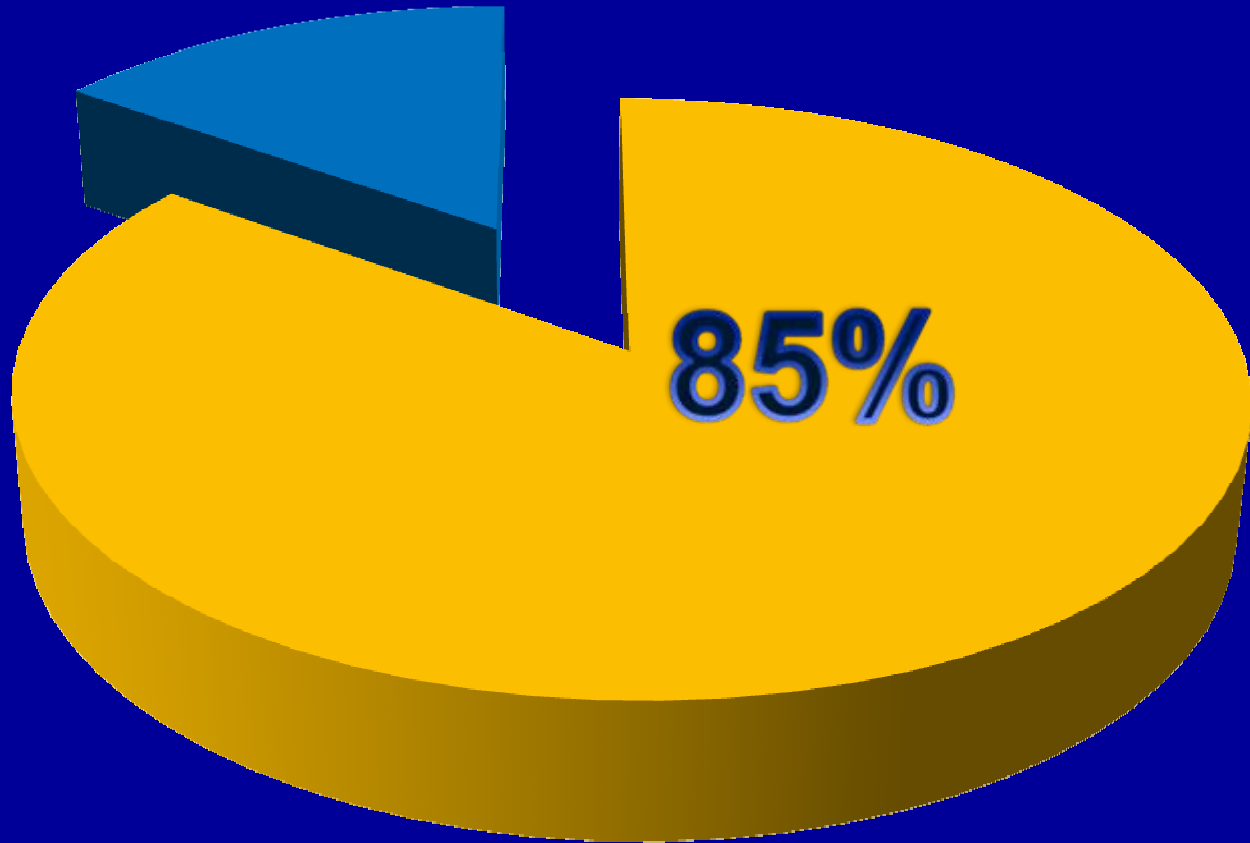


# Alcohol affects teens differently than adults:

1. Reduced sensitivity to intoxication

*Source: Clark (2004); Deas et al. (2000); Tapert (2006); Winters (2004)*

Of Deerfield youth who drank within the past 30 days, percentage who reported binge drinking:



Source: DCYA (2008)

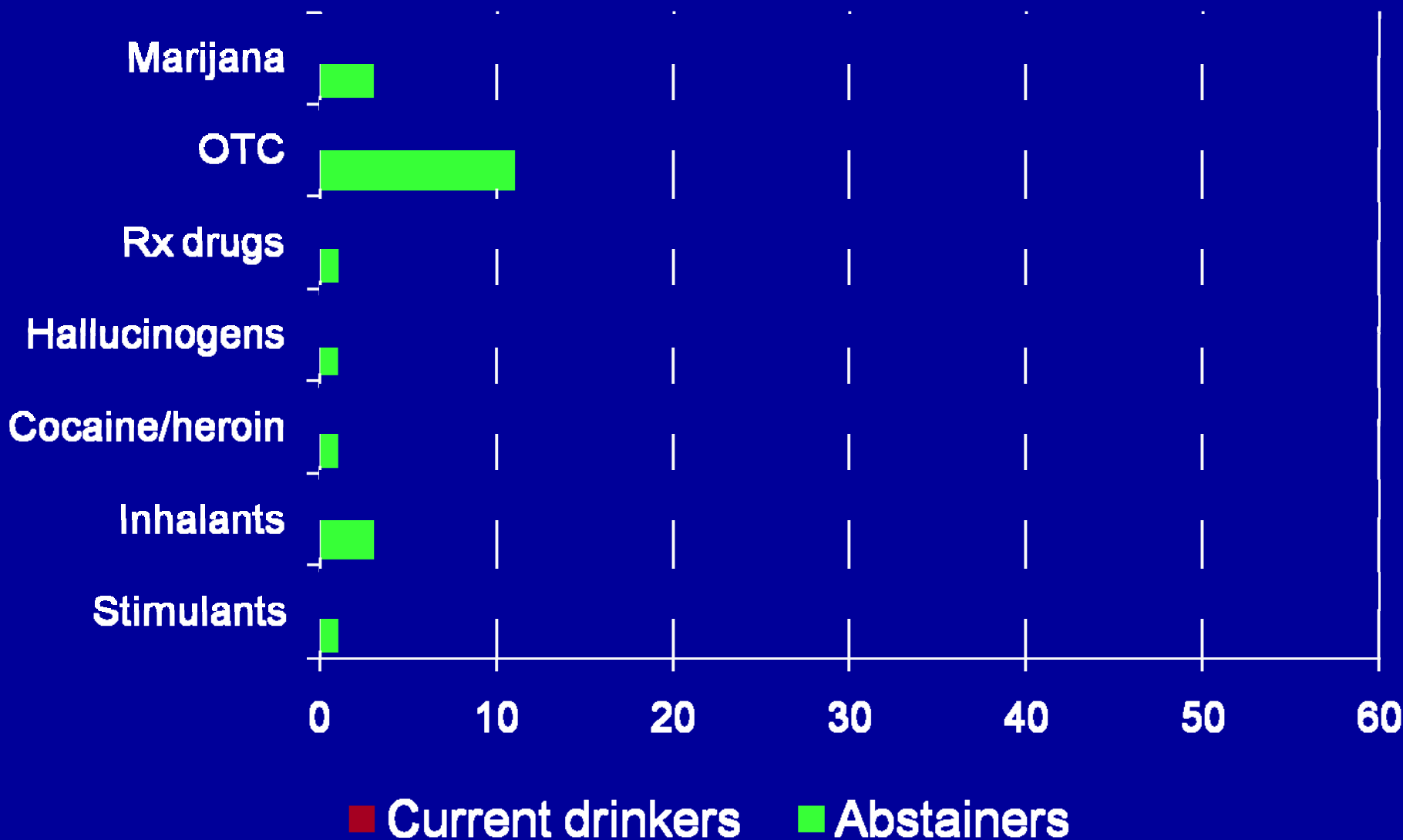
# Alcohol affects teens differently than adults:

1. Reduced sensitivity to intoxication
2. Involvement with other drug use

*Source: Clark (2004); Deas et al. (2000); Tapert (2006); Winters (2004)*

# Current drinking is strongly associated with prevalence (%) of past year drug use

Source: DCYA (2008)

