

DRUG ABUSE & ADDICTION

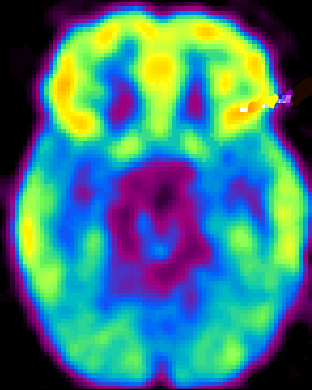
Preventable Brain Diseases

Wilson M. Compton, M.D., M.P.E.
Deputy Director
National Institute on Drug Abuse

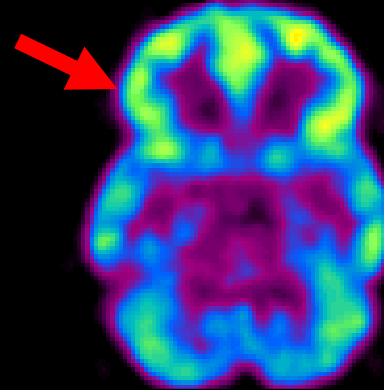


ADDICTION IS A **DISEASE OF THE BRAIN** *as other diseases it affects the tissue function*

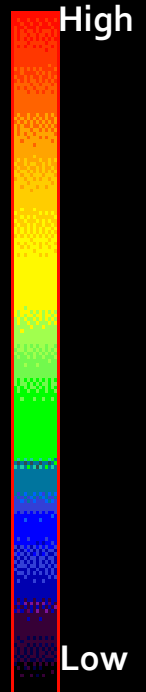
Decreased Brain Metabolism in **Drug Abuse Patient**



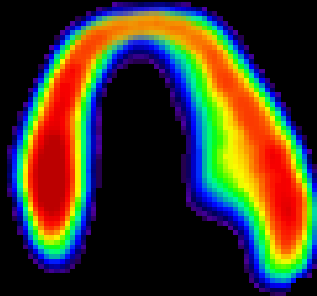
Control



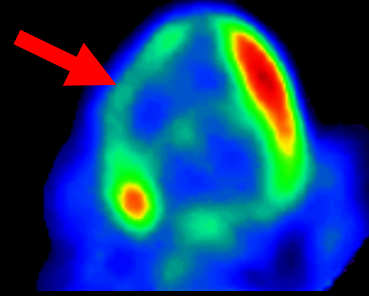
Cocaine Abuser



Decreased Heart Metabolism in **Heart Disease Patient**



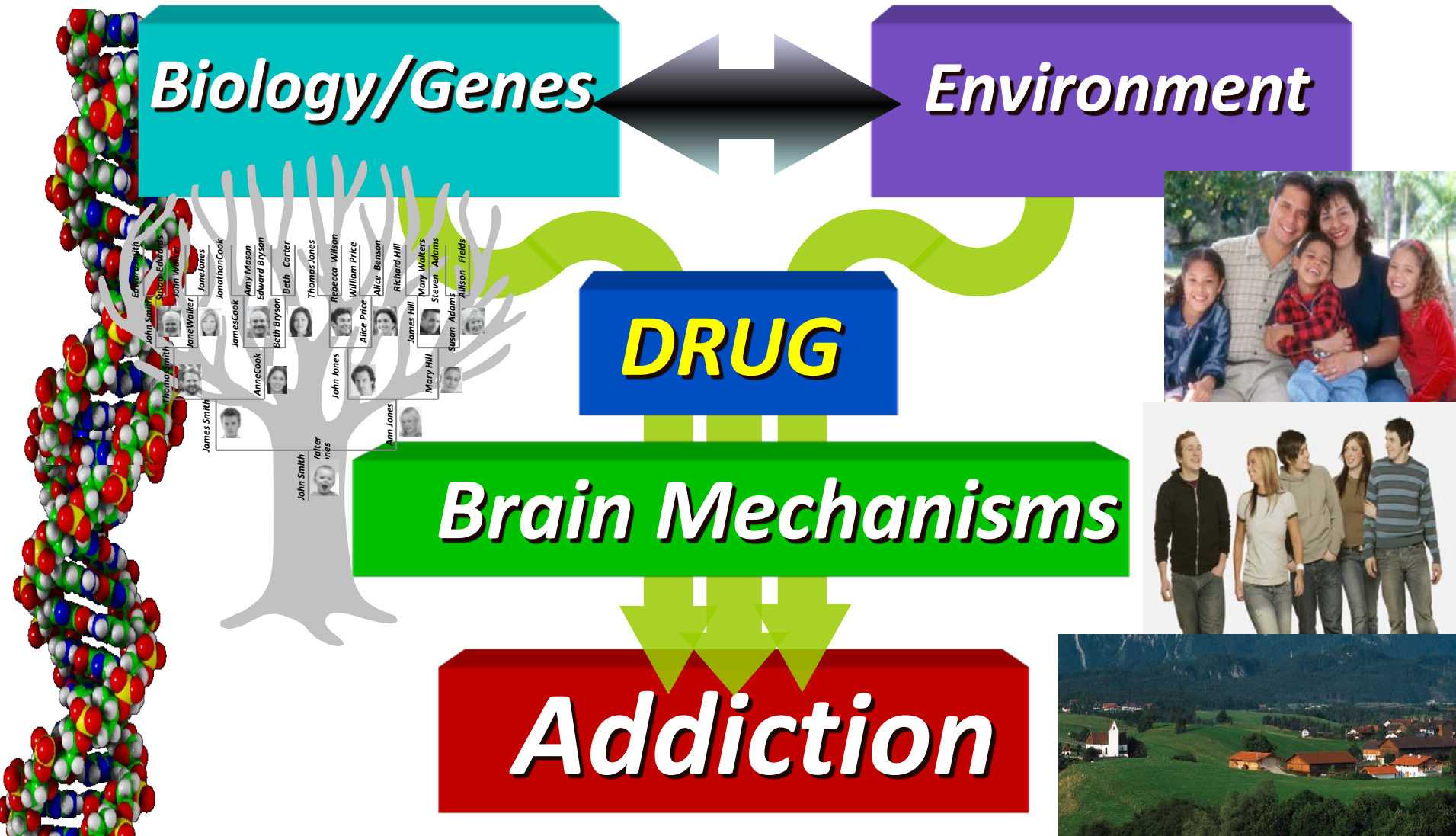
Healthy Heart

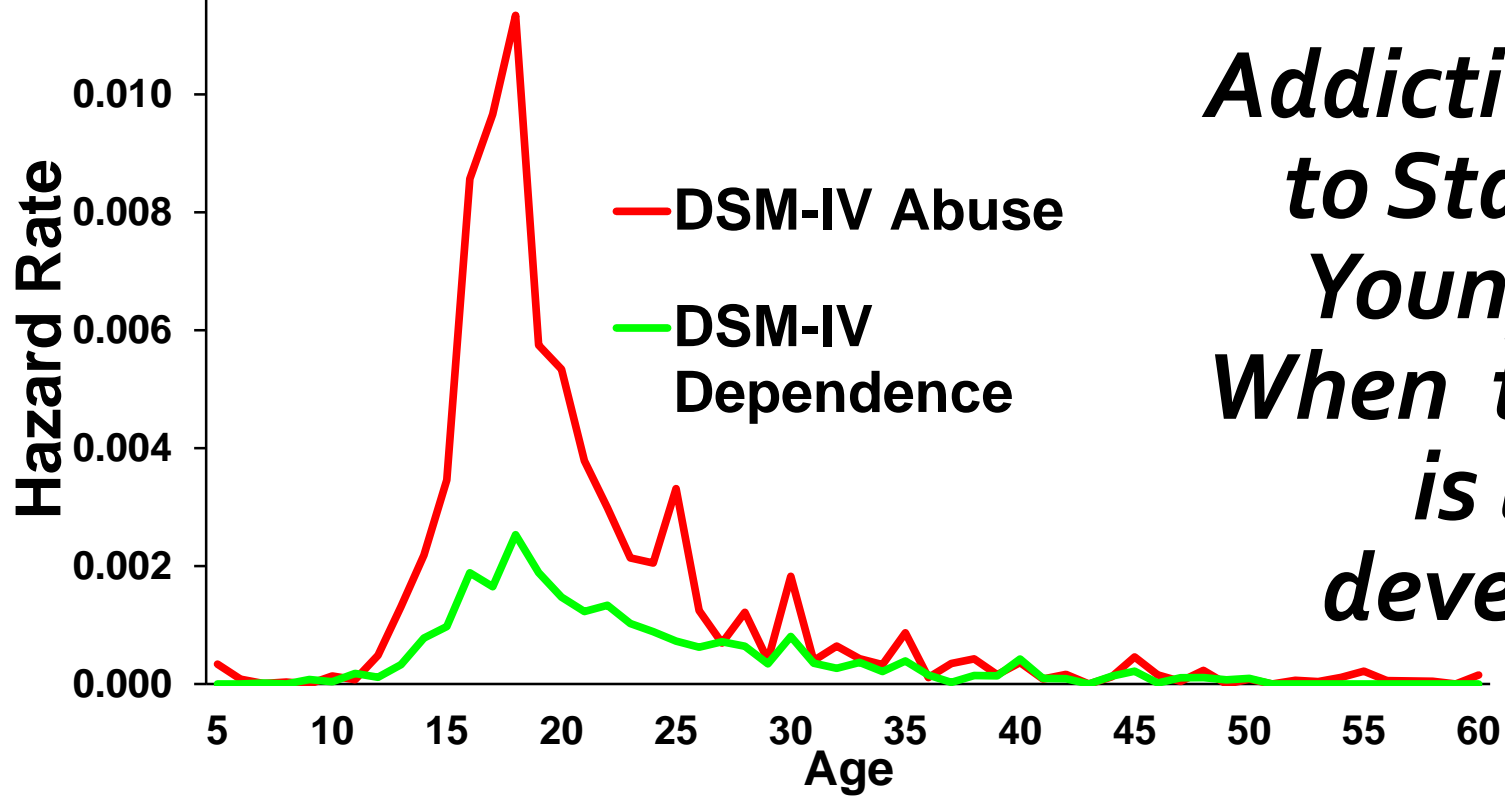


Diseased Heart

Sources: From the laboratories of Drs. N. Volkow and H. Schelbert

Many Factors Lead to Drug Abuse and Addiction

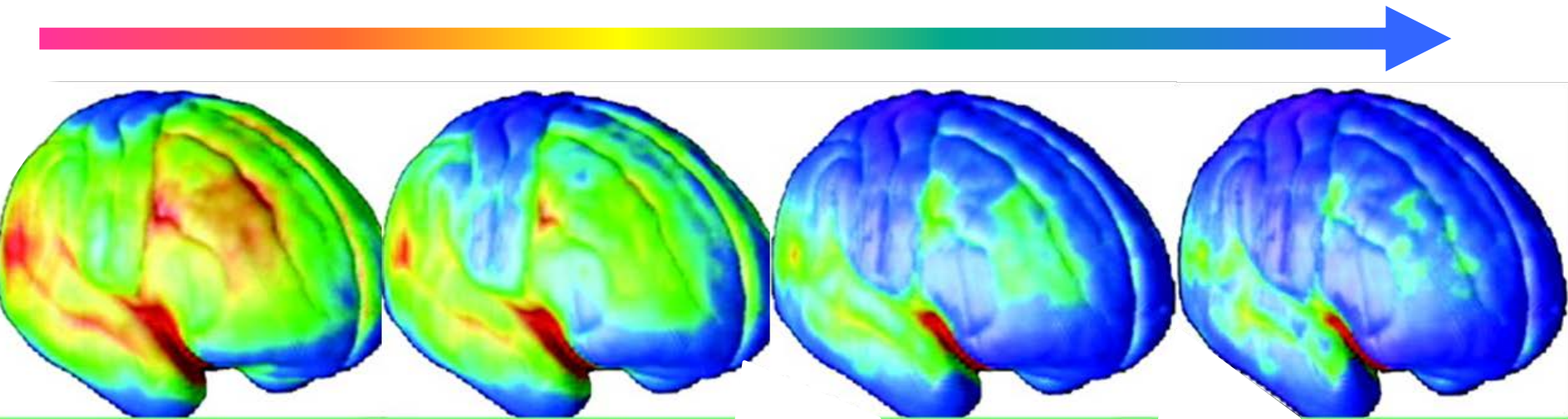




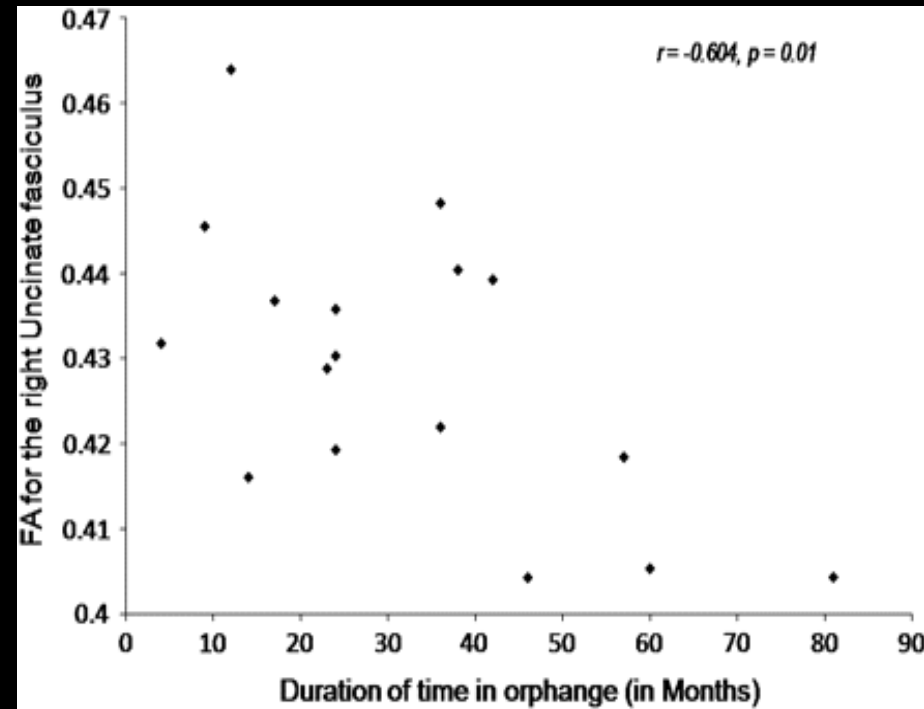
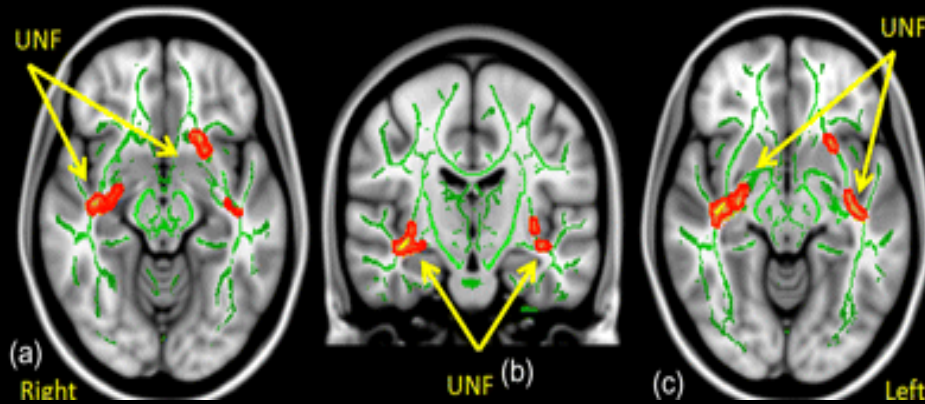
Addiction Tends to Start at a Young Age: When the brain is less developed

Age of Onset of Drug Abuse and Dependence

Source: Compton, et al. *Archives of General Psychiatry* 2007. NESARC Study.