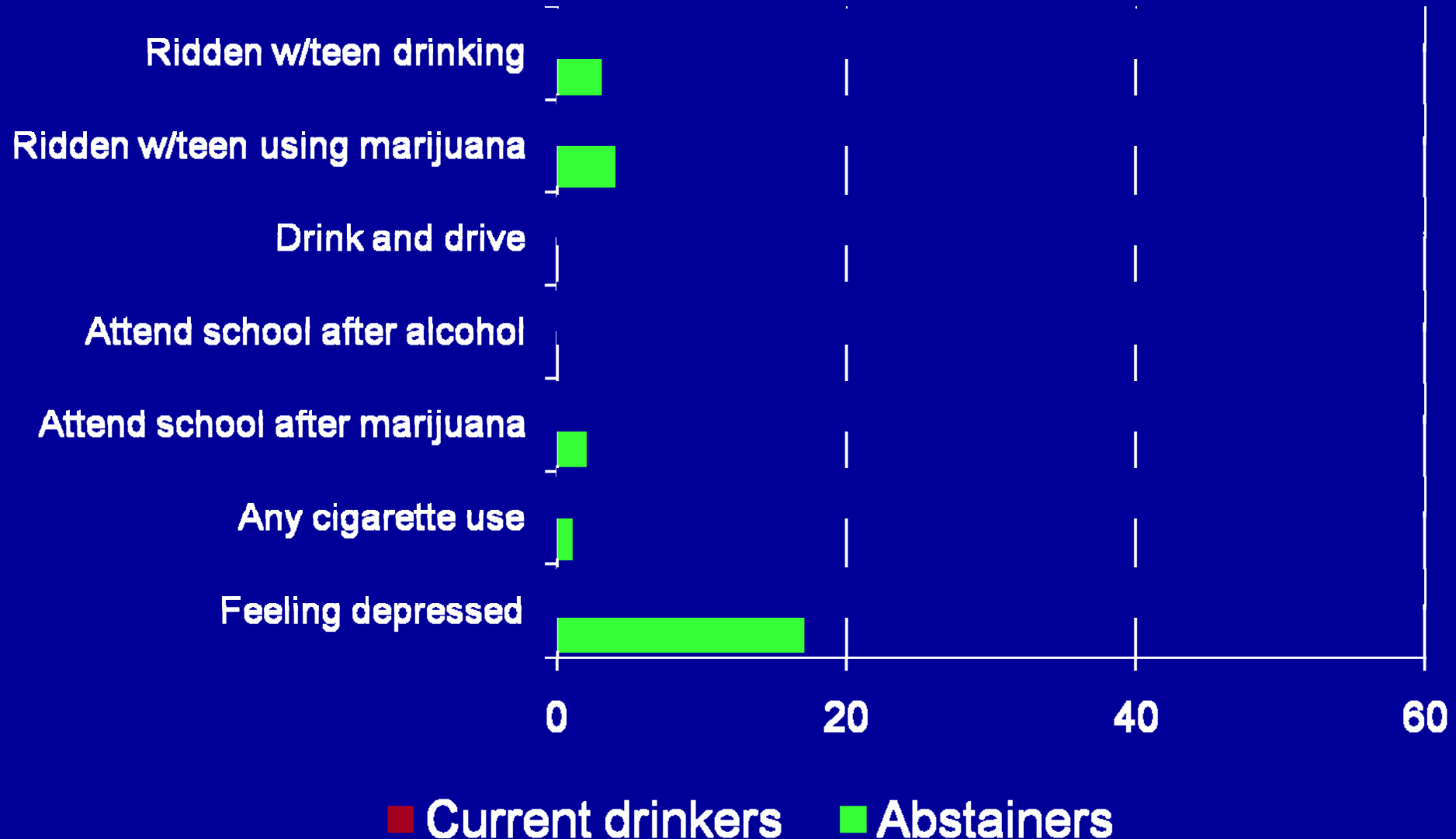


# Alcohol affects teens differently than adults:

1. Reduced sensitivity to intoxication
2. Involvement with other drug use
3. Greater risk taking

*Source: Clark (2004); Deas et al. (2000);  
Tapert (2006); Winters (2004)*

# Current drinking is strongly associated with prevalence (%) of current risk behaviors



# Alcohol affects teens differently than adults:

1. Reduced sensitivity to intoxication
2. Involvement with other drug use
3. Greater risk taking
4. Risk for cognitive and learning deficits

*Source: Clark (2004); Deas et al. (2000);  
Tapert (2006); Winters (2004)*

---

# Binge drinking and the teen brain

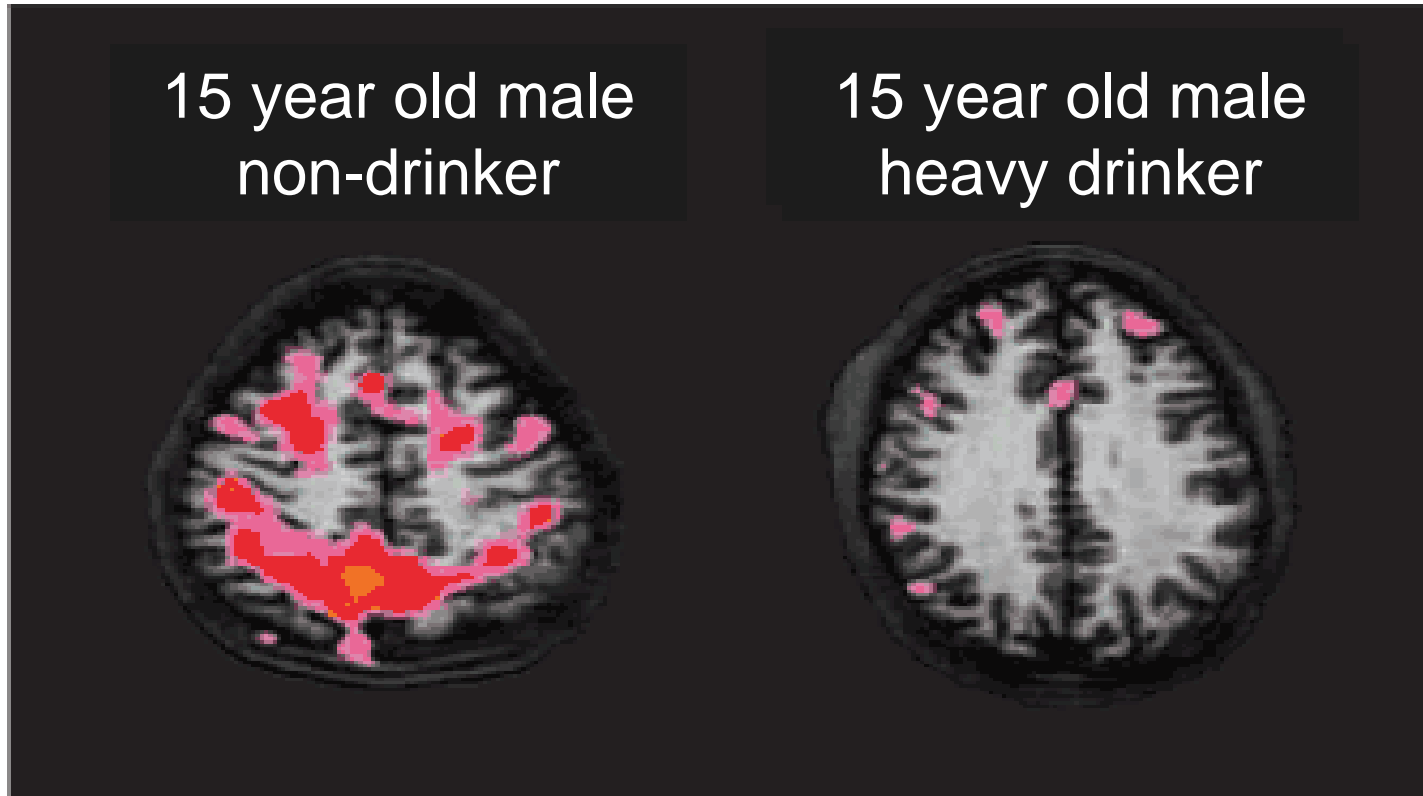
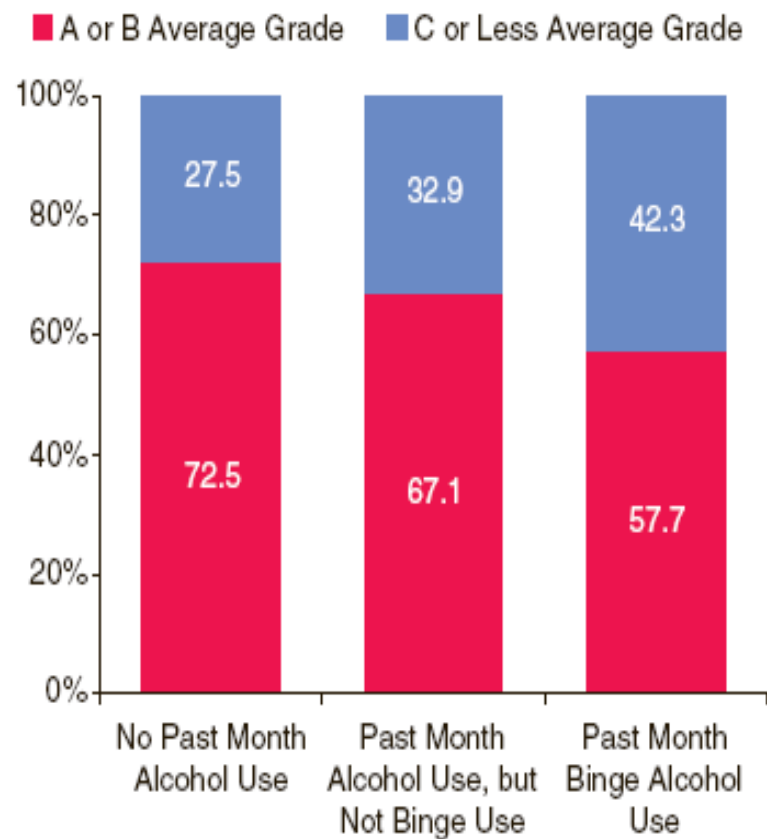


Image from Susan Tapert, PhD, University of California, San Diego.

---



**Figure 3. Average Grades During the Last Semester or Grading Period among Students Aged 12 to 17, by Past Month Alcohol Use: 2002 to 2004**



Source: SAMHSA, 2002, 2003, and 2004 NSDUHs.

# By late-adolescence, those with extensive drinking histories compared to controls showed:

- 10% - 35% ↓ hippocampus volume (brain structure converts information to memory)
- ↓ brain activity during memory tasks
- ↑ brain activation when shown alcohol images

*Source: Brown et al. (2000), Tapert (2006)*

# Alcohol affects teens differently than adults:

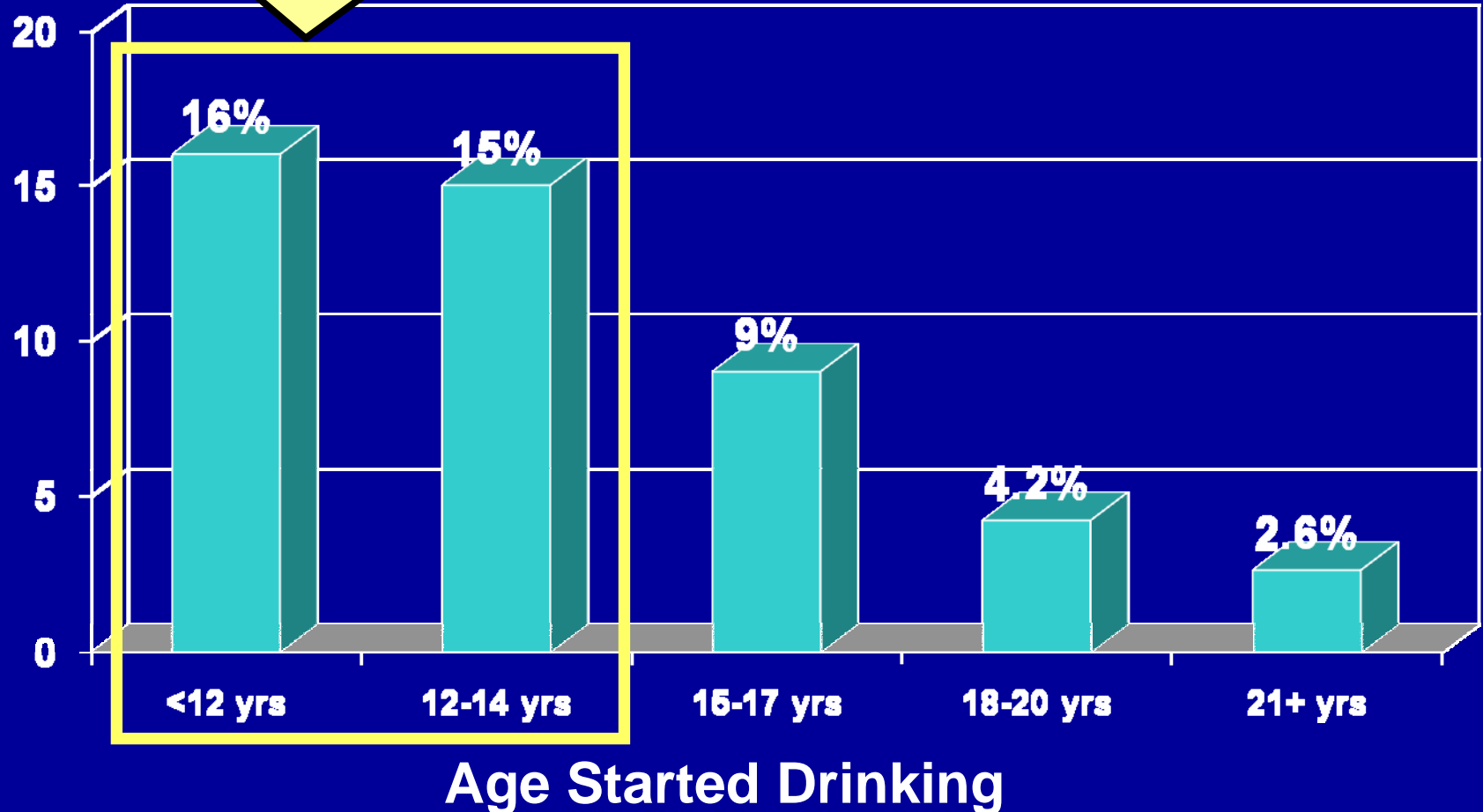
1. Reduced sensitivity to intoxication
2. Involvement with other drug use
3. Greater risk taking
4. Risk for cognitive and learning deficits
5. Risk for long-term alcohol problems

*Source: Clark (2004); Deas et al. (2000);  
Tapert (2006); Winters (2004)*

# Percentages of Past Year Alcohol Dependence or Abuse Among Adults Aged 21 or Older

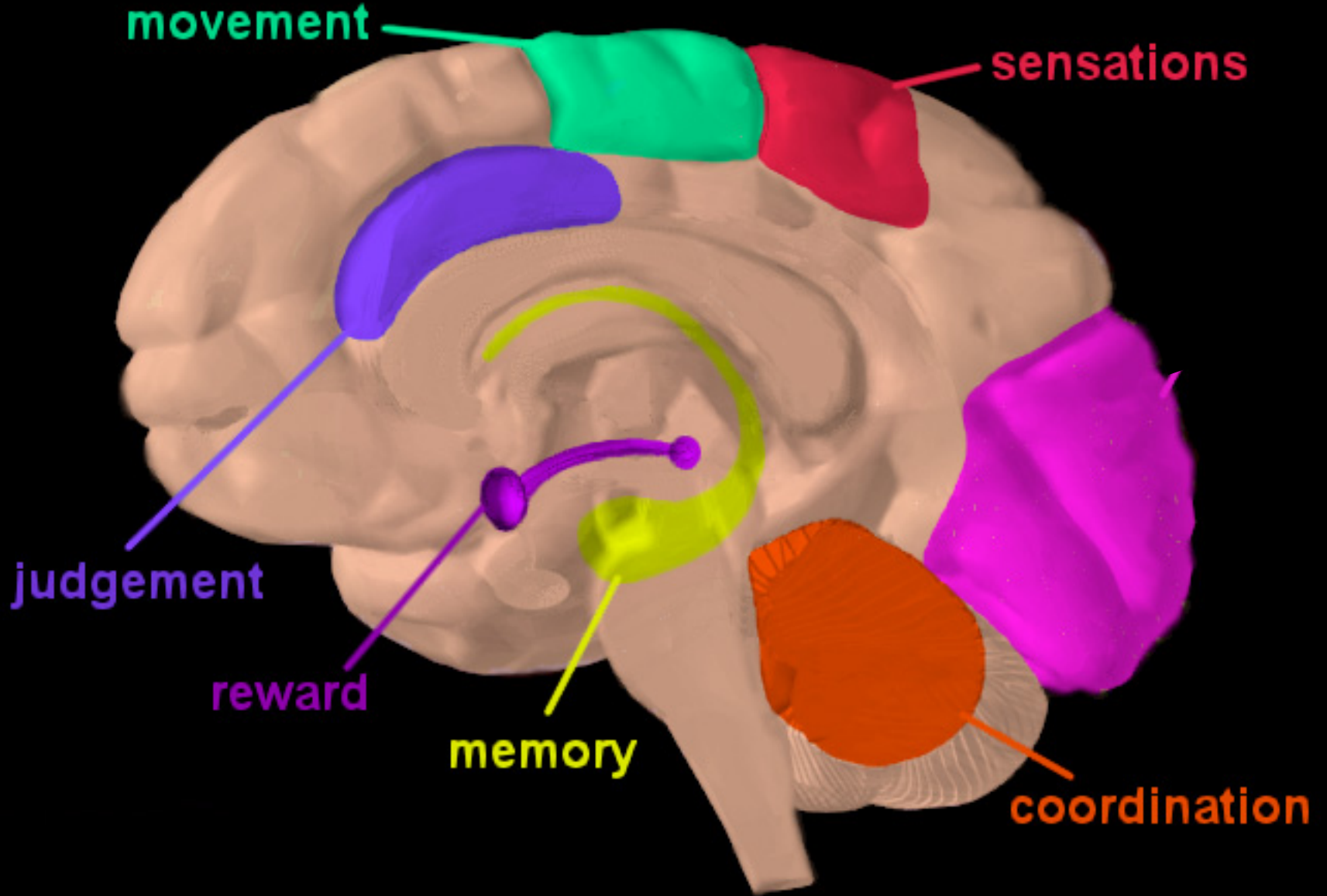
Source: SAMHSA (2005)