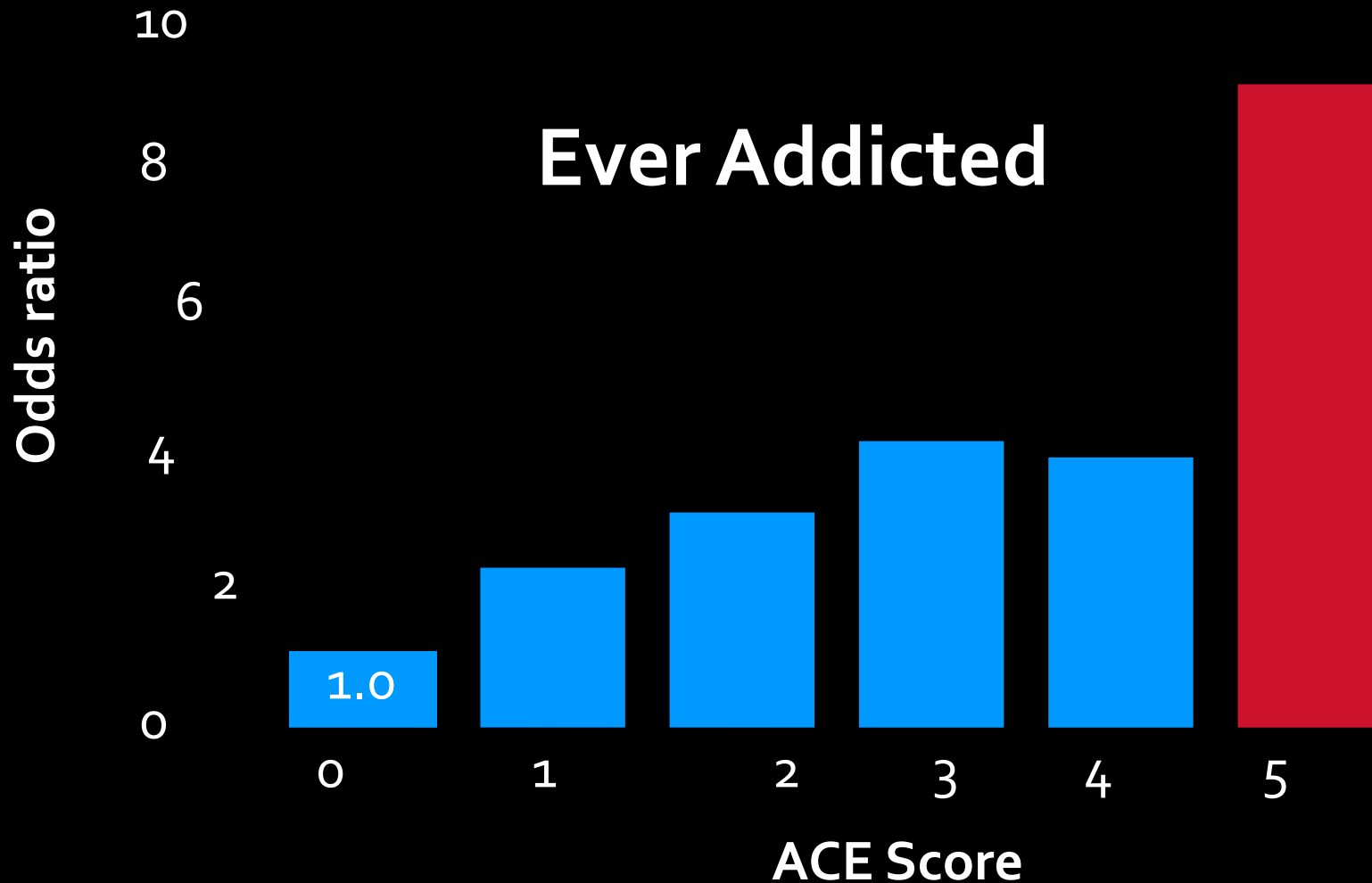


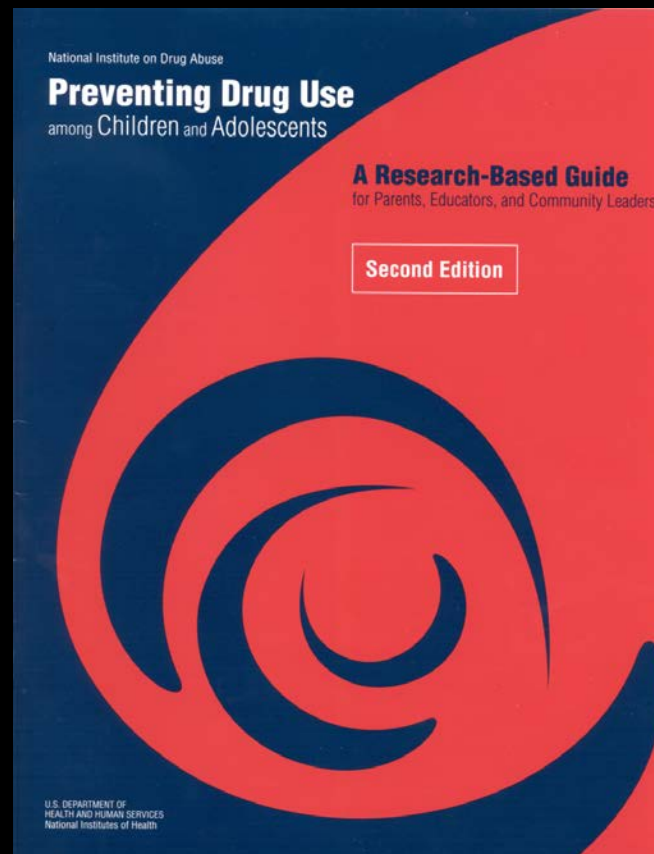
Social Neglect During Early Childhood Decreases Brain Connectivity



Children in an orphanage who experienced deprivation had fewer connections between the parts of brain that regulate emotions and the parts that control thinking

Adverse Childhood Experiences (ACE) Affect Illicit Drug Use





**Preventive Interventions Can
Have Long-term Effects on Drug
Use and Abuse**



EXAMPLES OF RISK AND PROTECTIVE FACTORS

Risk Factors	Domain	Protective Factors
Early Aggressive Behavior	Individual	Self-Control
Poor Social Skills	Individual	Positive Relationships
Lack of Parental Supervision	Family	Parental Monitoring and Support
Substance Abuse	Peer	Academic Competence
Drug Availability	School	Anti-Drug Use Policies
Poverty	Community	Strong Neighborhood Attachment

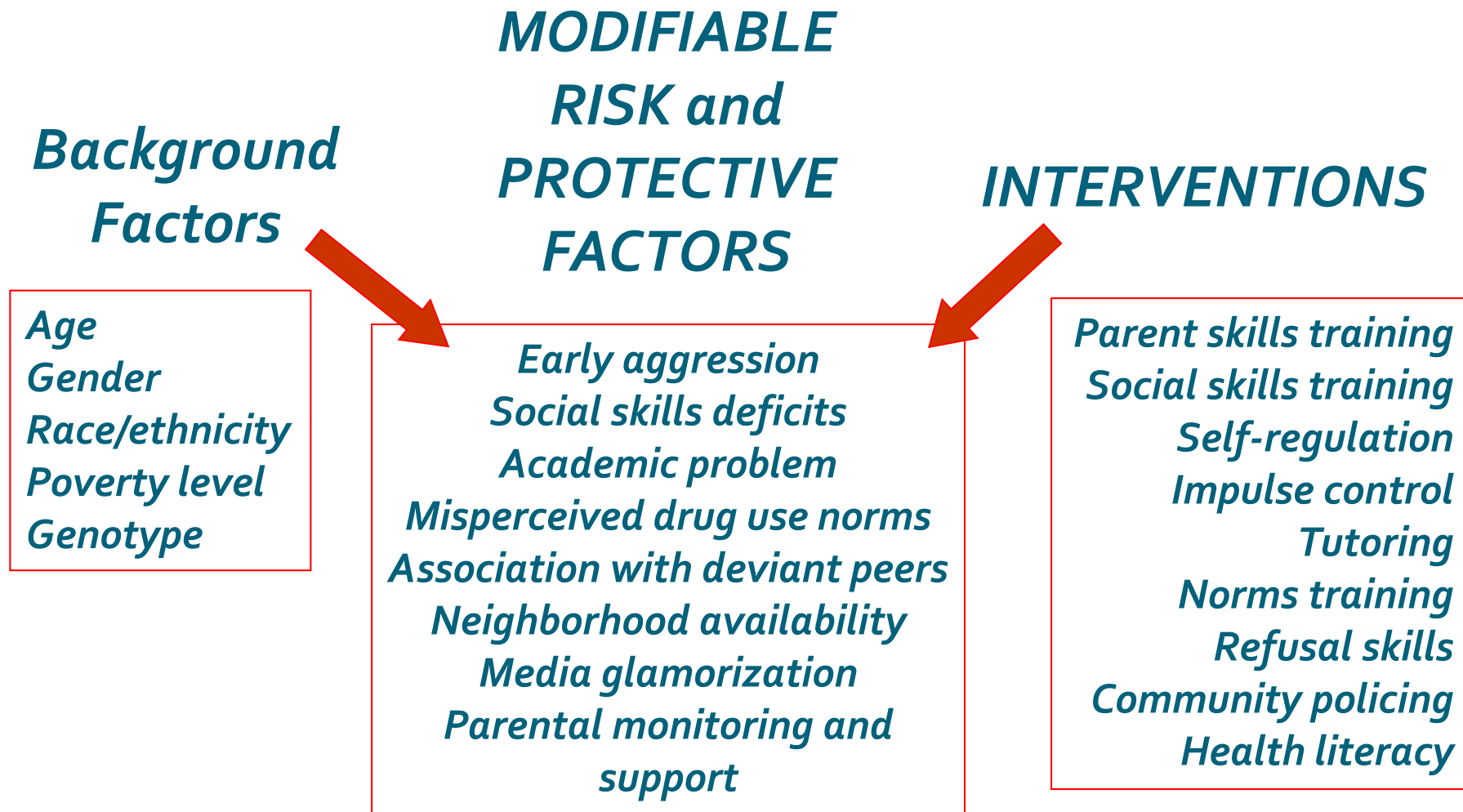
Reduce these



Elevate these

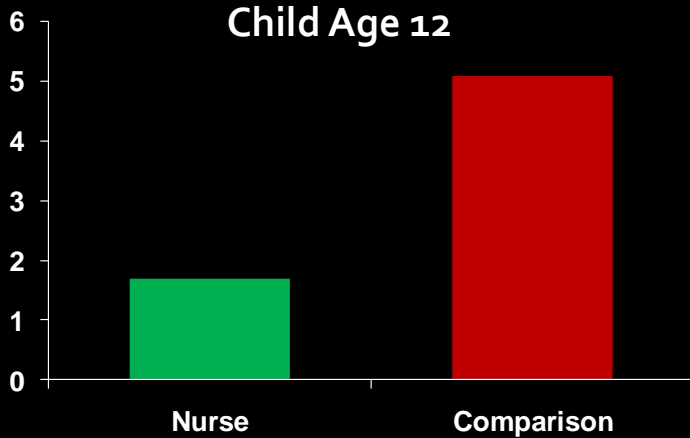
- Prevention Approaches Should Enhance Protective Factors & Reduce Risk Factors**

How Prevention Interventions Work

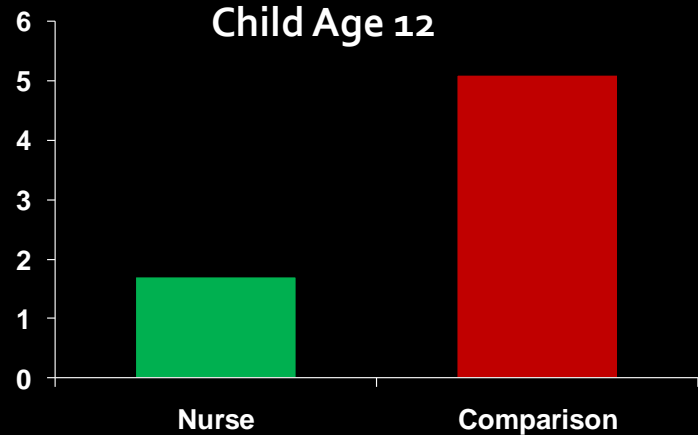


Nurse Home Visiting during pregnancy and first two years impacts substance use, mental health and academics

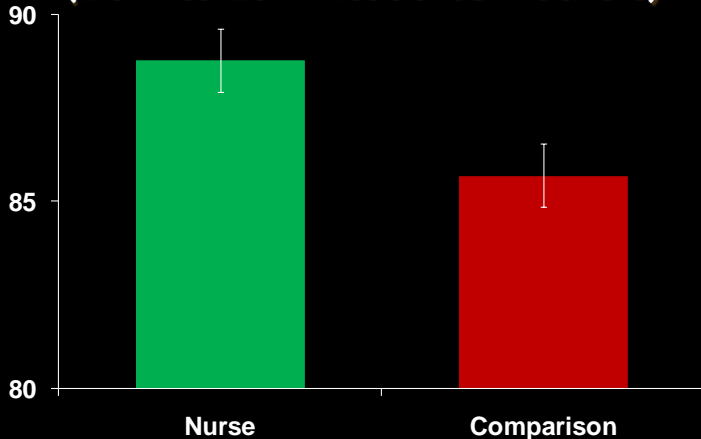
Percent of Children Who Used Tobacco, Alcohol, or Marijuana (Last 30 Days)



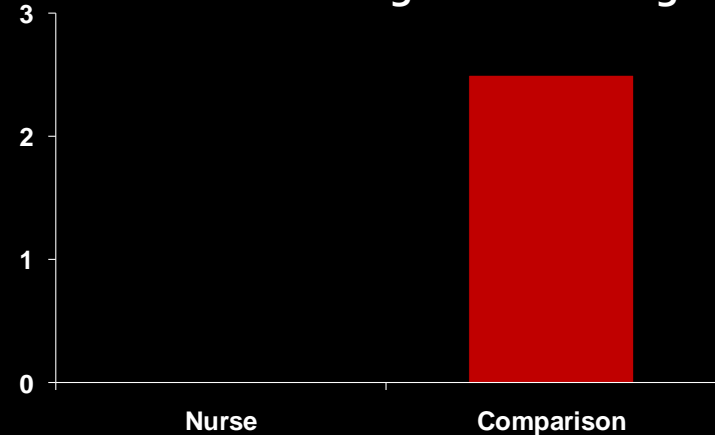
Percent of Children with Internalizing Problems (Borderline or Clinical)



PIAT Scores - Reading & Math – Age 12 (Born to Low-Resource Mothers)

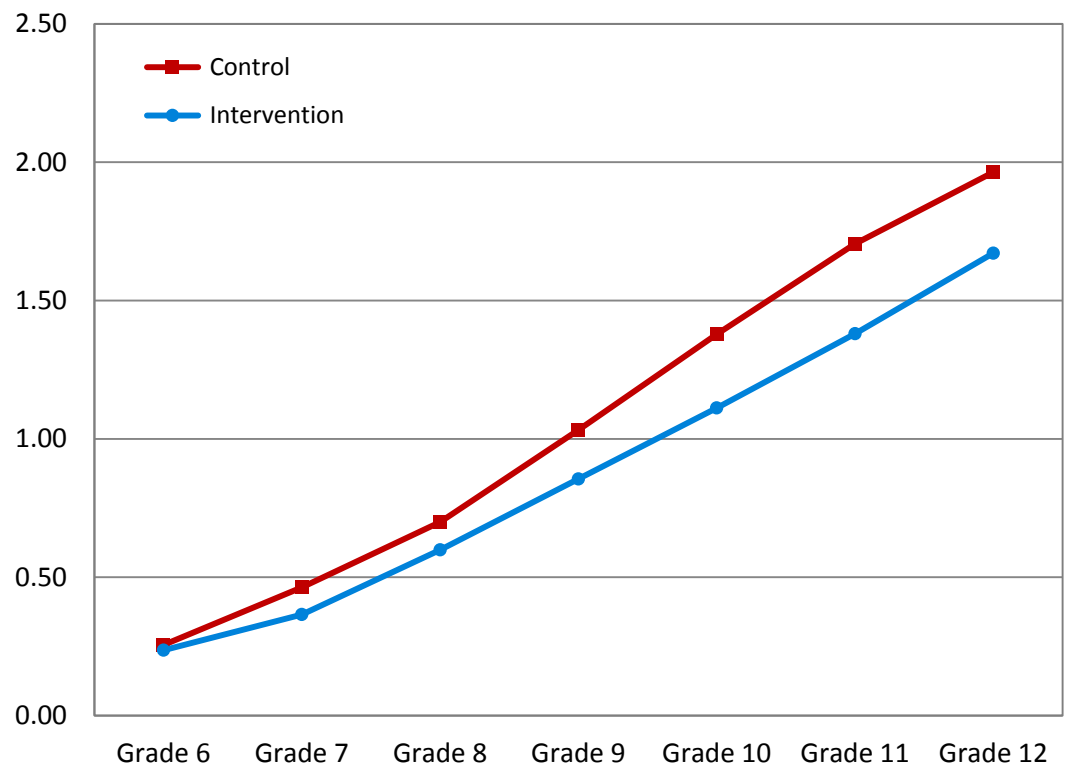


Percent of Mothers with Role Impairment due to Alcohol or Drug Use – Child Age 12



PROSPER (Community/University Partnership) Reduces Illicit Substance Use

Reduced Increase in Use Through 6½ Years Past Baseline

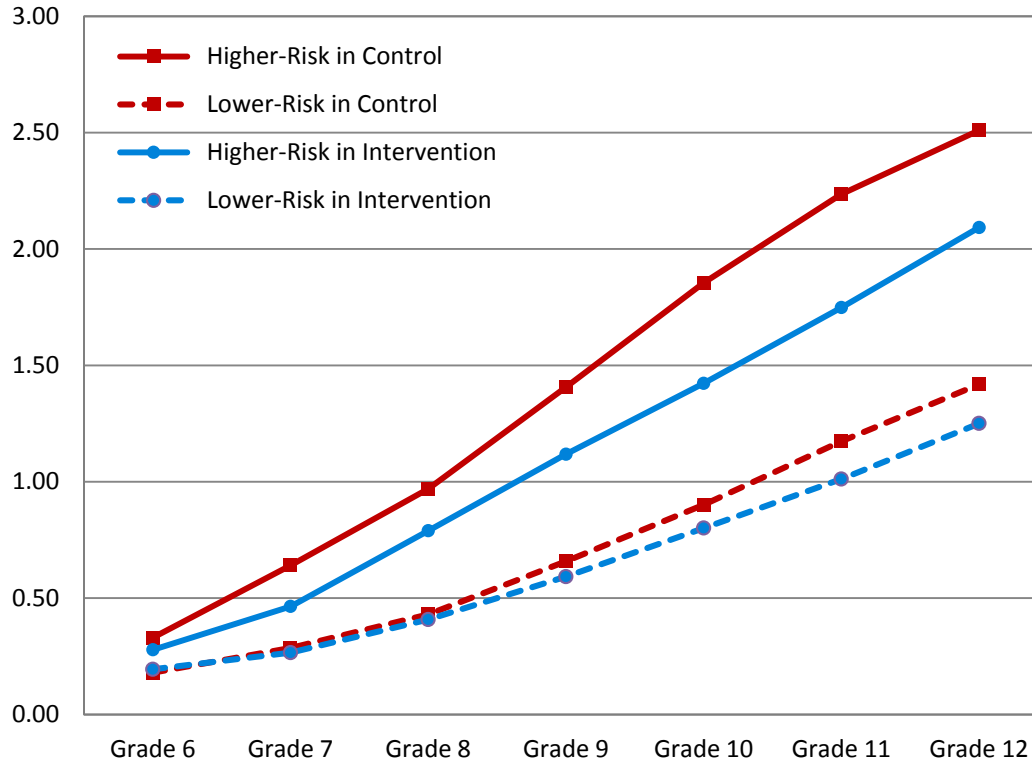


Sum of six lifetime illicit use measures (methamphetamines, Ecstasy, inhalants, Vicodin, prescription drug misuse overall, other illicit drug use); Intervention vs. Control difference in slope is statistically significant, as are differences at multiple time points, including 11th and 12th grades.