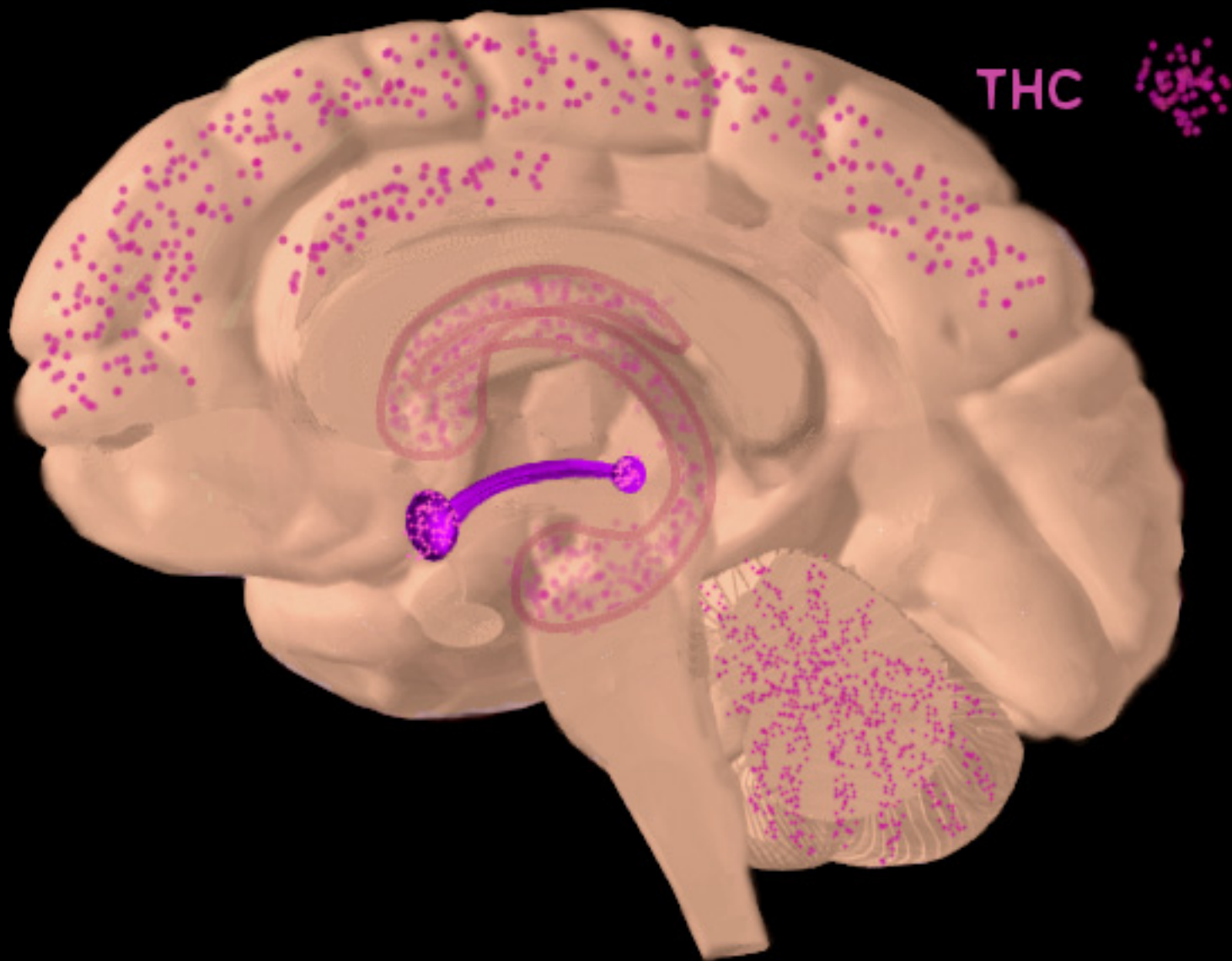
Early drinking increases future risk by 6 times



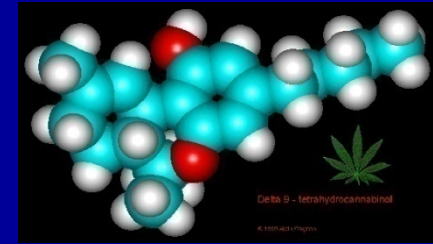
Marijuana

# Marijuana affects...





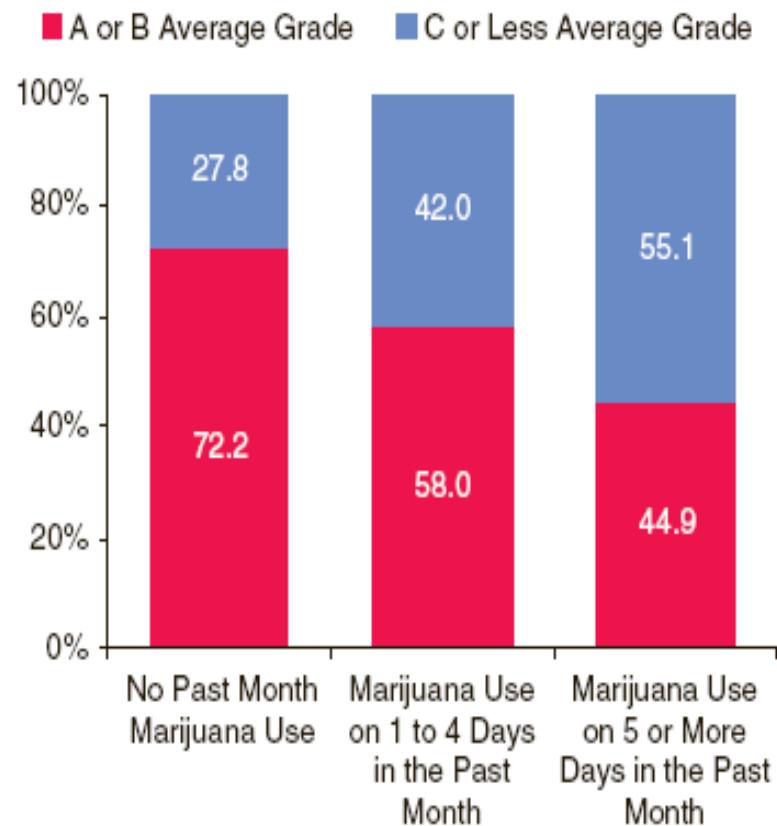
# Marijuana and teens:



- Substantial increase in THC potency since the 1980s
- Effects associated with:
  - decreased immune system function
  - decreased motivation
  - poor academic achievement

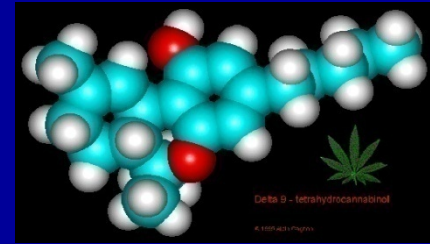


**Figure 4. Average Grades During the Last Semester or Grading Period among Students Aged 12 to 17, by Past Month Marijuana Use: 2002 to 2004**



Source: SAMHSA, 2002, 2003, and 2004 NSDUHs.

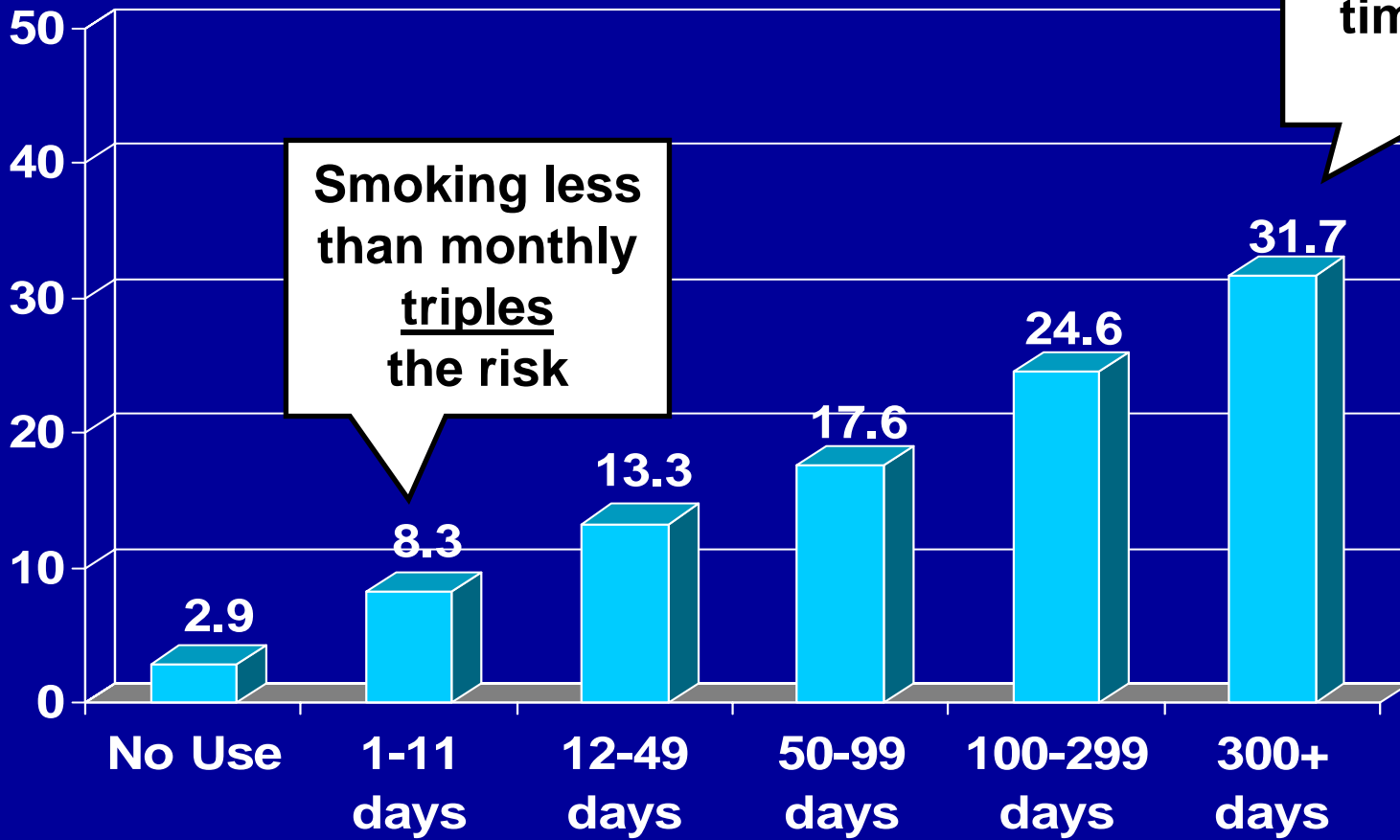
# Marijuana and teens:



- Substantial increase in THC potency since the 1980s
- Effects associated with:
  - decreased immune system function
  - decreased motivation
  - poor academic achievement
  - conduct problems and delinquency

# Percentages of those aged 12-17 who stole or tried to steal anything worth \$50 or more

Source: SAMHSA (2003)



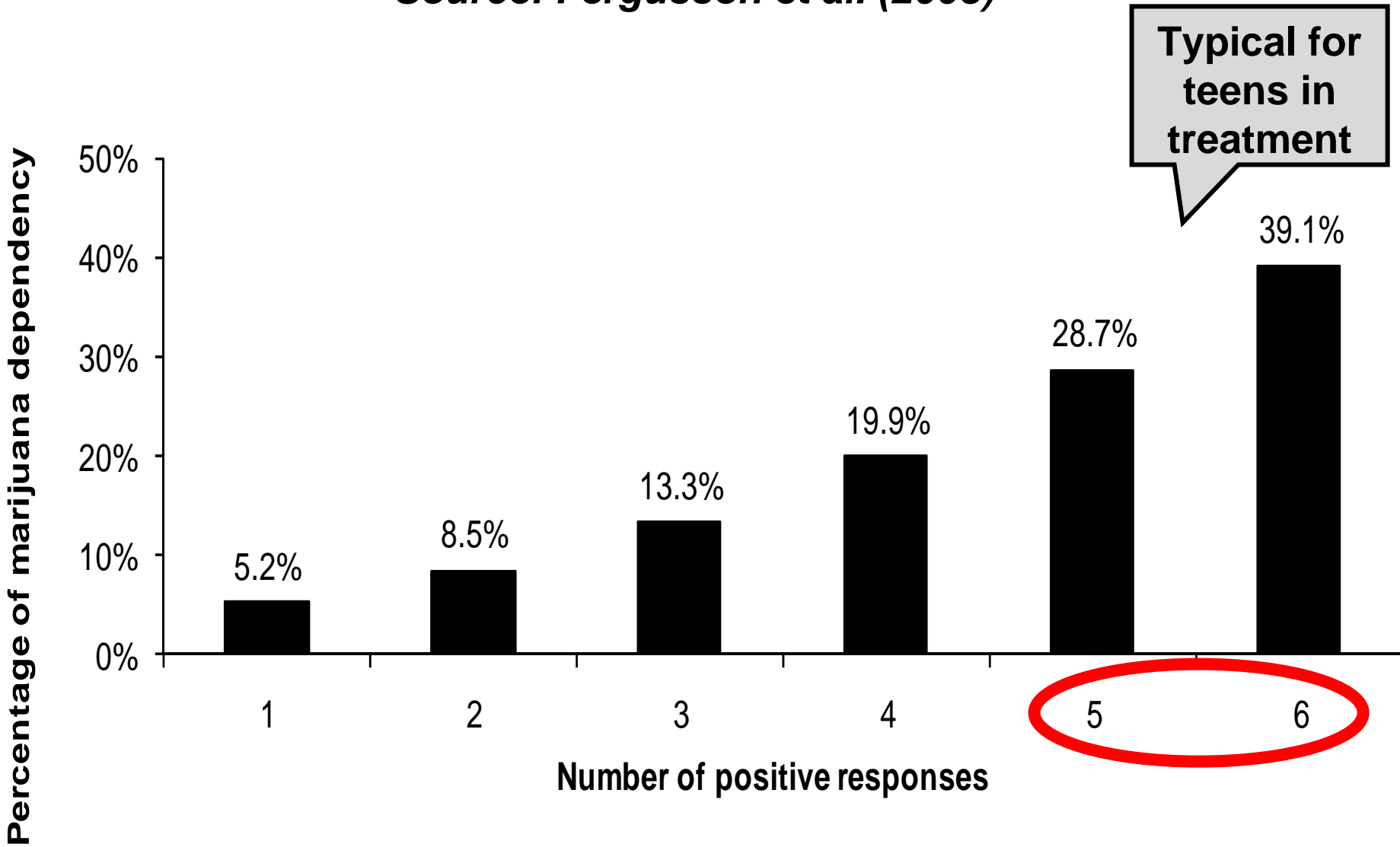
Frequency of past year marijuana use

***But is marijuana addictive?  
Can teen users get hooked?***

- Frequent use (4% of Deerfield 9-12<sup>th</sup> graders)
- Tolerance to effects
- Positive expectancies for effects

# Number of positive responses to marijuana by teens relates to later addiction

Source: Fergusson et al. (2003)



# *Is marijuana addictive?*

## *Can teen users get hooked?*

- Frequent use
- Tolerance to effects
- Positive expectancies for effects
- Low problem recognition
- Decreased activities and social relations
- Withdrawal is possible

# Cannabis withdrawal prevalence reported by adolescents in outpatient treatment

*Source: Vandrey et al. (2005)*

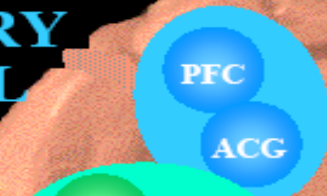
Withdrawal Symptom	Moderate or Severe Ratings
Craving	74%
Irritability	50%
Depressed mood	44%
Sleep difficulty	44%
Restlessness	36%
Increased anger	31%
Decreased appetite	27%
Physical symptoms	1% - 18%

The very brain systems  
developing during adolescence  
are implicated in addiction.