Source: Spoth, Redmond, Shin, Greenberg, Feinberg, et al. (2013). PROSPER community-university partnerships delivery system outcomes through 6½ years past baseline.

PROSPER (Community/University Partnership) Reduces Illicit Substance Use

Greater Impact of PROSPER on High Risk Youth Through 6½ Years Past Baseline

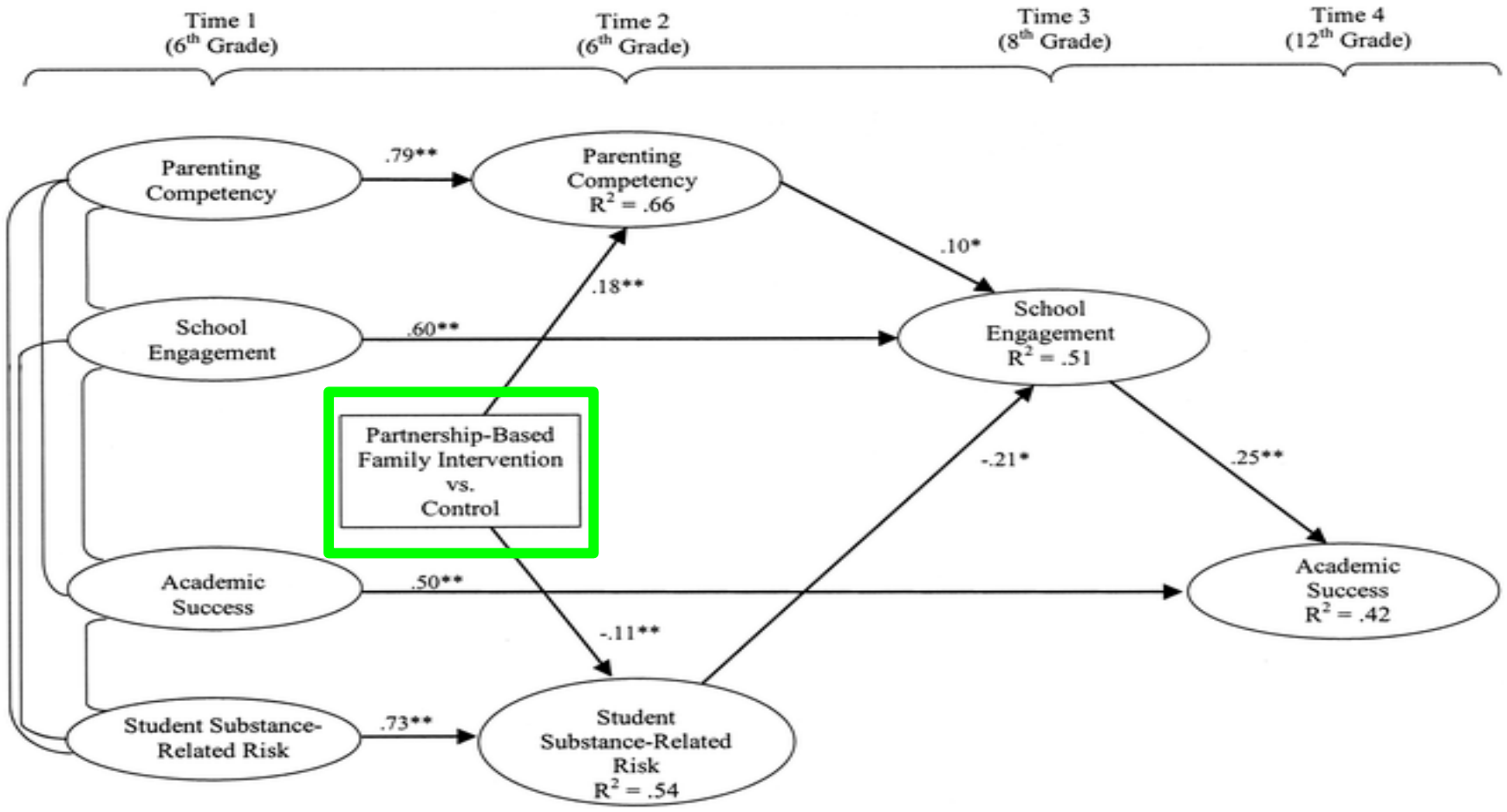


**Higher Risk = Lifetime initiation of alcohol, cigarette or marijuana use at baseline;
Lower Risk = No initiation at baseline.**

Intervention effects are significantly stronger for the Higher-Risk subgroup, as compared to the Lower-Risk Subgroup.

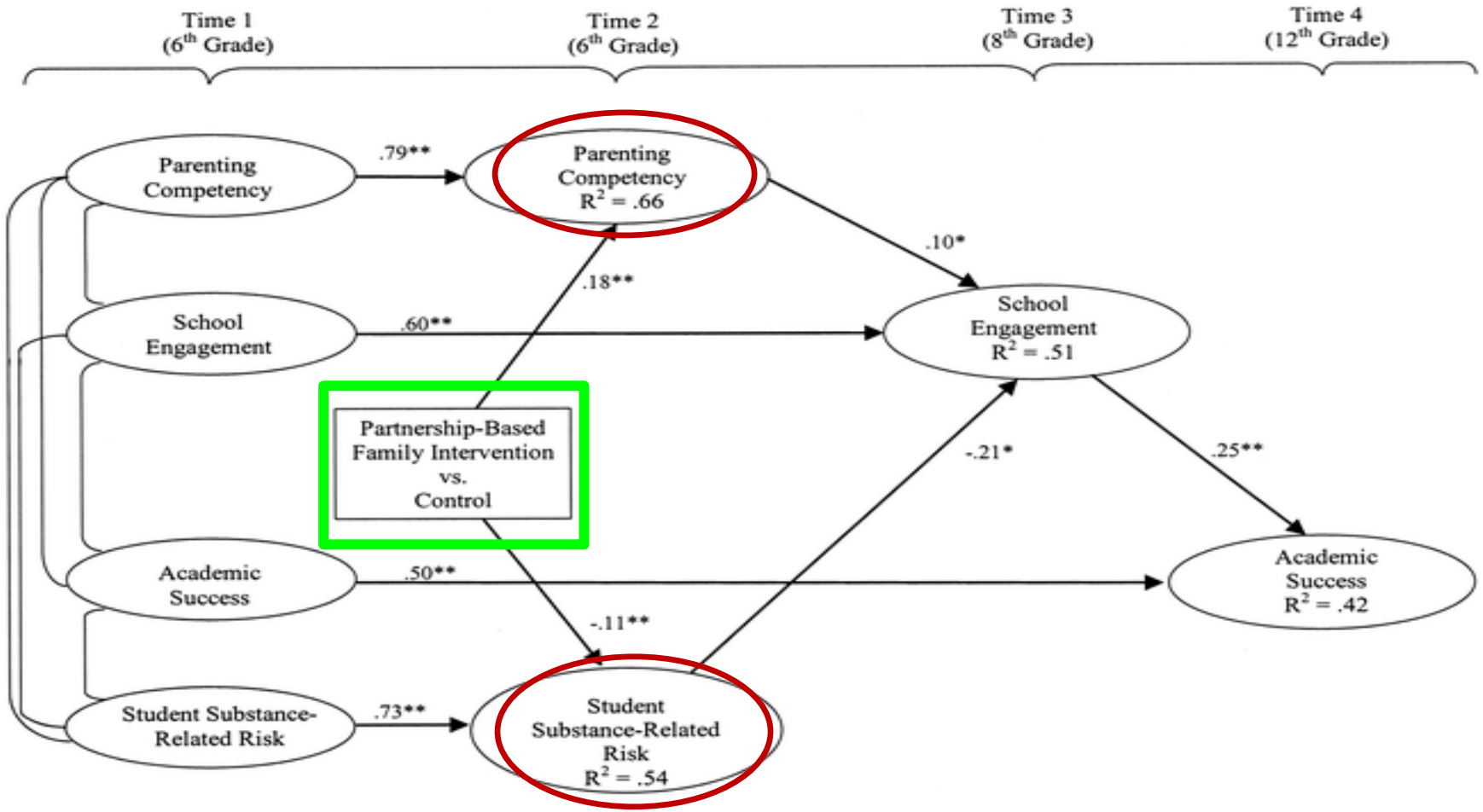
Source: Spoth, Redmond, Shin, Greenberg, Feinberg, et al. (2013). PROSPER community-university partnerships delivery system outcomes through 6½ years past baseline.

Strengthening Families Program 10-14 during Grade 6 Leads to Greater Academic Success in Grade 12



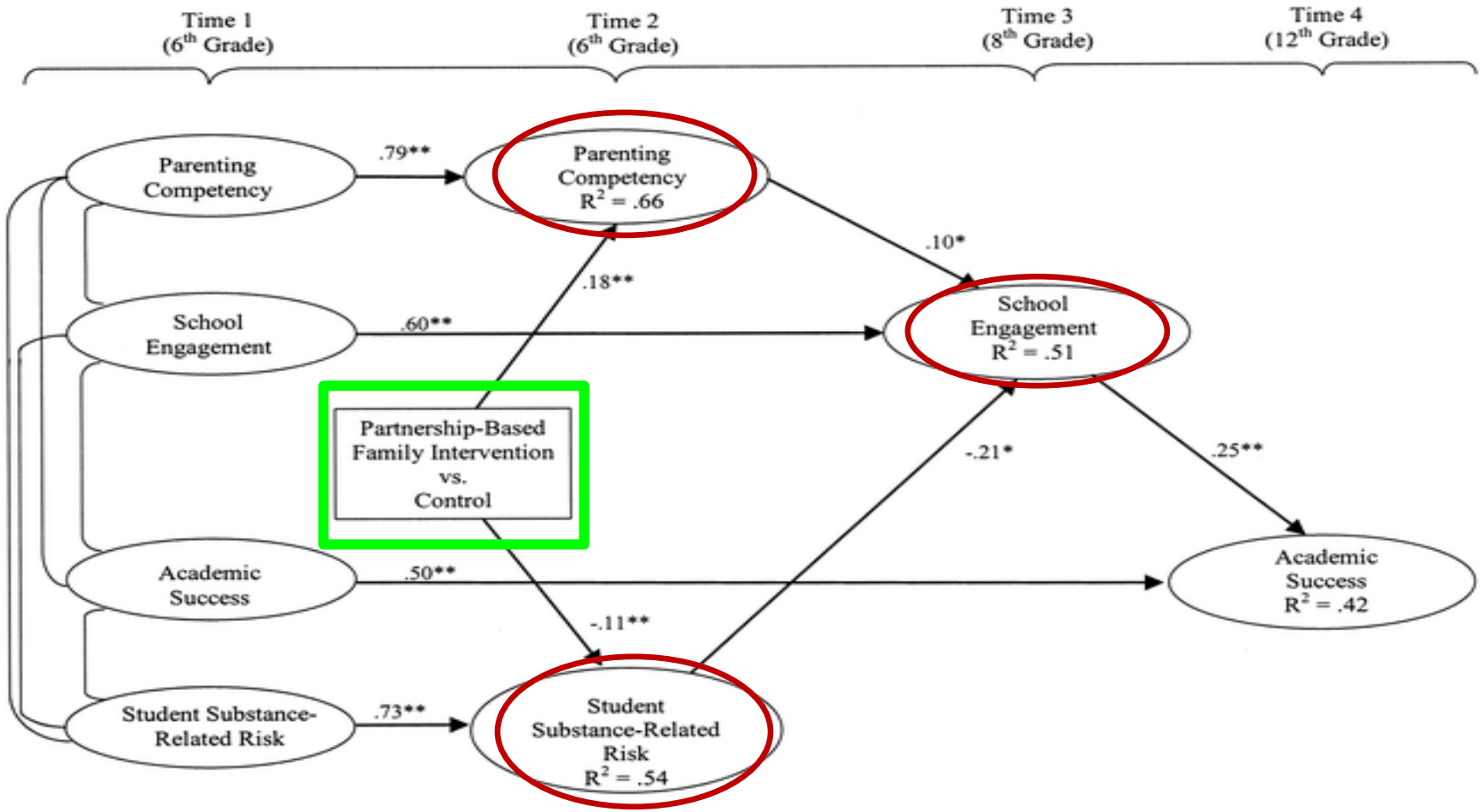
Spoth, R., Randall, G. K., & Shin, C. (2008) School Psychology Quarterly, 23(1), 70-89

Strengthening Families Program 10-14 during Grade 6 Leads to Greater Academic Success in Grade 12