# Circuits Involved In Drug Abuse and Addiction

**INHIBITORY CONTROL**



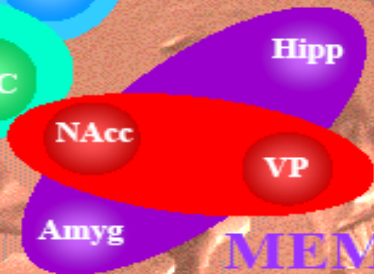
**MOTIVATION/ DRIVE**



**REWARD**



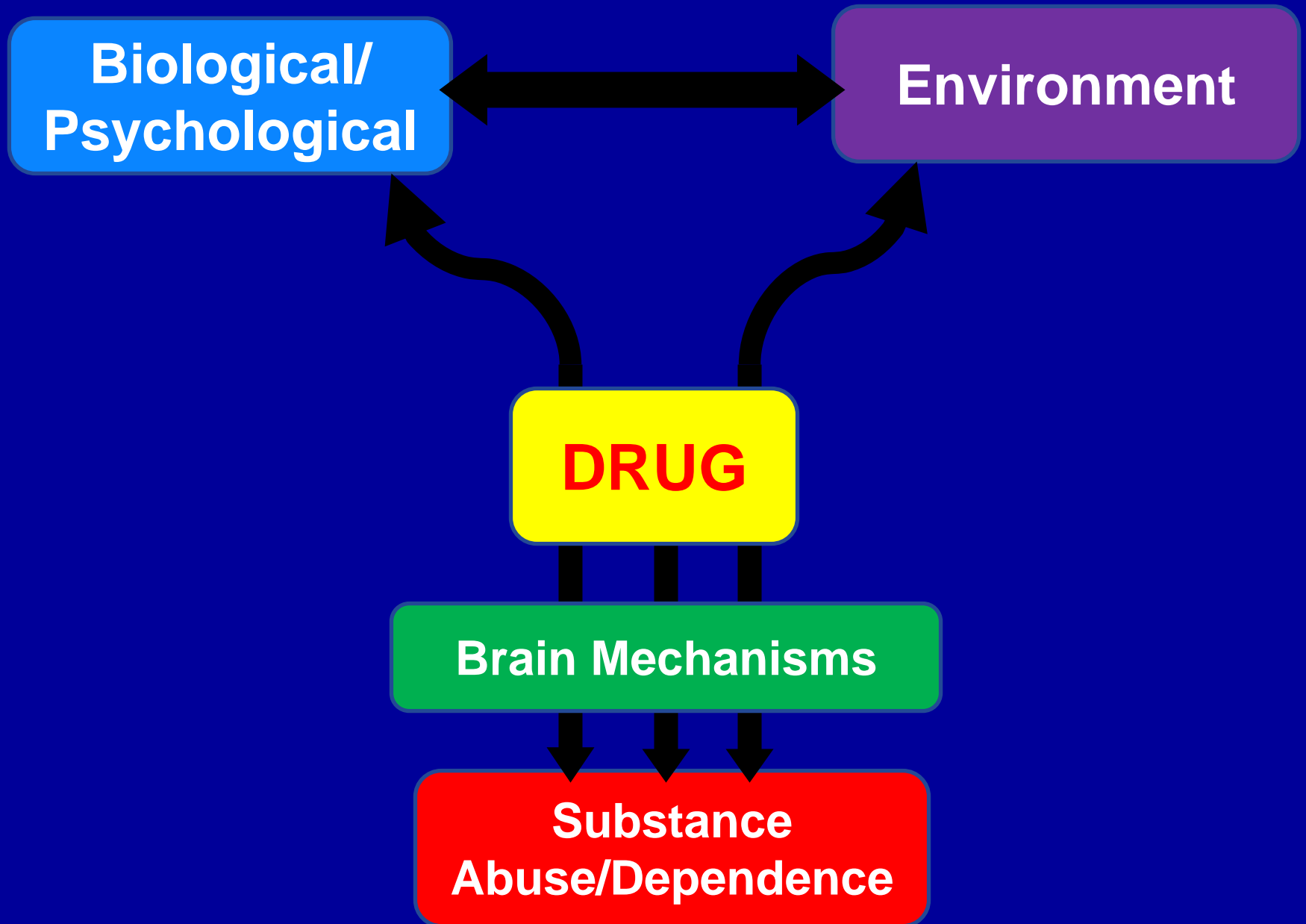
**MEMORY/ LEARNING**



**All of These Must Be Considered In Developing Strategies to Most Effectively Treat Addiction**

**What are the risk factors  
(causes) for adolescent  
AOD problems?**

# RISK FACTORS

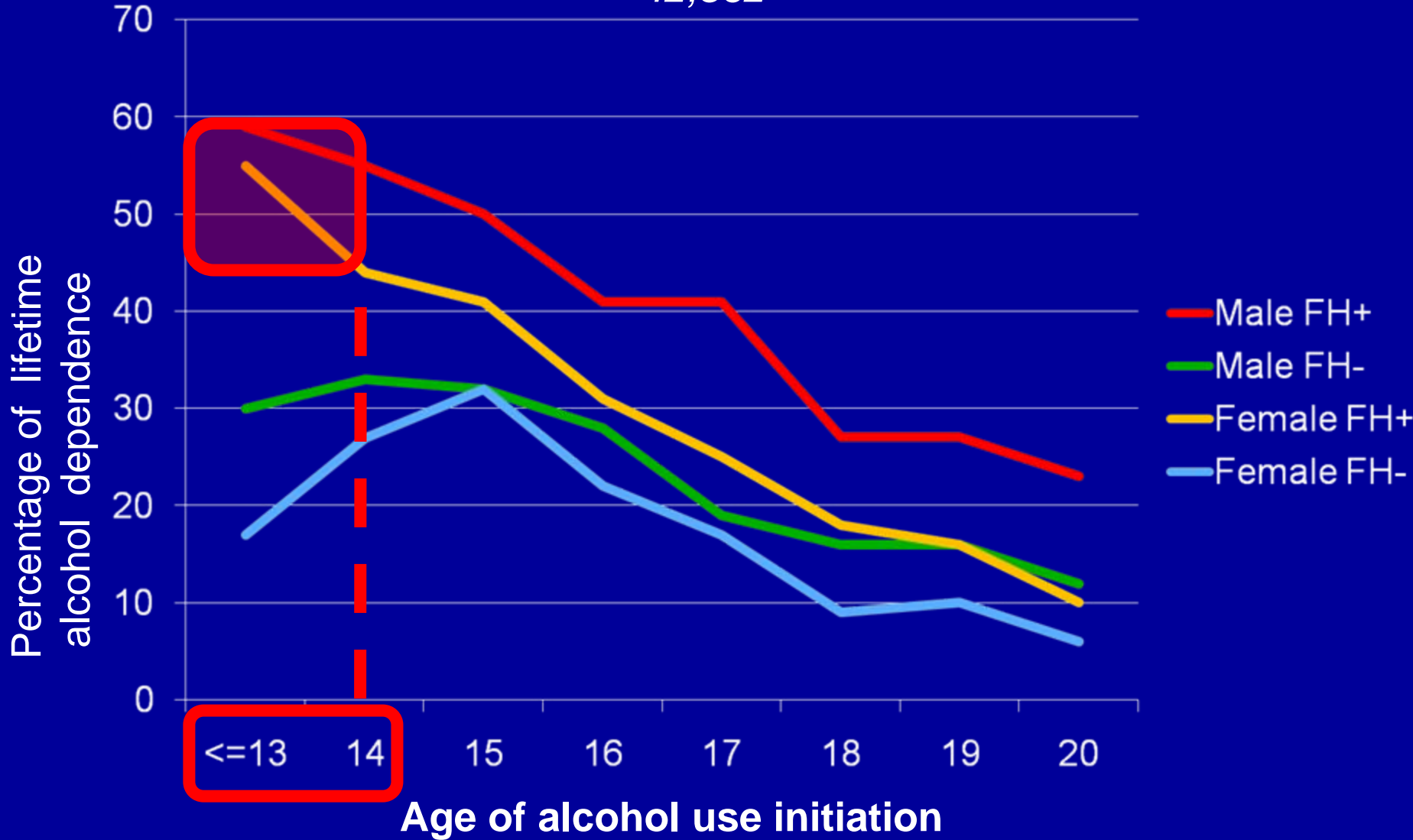


# Biological factors

- Family history – genetic vulnerability
- Difficult temperament
- Male
- Early onset of puberty
- Sleep difficulties
- Early age of use initiation

# Age at First Alcohol Use and Lifetime Prevalence of Alcohol Dependence by Gender and Family History (FH)

Source: Grant (1998) National Longitudinal Alcohol Epidemiologic Survey; N = 42,862



# Psychological factors

- Difficulties regulating emotion (chicken or egg?)
- Behavioral undercontrol
- Trauma or extreme stress experiences
- Low risk perception
- Thrill seeking
- Positive expectancies for effects

# Social factors

- Modeling of substance abuse
- Peer rejection
- Disconnection from home or school
- Association with drug abusing peers (peer selection)
- Ineffective parenting practices

What to do? How to effectively  
exert your protective influences?  
What are the school-based  
protective factors?