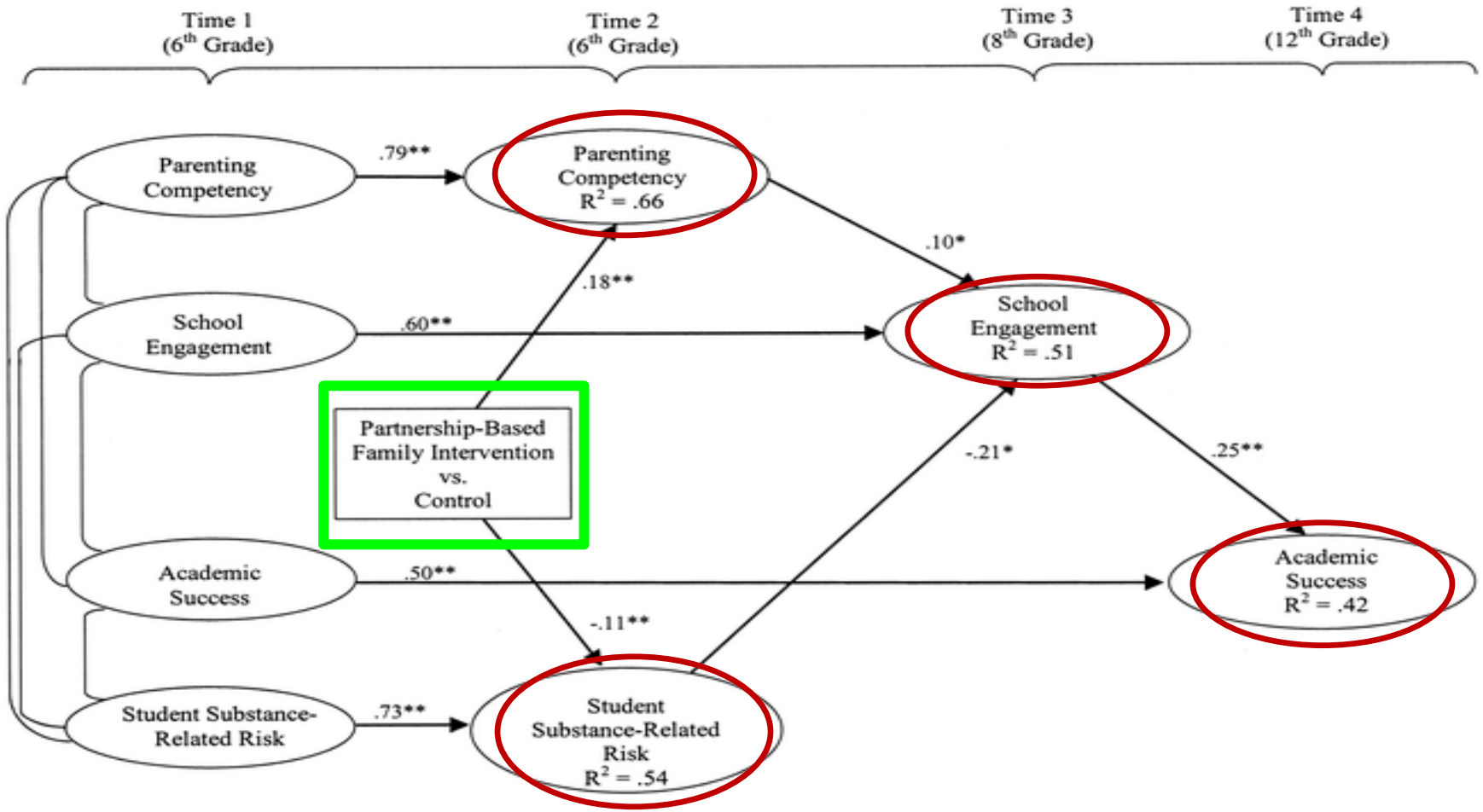
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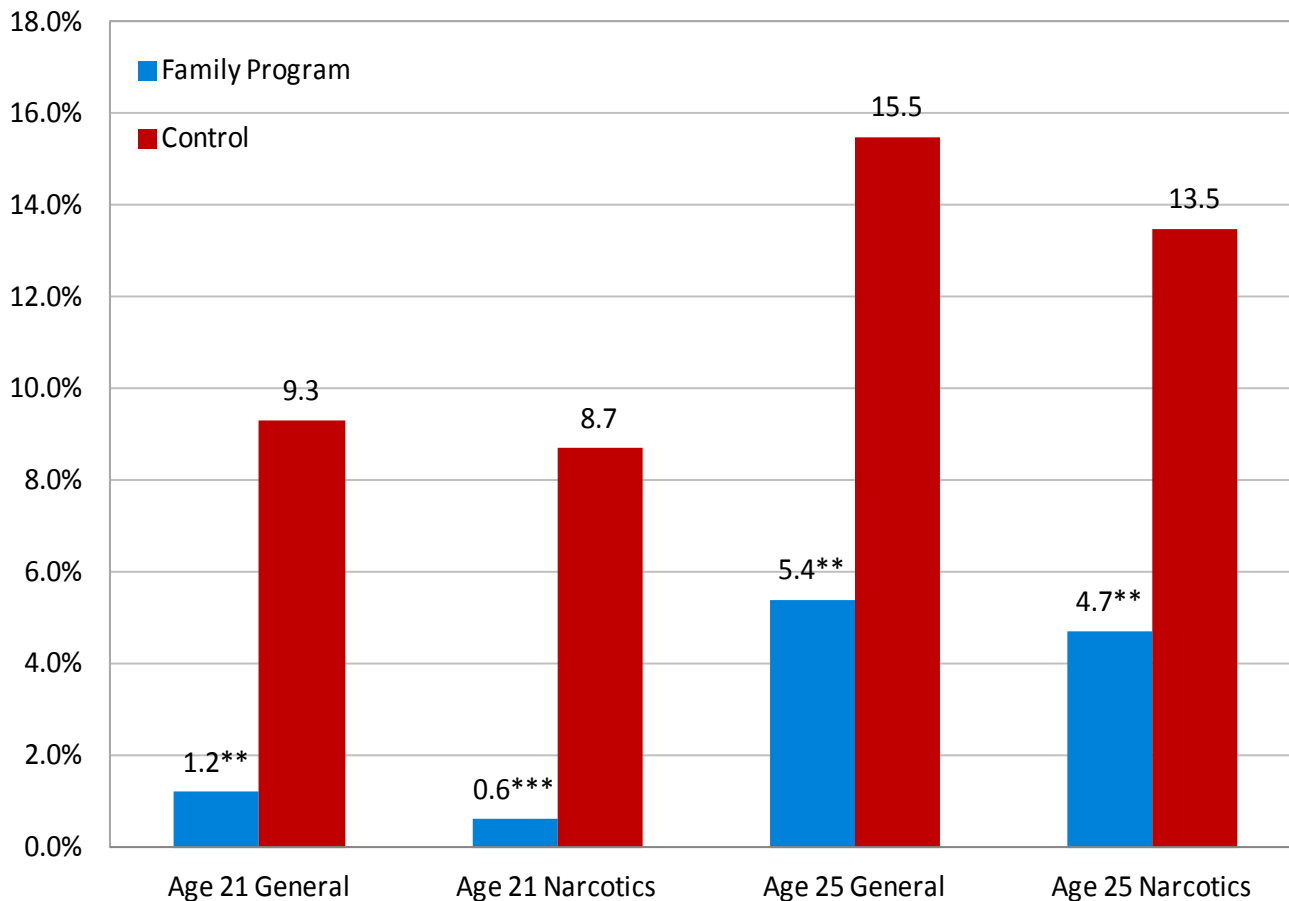
Spoth, R., Randall, G. K., & Shin, C. (2008) School Psychology Quarterly, 23(1), 70-89

Strengthening Families Program 10-14 during Grade 6 Leads to Greater Academic Success in Grade 12



Spoth, R., Randall, G. K., & Shin, C. (2008) School Psychology Quarterly, 23(1), 70-89

Universal Drug Abuse Prevention *Reduces Prescription Drug Misuse*



** $p < .01$; *** $p < .001$; Relative Reduction Rates (RRRs)= 65-93%

Notes: General=Misuse of narcotics or CNS depressants or stimulants.

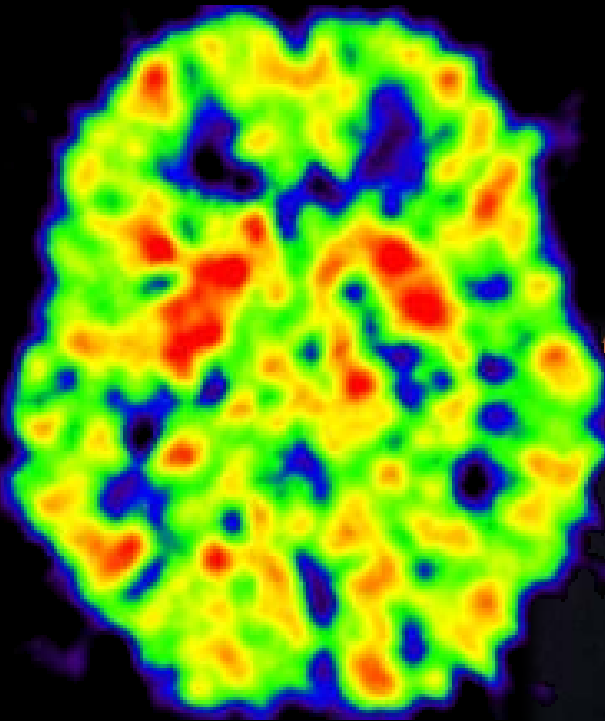
Source: R Spoth et al. *American Journal of Public Health* 2013

In this study, for 100 young adults in general population starting Rx abuse, only 35 young adults from an intervention community started.

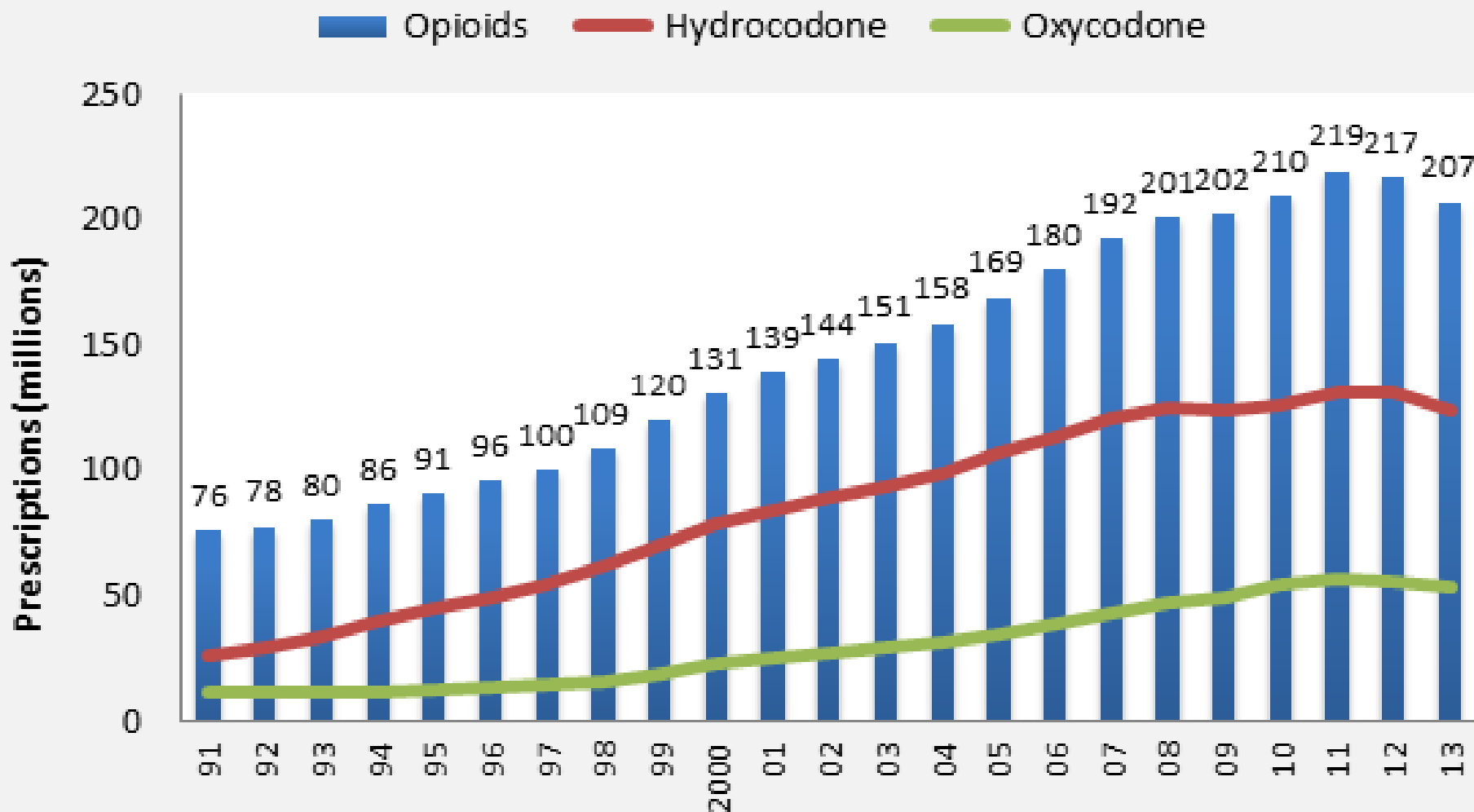
Overall, three studies now suggest the impact of universal prevention on prescription drug abuse.

Prescription Drug Abuse:

It's NOT What the Doctor Ordered!



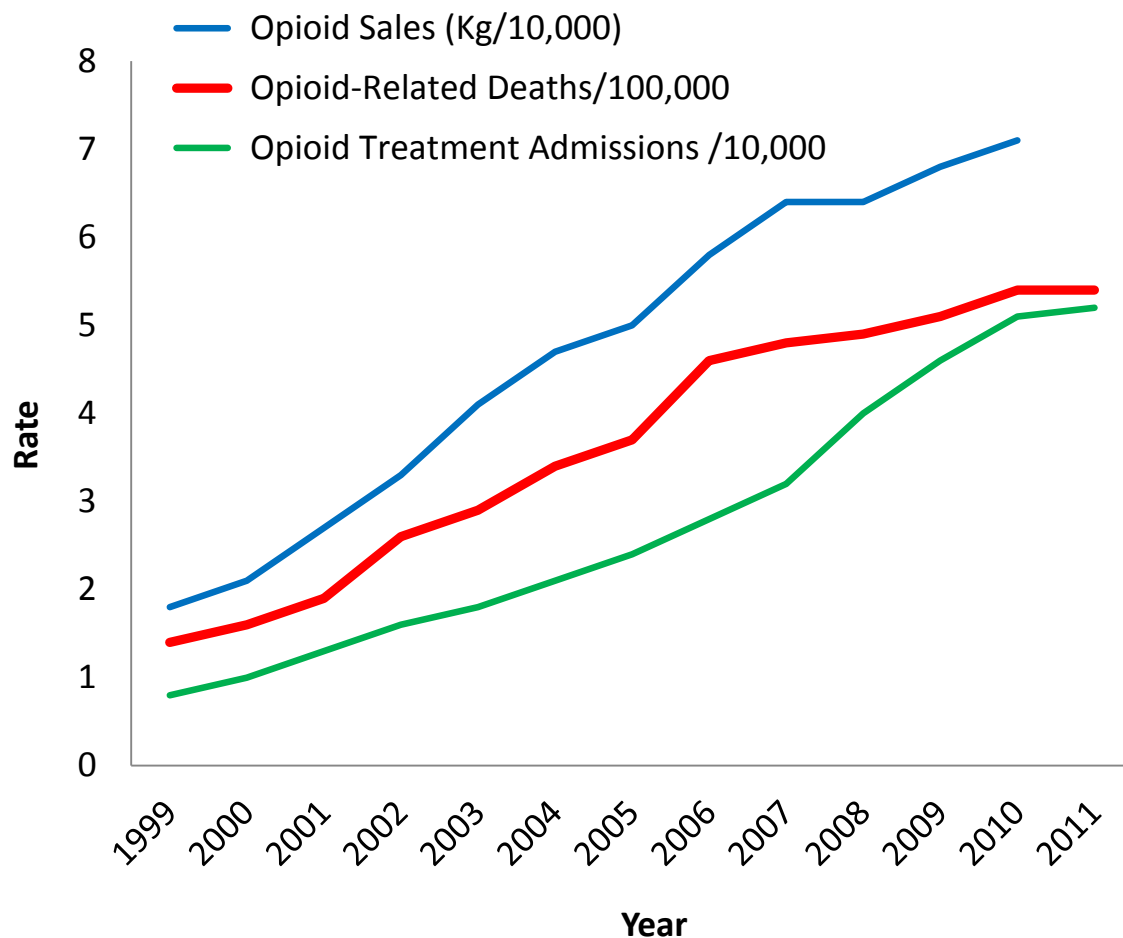
Near Tripling of Opioid Prescriptions Dispensed by U.S. Retail Pharmacies, Years 1991-2013



IMS Health, Vector One®: National, Years 1991-2011, Data Extracted 2012

IMS Health, National Prescription Audit, Years 2012-2013, Data Extracted 2014

Marked Increases in Opioid-related Deaths (parallel to opioid sales and Rx opioid treatment admits), USA