# Principles of effective prevention

# Principles of effective prevention

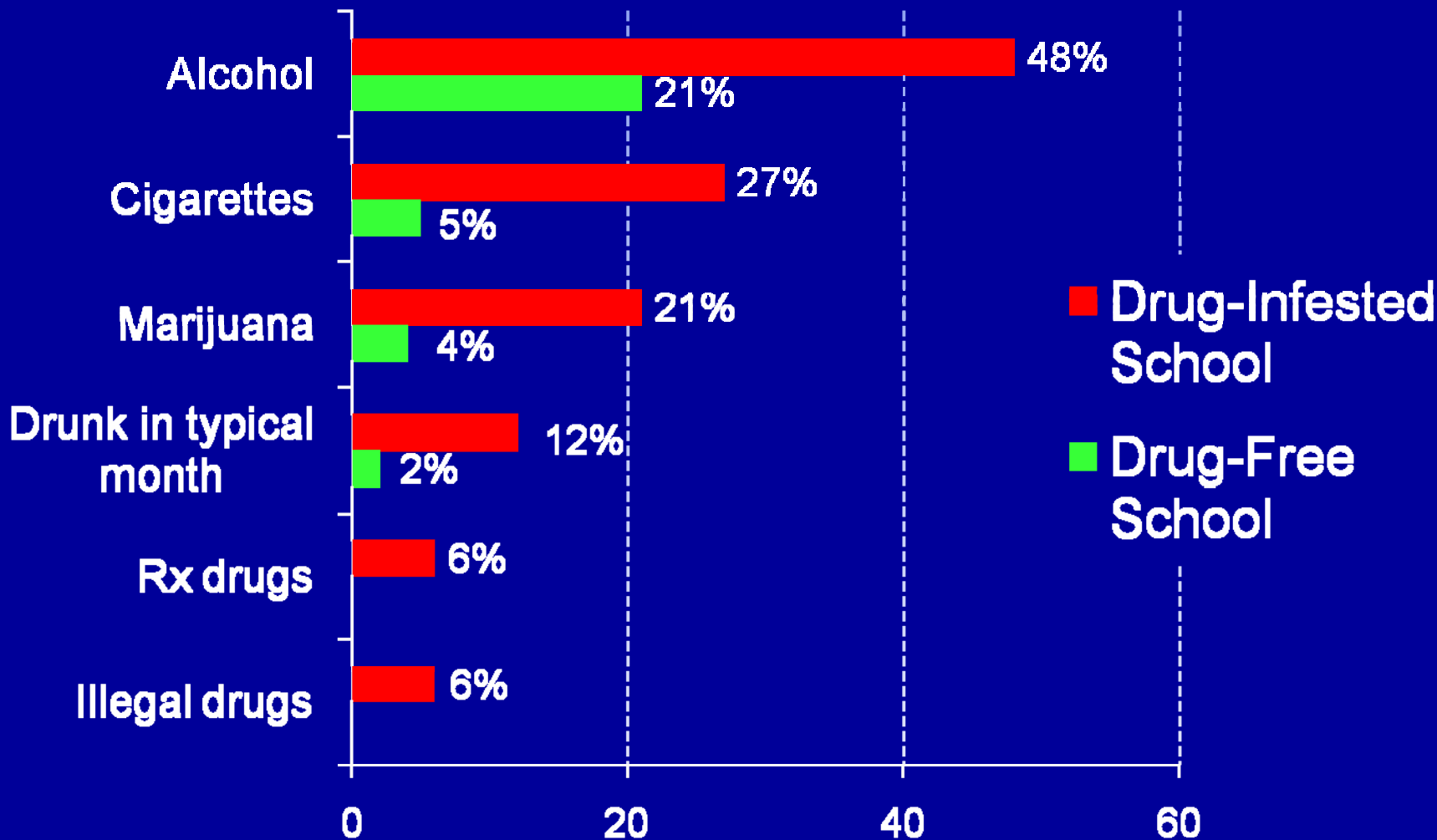
1. Supportive and caring teacher-student relationships

# Principles of effective prevention

1. Supportive and caring teacher-student relationships
2. Clear expectations for AOD-free school

# Percentage of teens who have used AODs by Drug-free vs. Drug-infested school

"Is your school a drug-free school or is it not drug free, meaning some students keep drugs, use drugs or sell drugs on school grounds?"



Source: Center for Addiction and Substance Abuse (CASA, 2007)

# Principles of effective prevention

1. Supportive and caring teacher-student relationships
2. Clear expectations for AOD-free school
3. Active disapproval of any AOD use

# Principles of effective prevention

1. Supportive and caring teacher-student relationships
2. Clear expectations for AOD-free school
3. Active disapproval of any AOD use
4. Monitor behavior, attendance, and grades
5. Accountability – effective responses

# Principles of effective prevention

1. Supportive and caring teacher-student relationships
2. Clear expectations for AOD-free school
3. Active disapproval of any AOD use
4. Monitor behavior, attendance, and grades
5. Accountability – effective responses
6. Drug-free and prosocial activities available

# Principles of effective prevention

1. Supportive and caring teacher-student relationships
2. Clear expectations for AOD-free school
3. Active disapproval of any AOD use
4. Monitor behavior, attendance, and grades
5. Accountability – effective responses
6. Drug-free and prosocial activities available
7. Strong teacher-parent relationships: school support for “authoritative” parenting



**What are practices and attitudes of “authoritative” (effective) parents?**

# Authoritative parents...

- Know they have influence (not control)
- Involved and supportive
- Warmth in communication
- Also, clear expectations and limits
- Non-permissive on any AOD use
- Monitors whereabouts, activities, peer relations, mood, school performance (*trust but verify*)
- Accountability when the rules are broken  
(*firm but fair*) consistency is important
- Understands the value of “natural consequences” for promoting learning

# Back to the teen brain...

Clear, non-permissive expectations helps teens with decision making; monitoring and use of natural consequences helps with learning

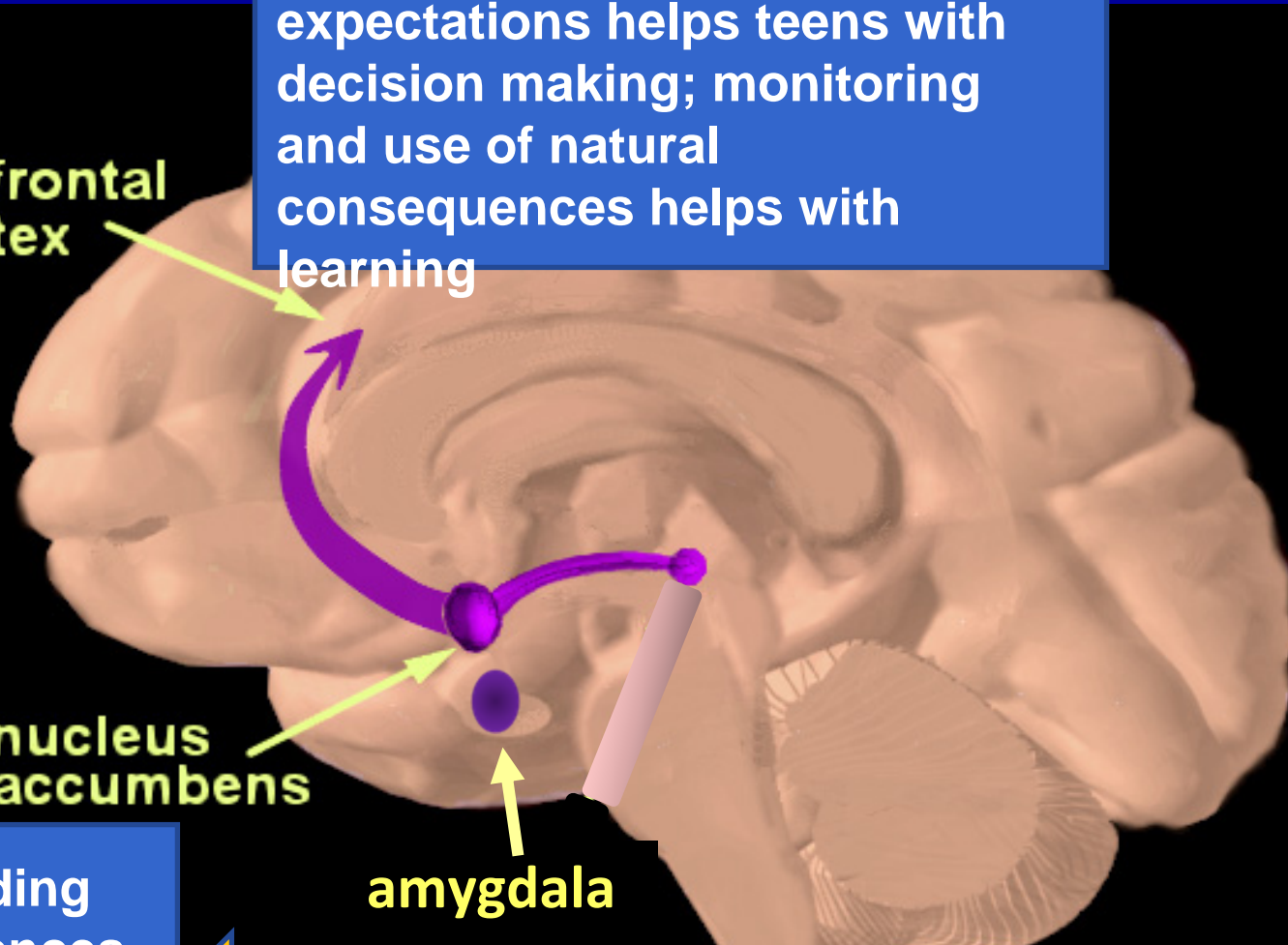
prefrontal cortex

nucleus accumbens

amygdala

Rewarding experiences promotes motivation

Expressing love, support, warmth promotes healthy emotional development



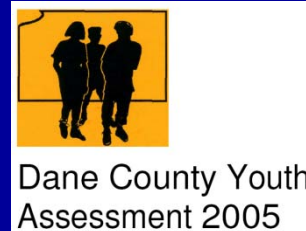
# Deerfield youth on their parents:

- Percentage of high school students who reported having “good conversations” about AOD with parents: **17%**
- Percentage of middle school students: **11%**

*Source: DCYA (2008)*

# My parents think it's wrong to drink alcohol

(% strongly agree/ agree)