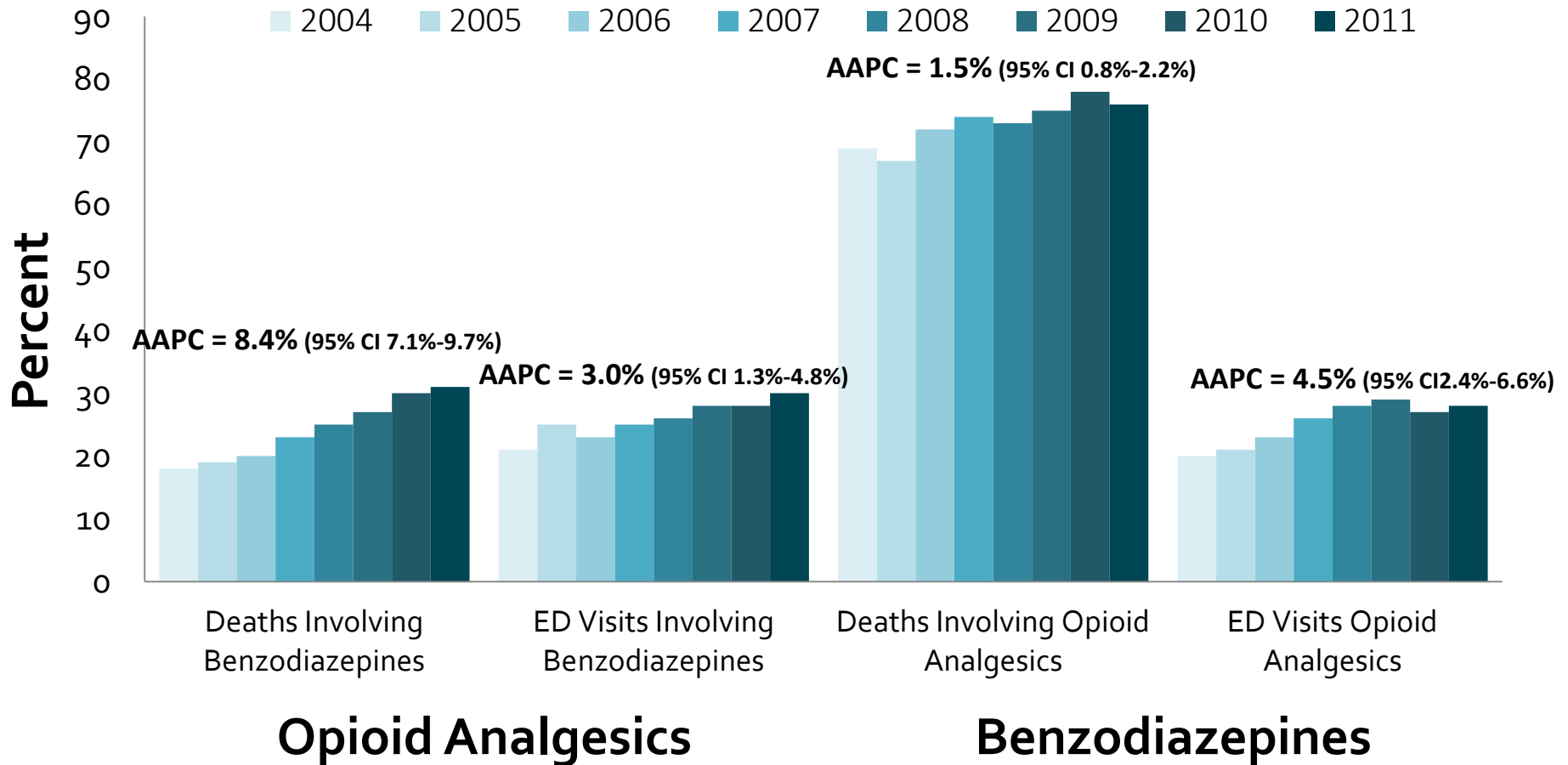


2013 OD Deaths:

- **43,982 Any Drug**
- **16,235 Rx opioid**
- **8,257 Heroin**

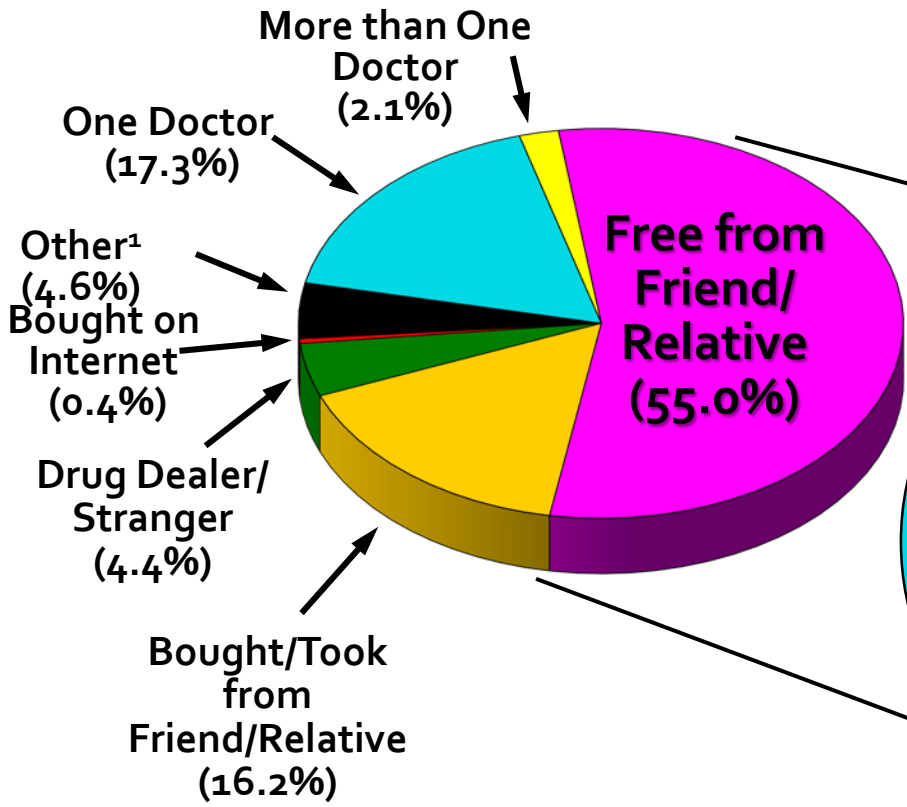
Overlap of Benzodiazepines and Opioids in USA

Opioid Analgesic ED Visits and OD Deaths Involving Benzodiazepines & Benzodiazepine ED Visits and OD Deaths Involving Opioids

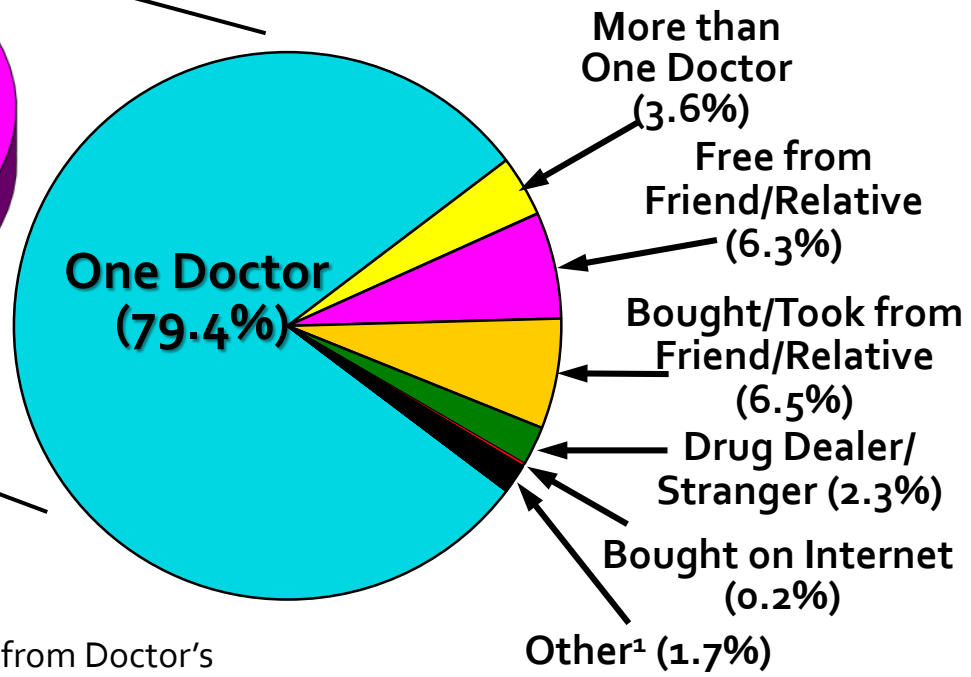


People Abusing Analgesics DIRECTLY & INDIRECTLY Obtain Them by Prescription: *Most Recent Pill Source*

Source Where Respondent Age 12+ Obtained Analgesics:



Source Where Friend/Relative Obtained



¹Other category includes Wrote Fake Prescription, "Stole from Doctor's Office/Clinic/Hospital/Pharmacy," and "Some Other Way."

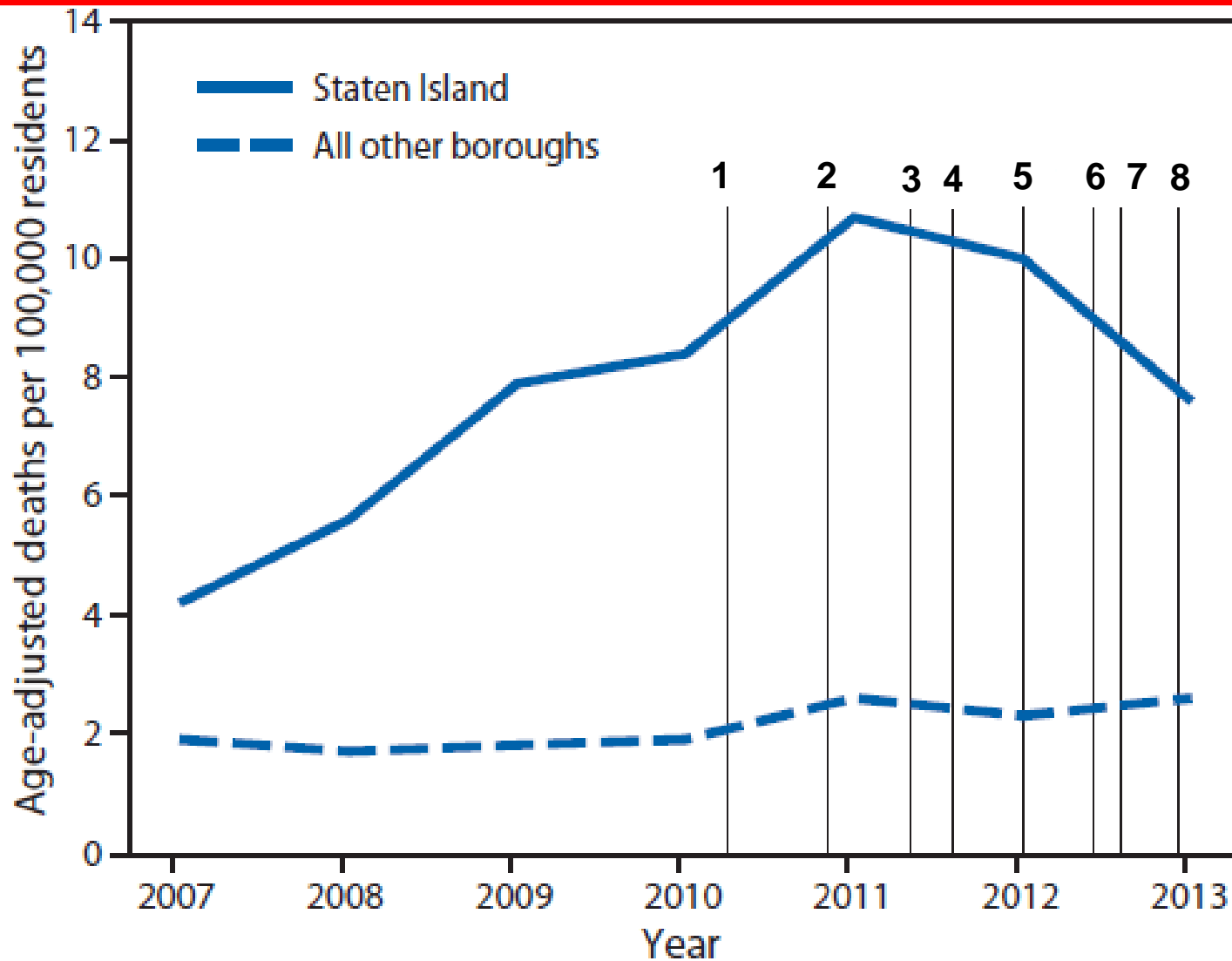
Prescription Drug Abuse:

What can be done?

- **Primary Prevention**
- **Less abusable analgesics**
- **Overdose Intervention**
- **Better Access to Effective Addiction Treatments**
(especially medications for opioid addiction)
- **Public and Clinician Education**



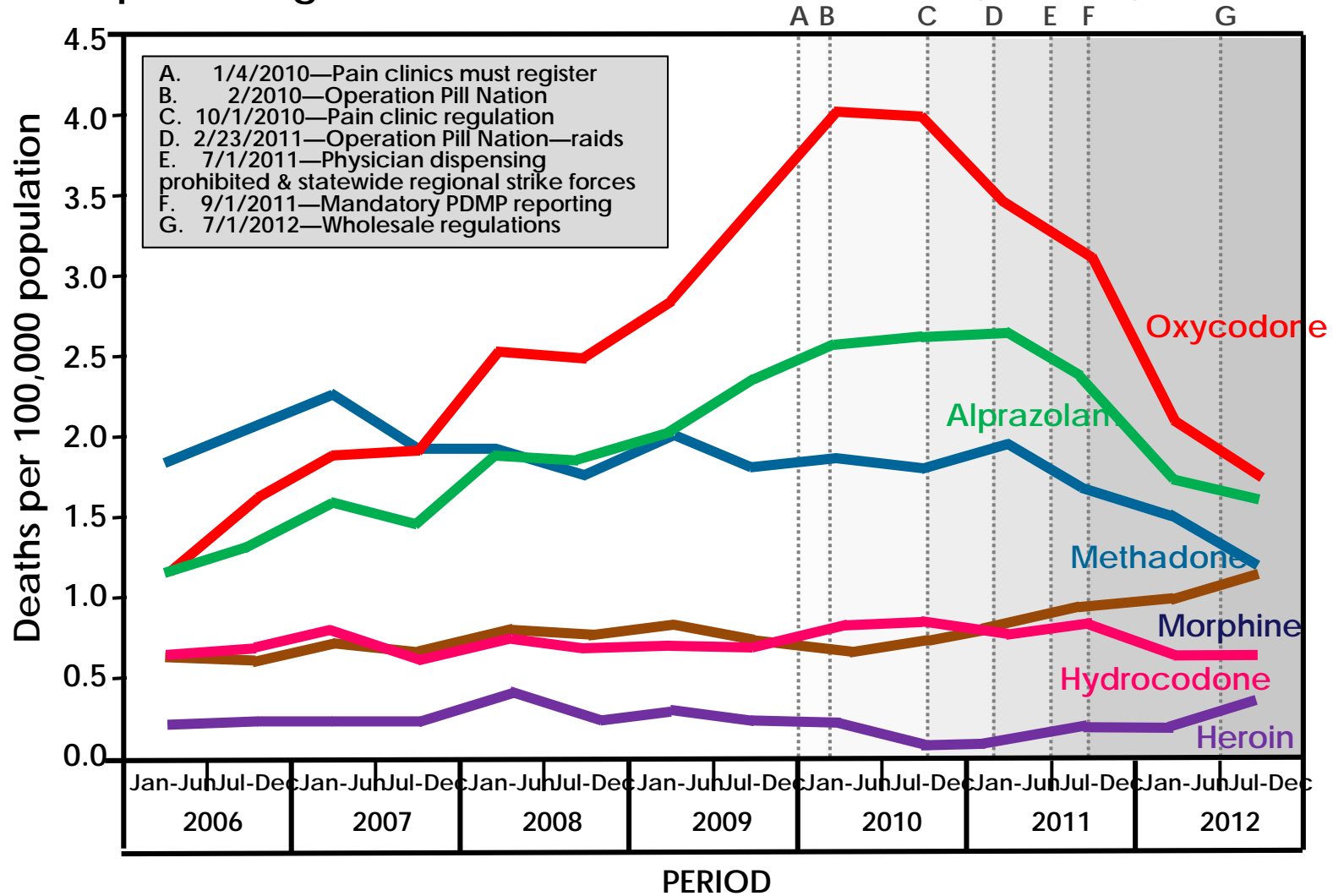
Multi-pronged approaches can save lives: *Staten Island Case Study*



1. data brief
2. opioid Rx guidelines
3. PSAs
4. PDMP law
5. ED opioid Rx guidelines
6. town halls and detailing campaign to promote guidelines
7. PDMP mandated use
8. PSAs

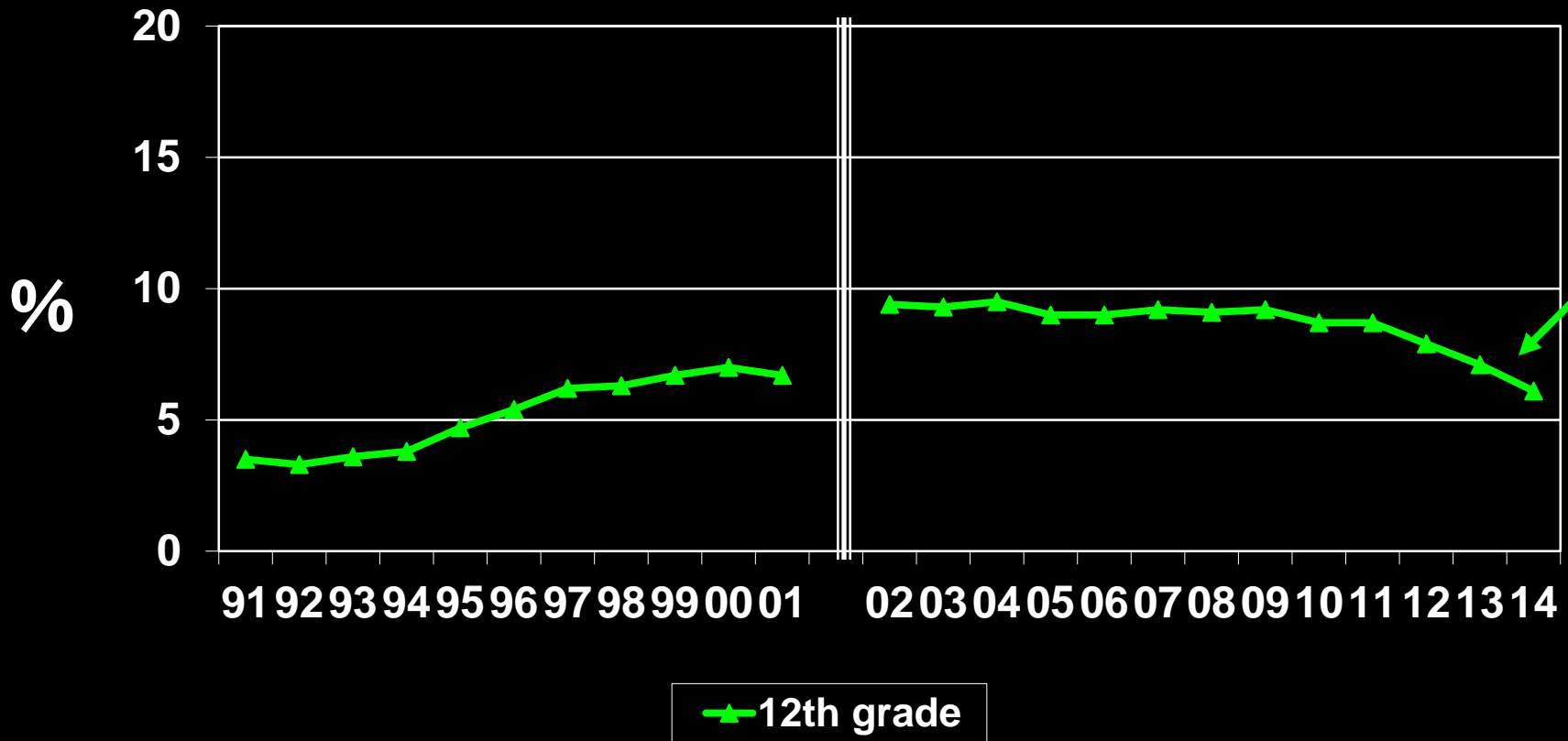
Decline in Drug Overdose Deaths After State Policy Changes in Florida, 2010–2012

Semi-Annual Drug Overdose Death Rates* for Selected Drugs, & Selected Prescription Drug Diversion & Misuse Actions Taken, Florida, 2006 – 2012⁺



*Per 100,000 population. Based on Florida Department of Health resident population estimates.
⁺ The source of overdose death data is the Florida Medical Examiners Commission.

Fewer High School Seniors Reporting Use of Narcotics Other than Heroin, in USA





↗ Denotes significant difference between 2013 and 2014

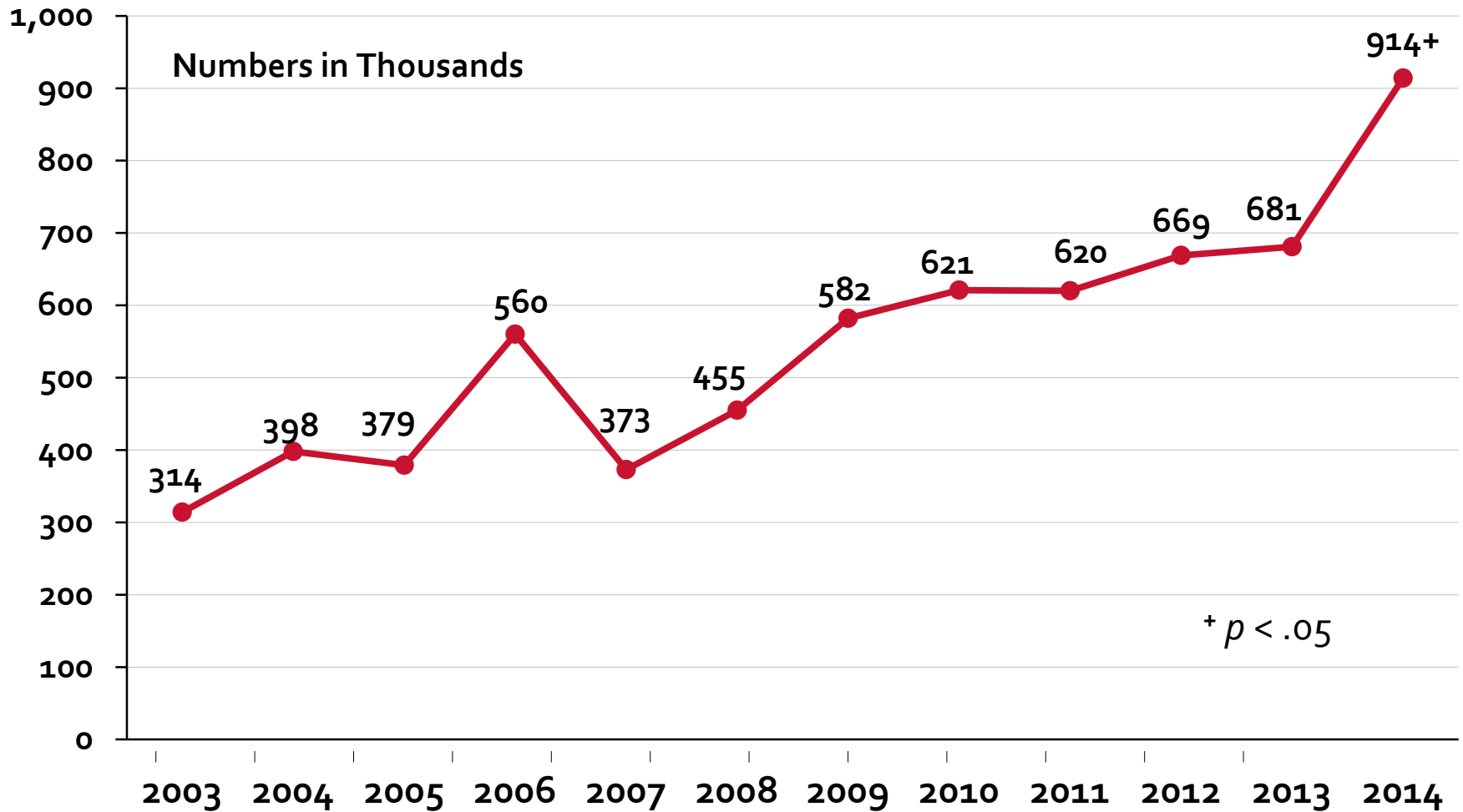
SOURCE: University of Michigan, 2014 Monitoring the Future Study

Recent Slight Reductions in Rx Opioid-Related Deaths but *Marked Increases in Heroin*

2013 OD Deaths:

- **16,235 Rx opioid**
 - *(16,007 in 2012 and 16,917 in 2011)* 
- **8,257 Heroin**
 - *(5,927 in 2012 and 4,397 in 2011)* 

Past Year Heroin Use among Persons Aged 12 or Older, 2003-2014



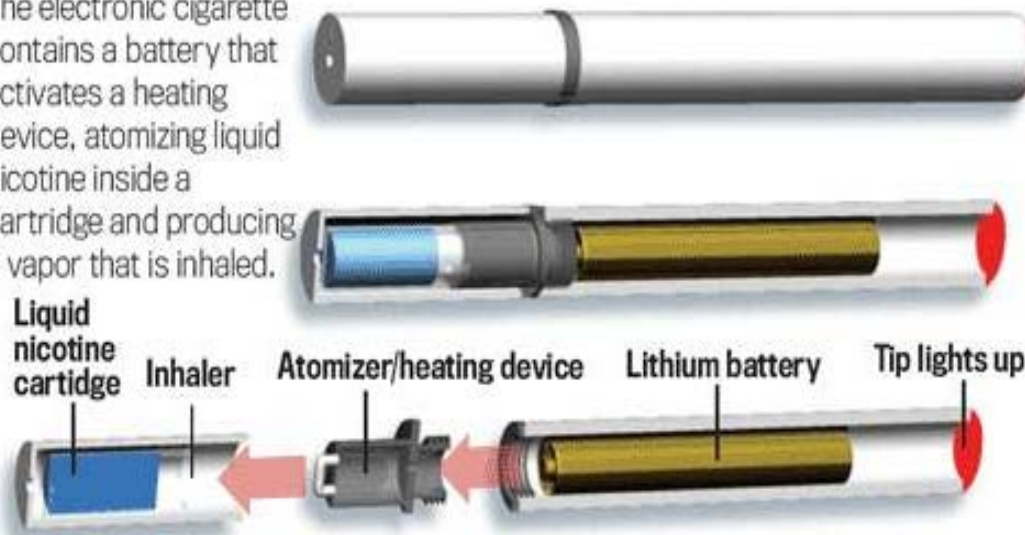
Source: SAMHSA, 2014 National Survey on Drug Use

Electronic Nicotine Delivery Systems—E-cigarettes:

Promise and Peril

How an electronic cigarette works

The electronic cigarette contains a battery that activates a heating device, atomizing liquid nicotine inside a cartridge and producing a vapor that is inhaled.



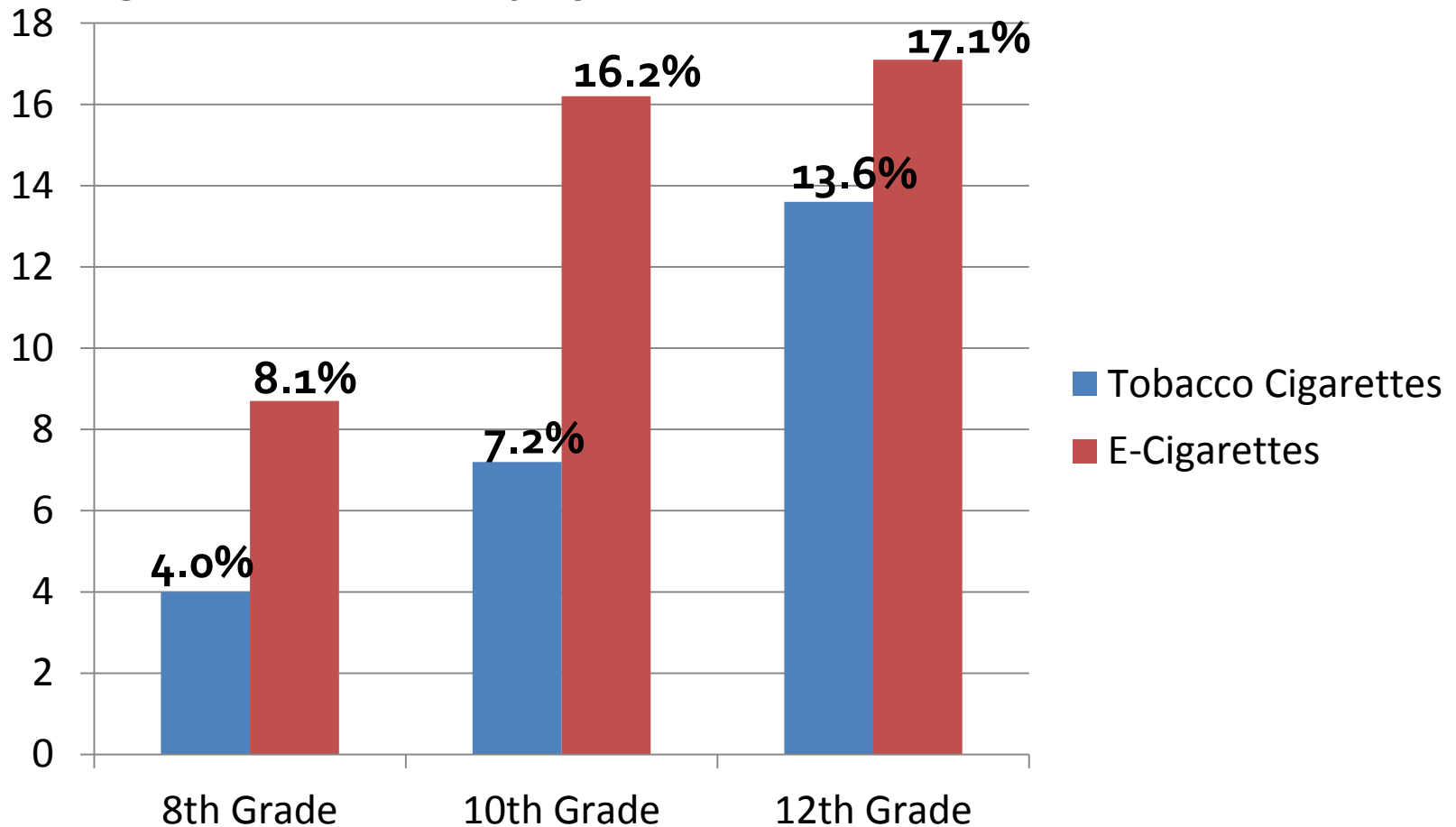
Source: allhookah.net

Tim Summers / The Detroit News

PROMISING for tobacco cessation?
PERILOUS for new onset addiction?

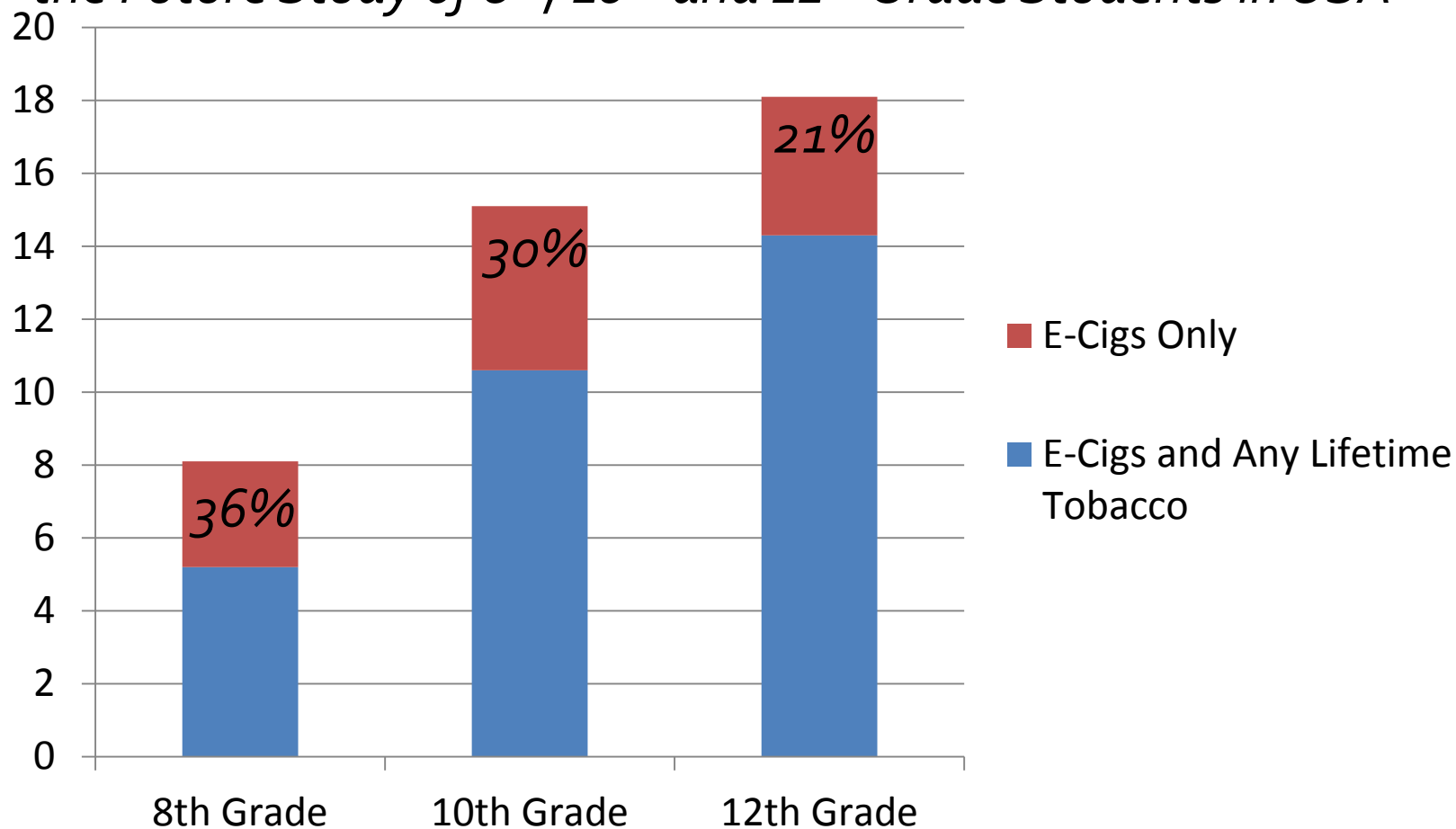
More Youth Use E-Cigarettes Than Tobacco Cigs

Past Month Use of E-Cigs vs. Traditional Cigarettes in the 2014 Monitoring the Future Study of 8th, 10th and 12th Grade Students in USA



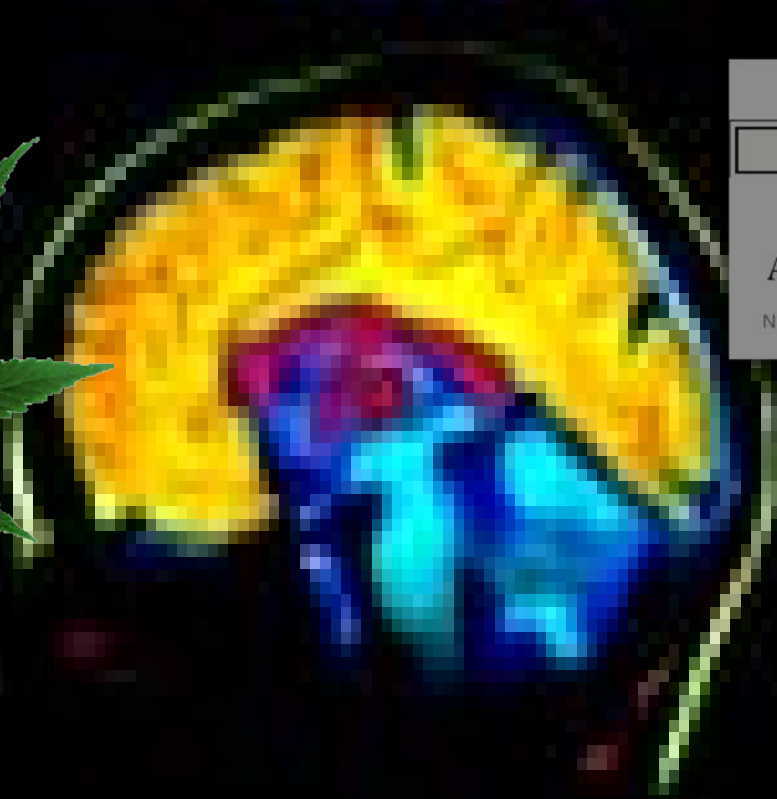
Large Numbers of Youth in USA Using E-Cigarettes Without Prior Use of Tobacco

Past Month Use of E-Cigarettes Among Youth with/without Any Lifetime Use of Tobacco Cigarettes or Smokeless Tobacco in the 2014 Monitoring the Future Study of 8th, 10th and 12th Grade Students in USA