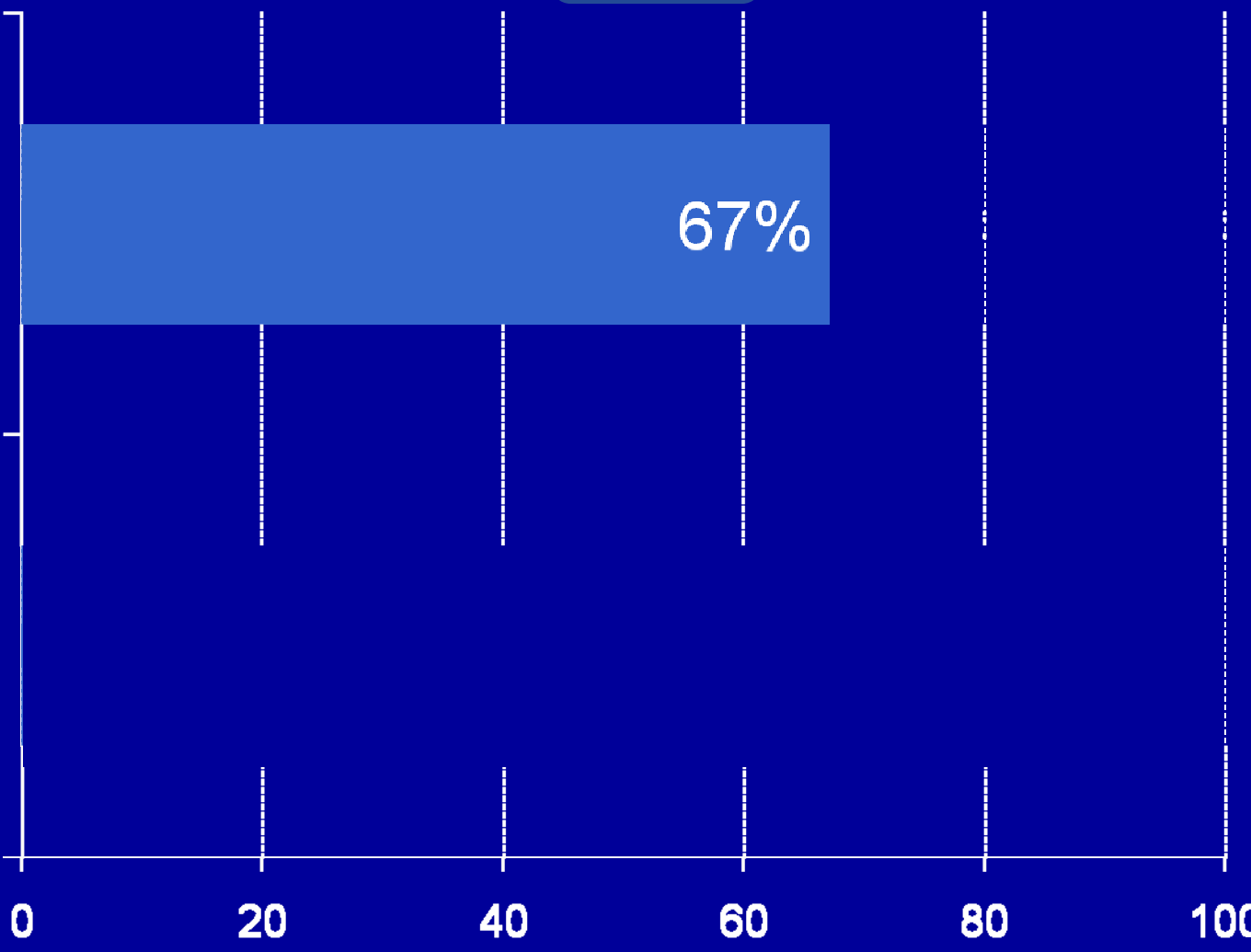


**88%**

Current drinkers

67%

Abstainers

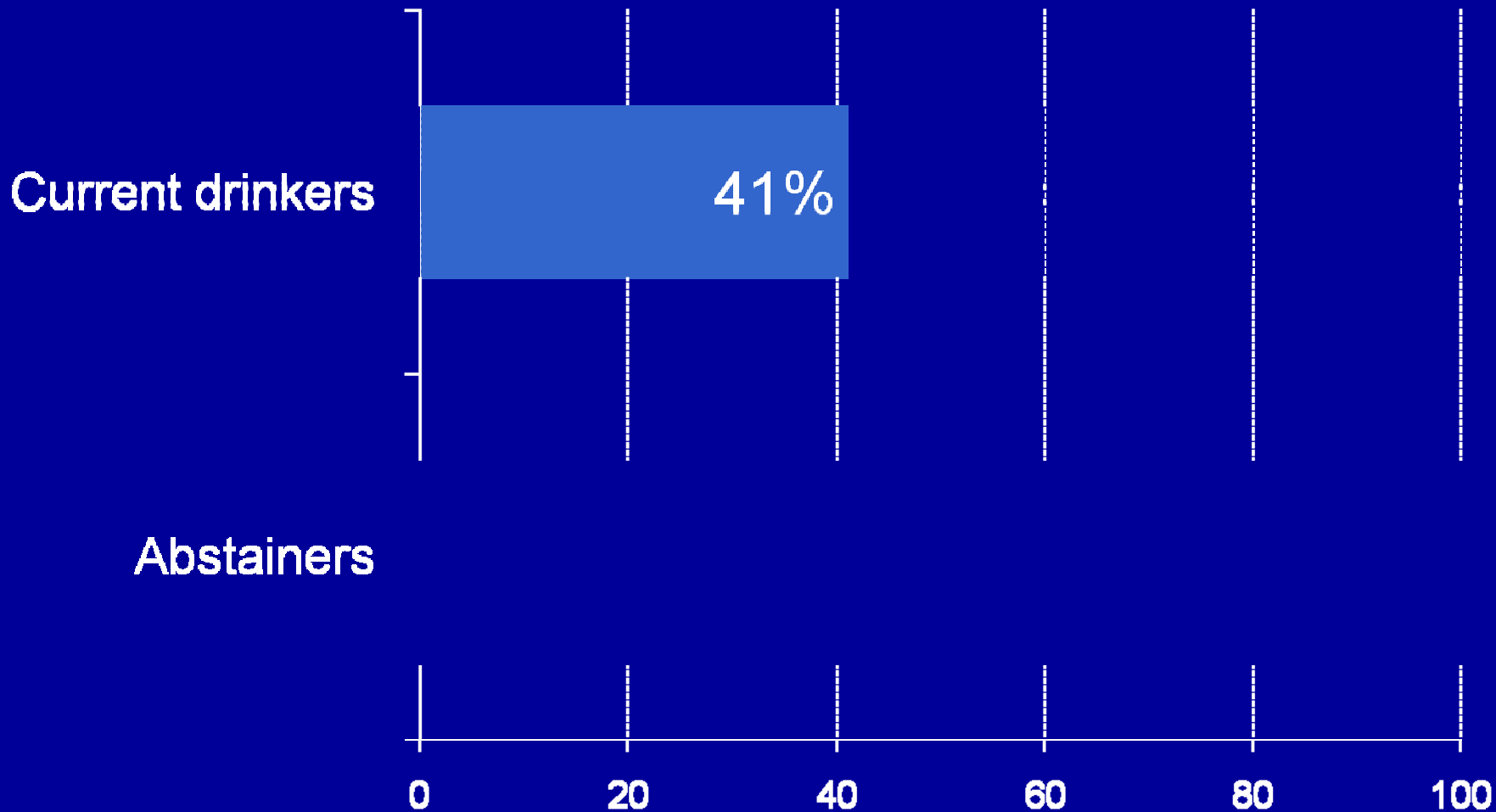
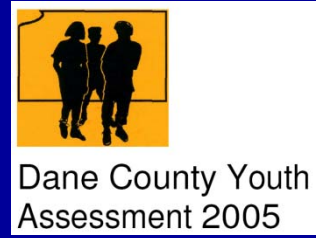


Source: DCYA (2008)

# My parents know what I'm doing after school

(% often/ very often)

**82%**



Source: DCYA (2008)

# Principles of effective prevention

1. Supportive and caring teacher-student relationships
2. Clear expectations for AOD-free school
3. Active disapproval of any AOD use
4. Monitor behavior, attendance, and grades
5. Accountability – effective responses
6. Drug-free and prosocial activities available
7. Strong teacher-parent relationships: school support for “authoritative” parenting
8. **“SBIRT” model for student services:**  
Screening, Brief Intervention, Referral for Treatment

# Summary: Dispelling Common Myths about Teens and AODs

- Teens are not basically “mini adults”
- Most Deerfield high school students are abstaining from alcohol and other drugs
- However... alcohol can profoundly impact teens in ways that are different than adults
- Regular marijuana use can lead to addiction
- Peer pressure does not drive AOD problems; peer selection does with biopsychsocial factors
- There is a great deal that can be done to deter AOD use initiation and reduce risk



*Thank you!*

sb.caldwell@hotmail.com