Another Key Emergent Drug Issue in the USA:

The Shifting **Marijuana Legal Environment:** Linking Epidemiology and **Neuroscience**



THE NEW ENGLAND JOURNAL of MEDICINE

REVIEW ARTICLE

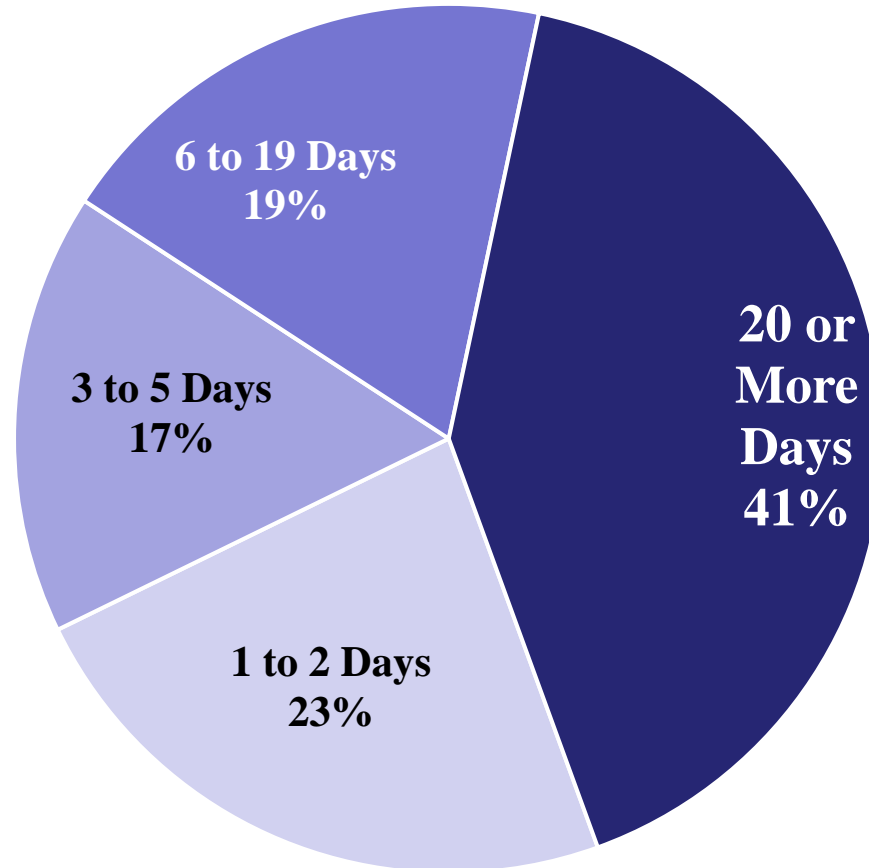
Dan L. Longo, M.D., *Editor*

Adverse Health Effects of Marijuana Use

Nora D. Volkow, M.D., Ruben D. Baler, Ph.D., Wilson M. Compton, M.D.,
and Susan R.B. Weiss, Ph.D.

Among Current Marijuana Users, Two In Five Are Daily or Almost Daily Users

Number of Days Used Marijuana in the Past Month

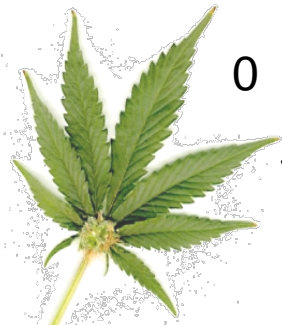
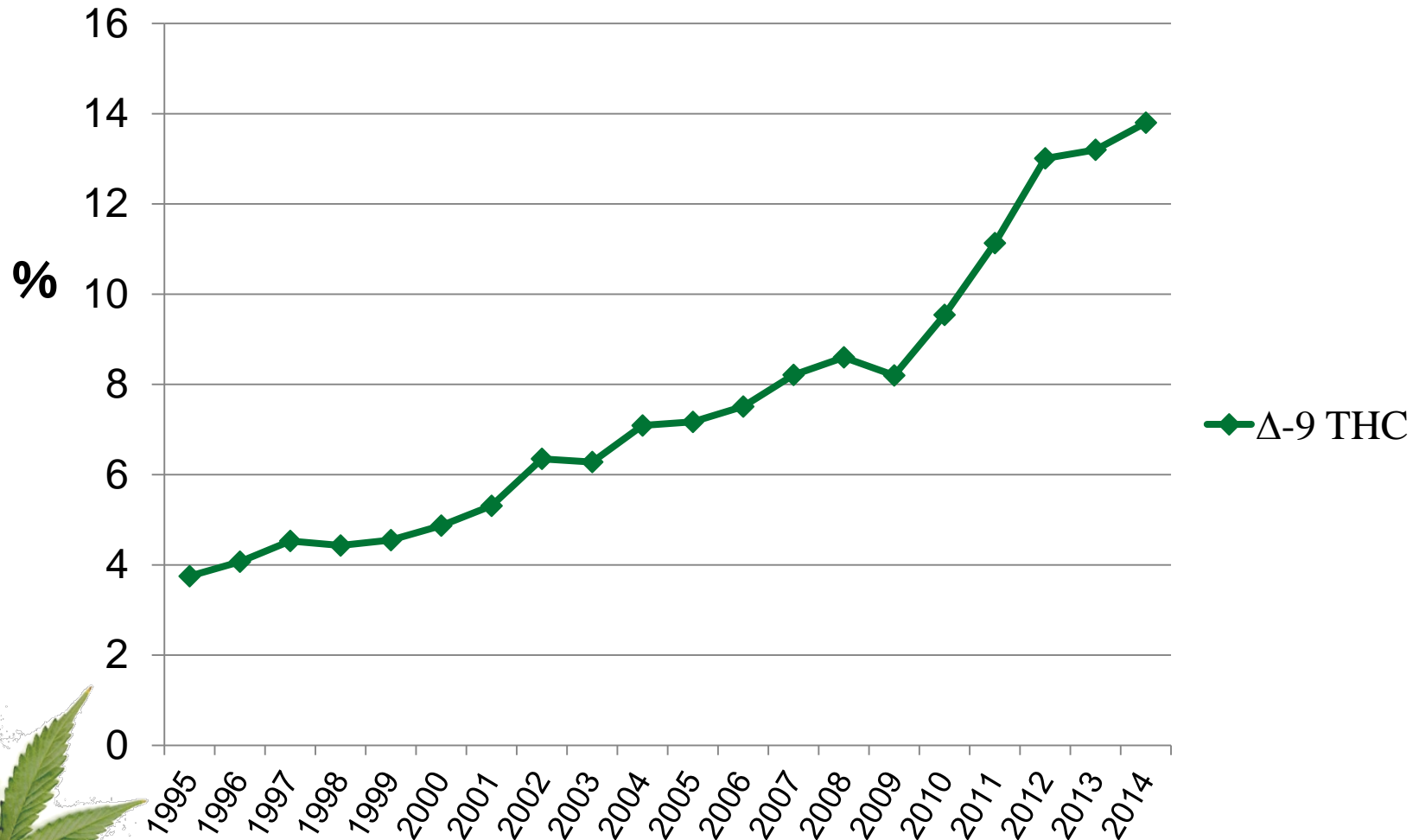


19.8 Million Past Month Users of Marijuana in

Source: SAMHSA, 2013 National Survey on Drug Use and Health (September 2014).

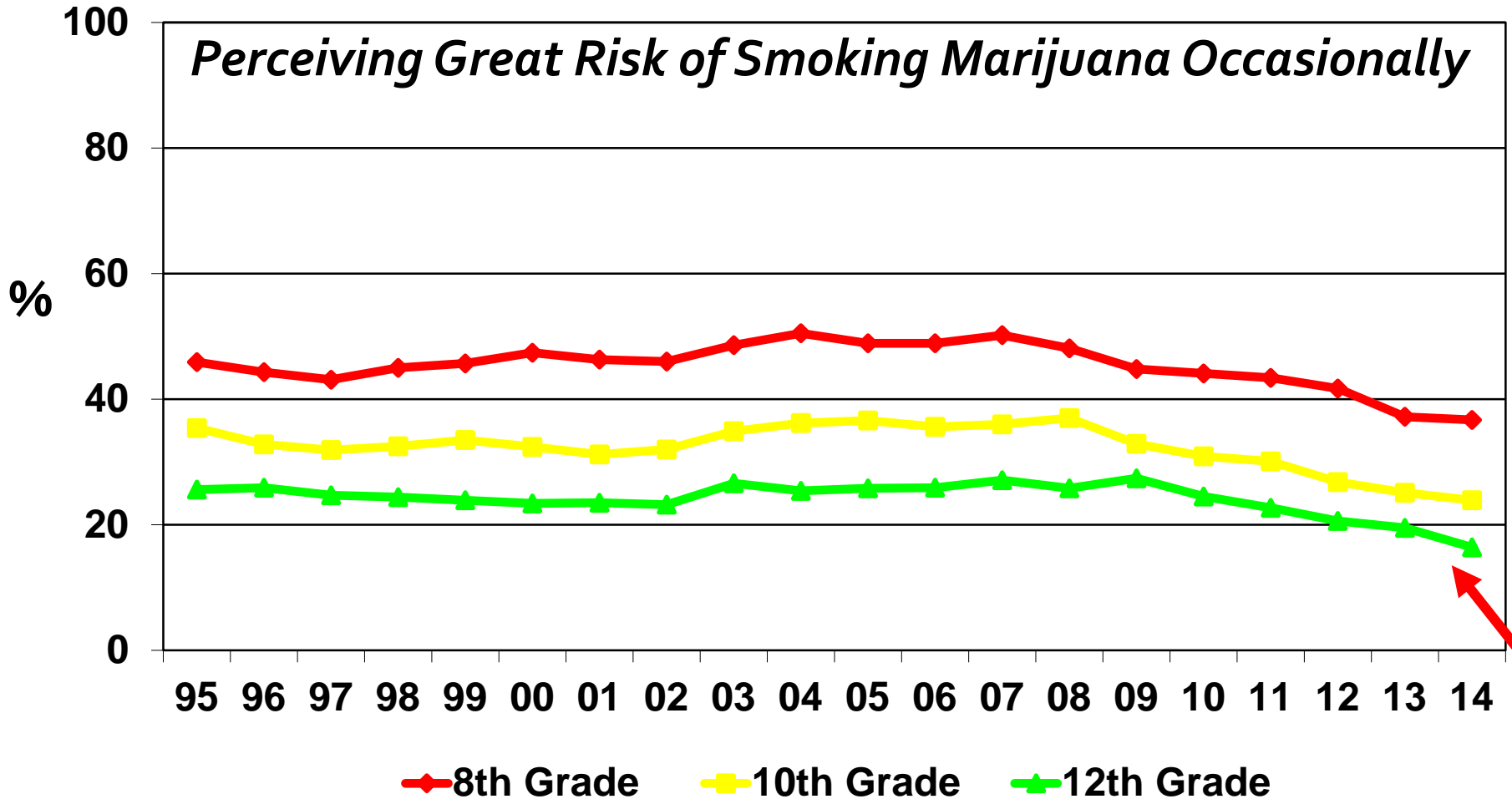
2013

Increasing Potency of Marijuana (% Δ -9 THC)



SOURCE: University of Mississippi Marijuana Project

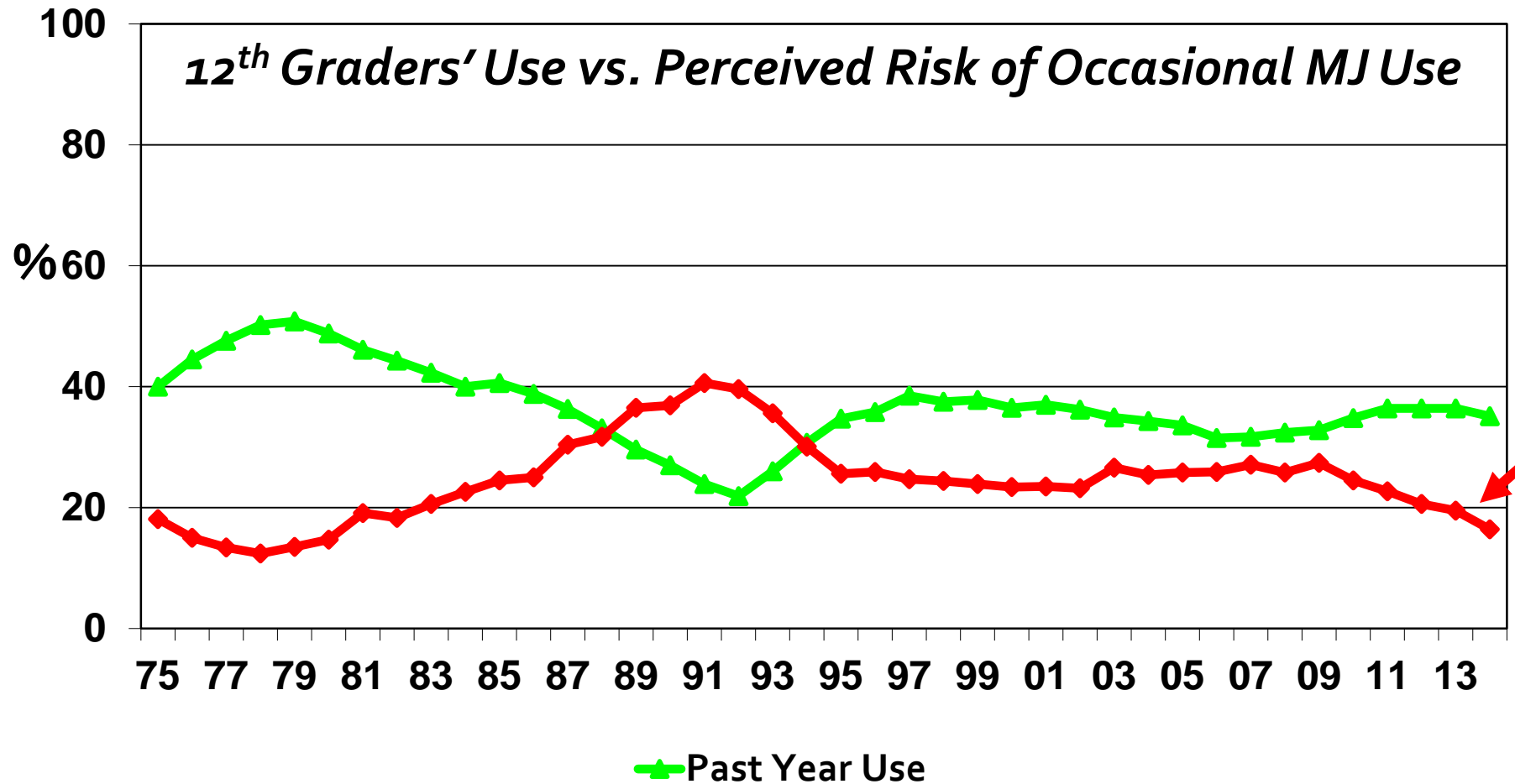
Perceived Riskiness of Smoking Marijuana has Declined



Denotes significant difference between 2013 and 2014.

SOURCE: University of Michigan, 2014 Monitoring the Future Study

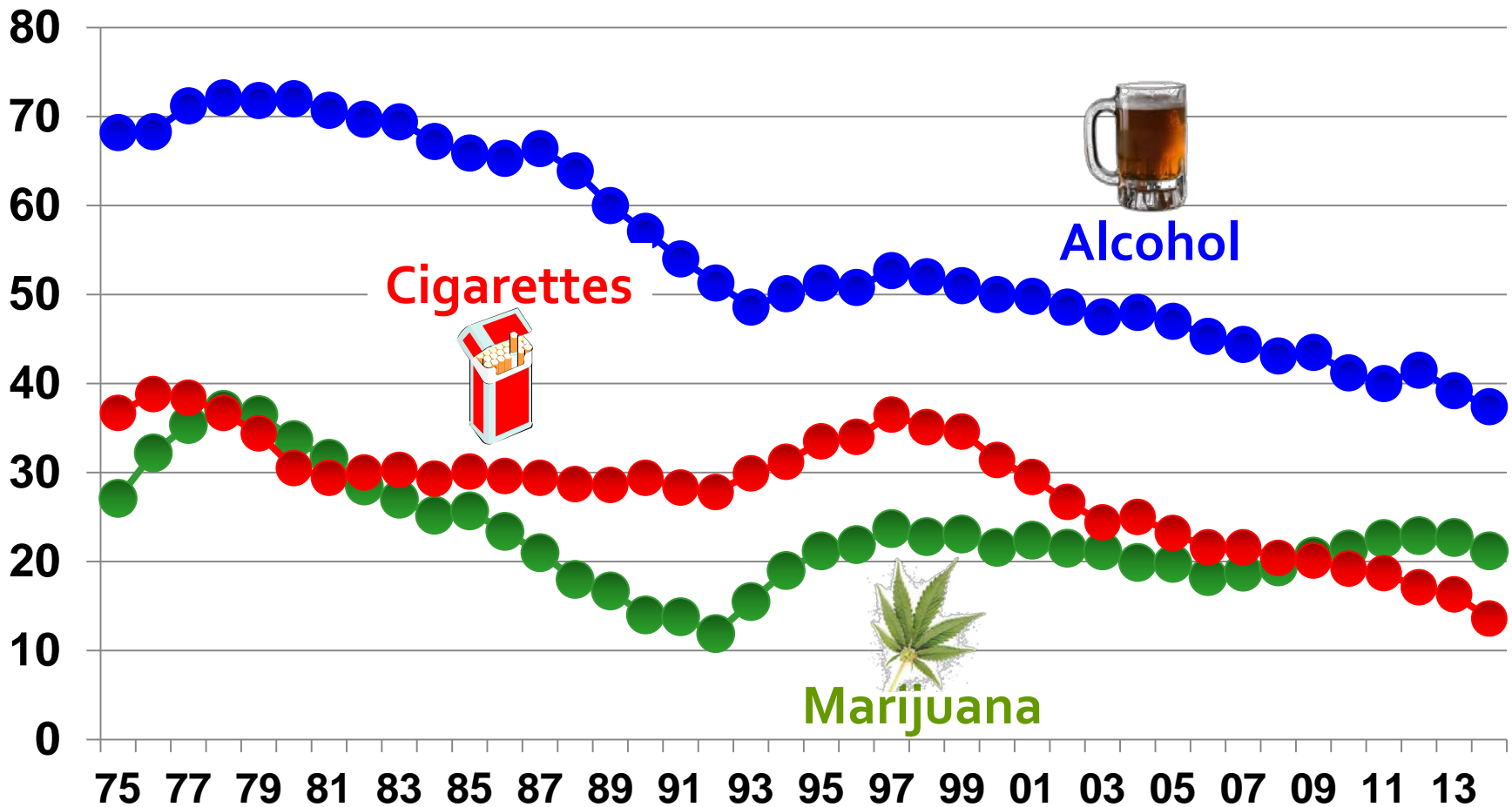
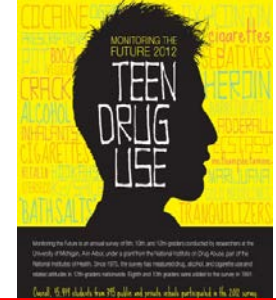
Perceived Risk is Correlated with Use of Marijuana



Denotes significant difference between 2013 and 2014.

SOURCE: University of Michigan, 2014 Monitoring the Future Study

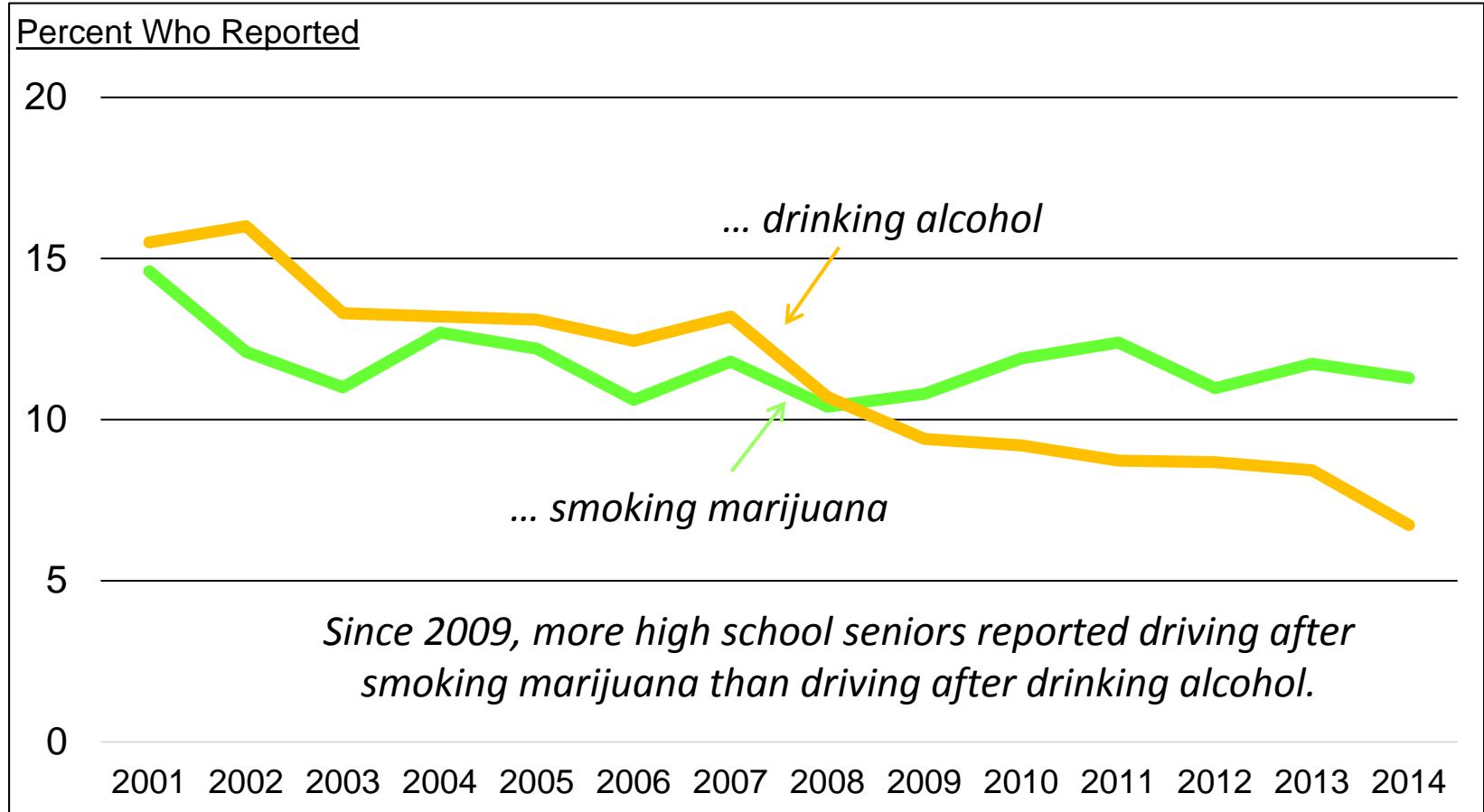
Percentage of U.S. 12th Grade Students Reporting Past Month Use of Alcohol, Cigarettes and Marijuana



SOURCE: University of Michigan, 2014 Monitoring the Future Study.

12th Graders Who Drove After Smoking Marijuana or Drinking Alcohol, 2001-2014

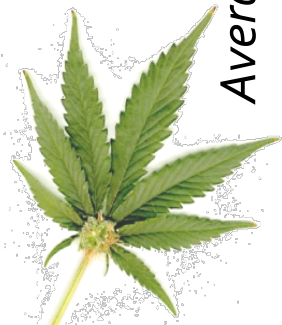
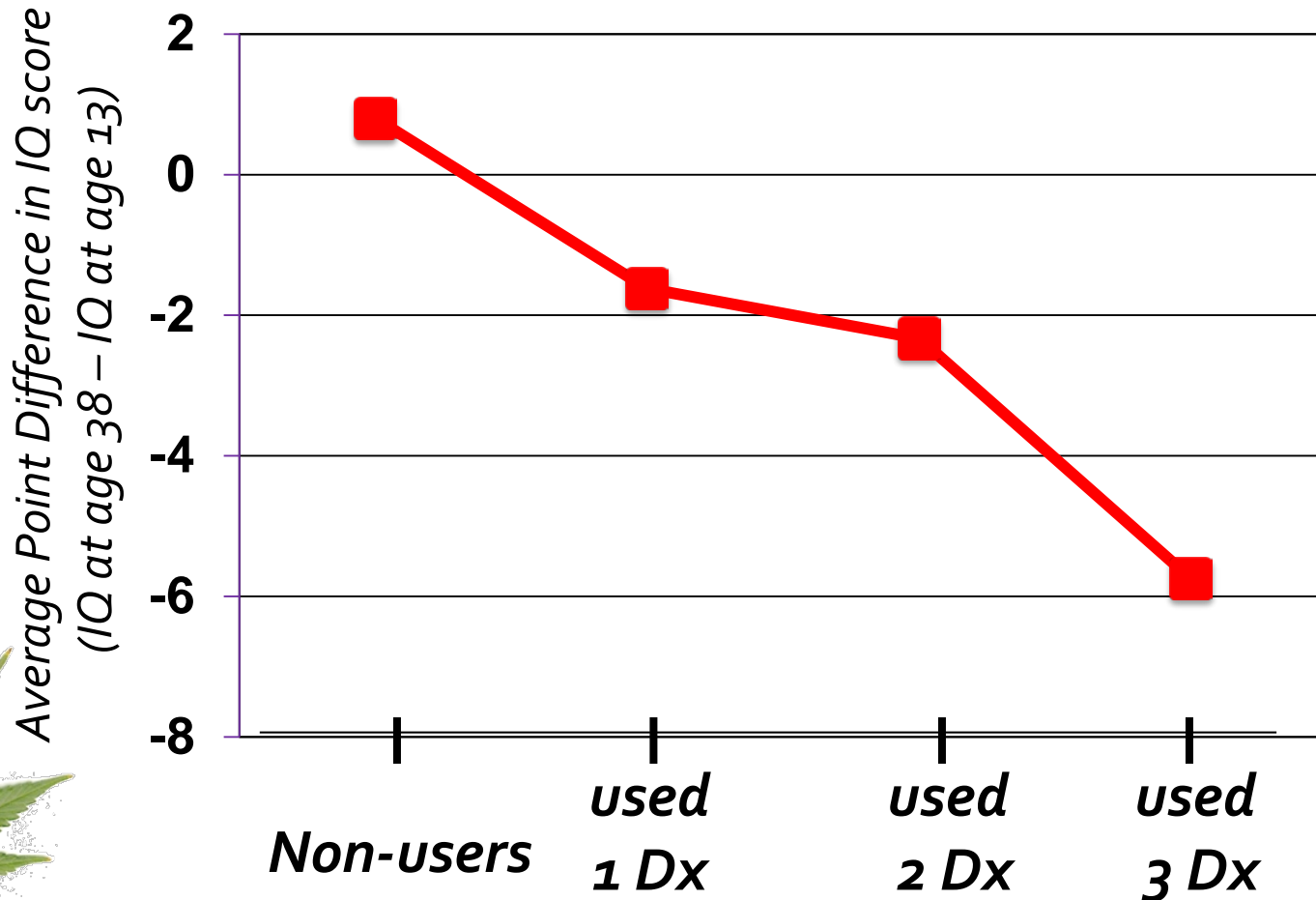
During the LAST TWO WEEKS, have you driven a car, truck, or motorcycle after ...



Source: University of Michigan, 2014 Monitoring the Future study, Unpublished special tabulations (December 2014).

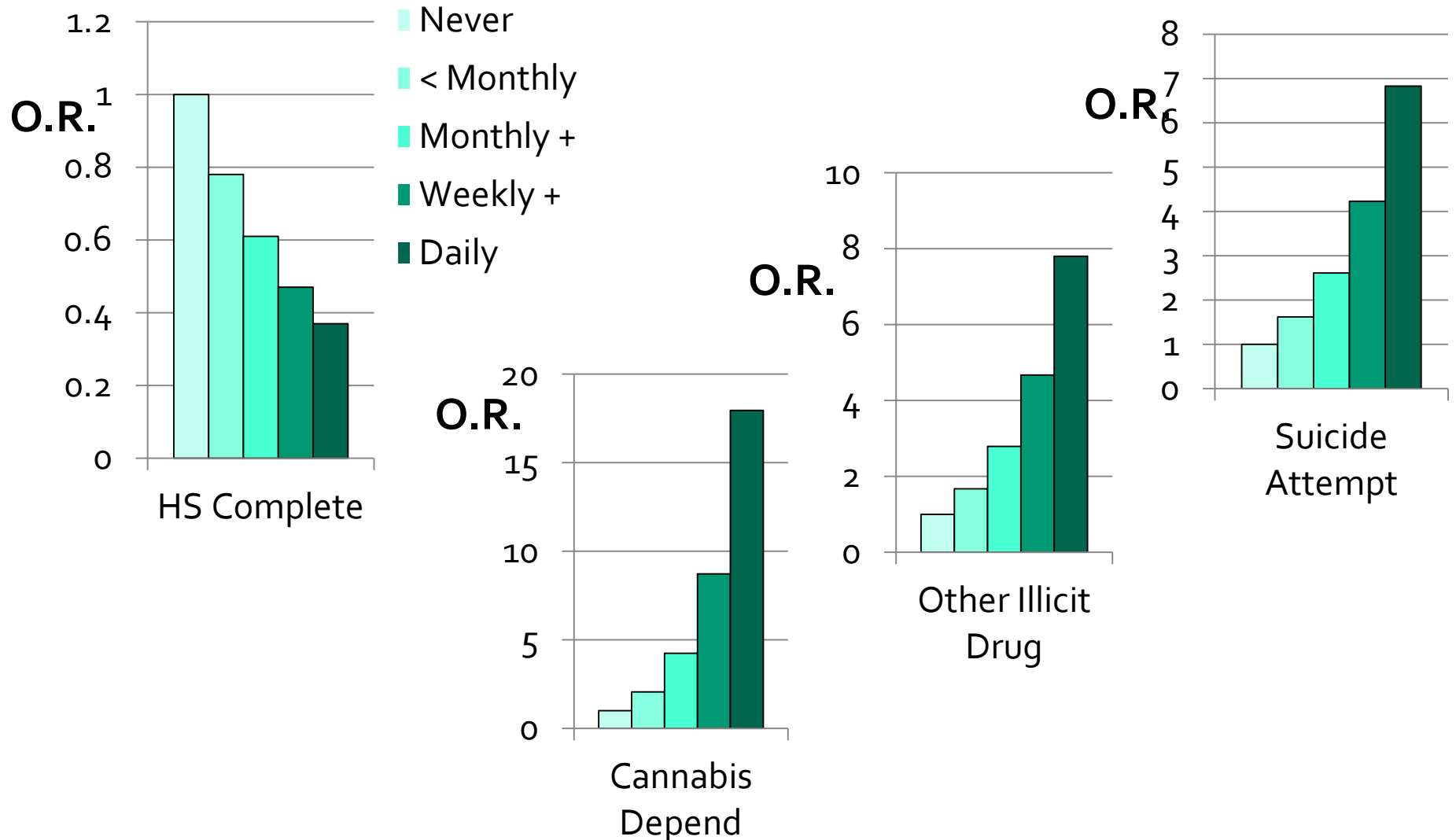
Persistent Marijuana Users Show A Significant IQ Drop between Childhood and Midlife

Followed 1,037 individuals from birth to age 38. Tested marijuana use at 18, 21, 26, 32 and 38. Tested for IQ at ages 13 and 38



Source: Meier MH et al., PNAS Early Edition 2012

More Teenage Use of Cannabis Associated with Worse Outcomes in 20's (3 Australia/New Zealand Studies)



Cannabis Associated with Schizophrenia

Risk (Odds Ratios) of hospital diagnosis of schizophrenia after prior registration for cannabis abuse in: (i) general population and (ii) co-relatives, allowing time from exposure to disease to vary by 1-7 years

	Baseline	After 1 Yr	After 5 Yrs	After 7 Yrs
General Pop'n	10.44	9.19	5.95	4.24
Relative Pairs:				
1st Cousin	9.40	8.37	5.85	4.05
Paternal 1/2				
Sib	9.15	8.42	6.12	4.18
Maternal 1/2				
Sib	6.00	5.85	3.42	2.58
Full Sibs	5.07	4.47	2.80	1.98
MZ Twins*	3.92	3.38	2.63	1.67

*** Extrapolated**

Adolescent Brain Cognitive Development National Longitudinal Study

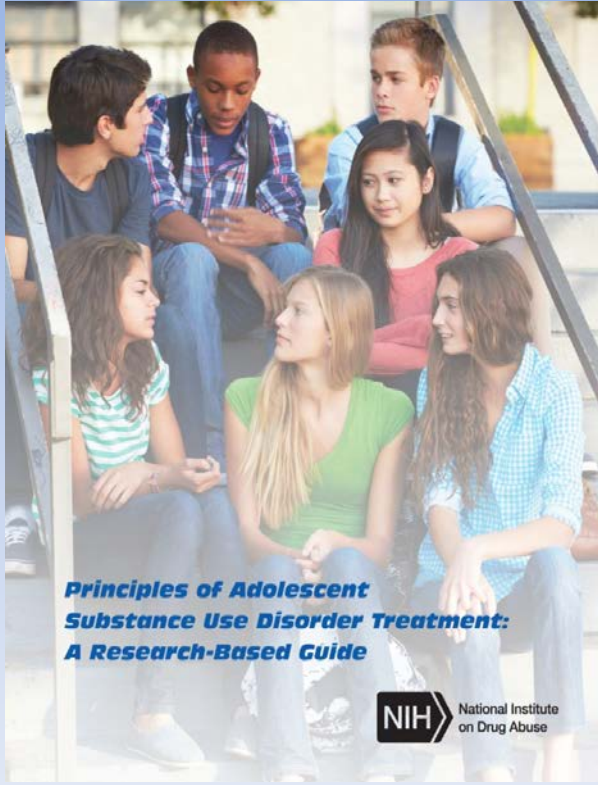
NIDA, NIAAA, NCI, NICHD, NIMHD, ORWH, NIMH, NINDS, OBSSR

*Ten year longitudinal study of 10,000 children from
age 10 to 20 years to assess effects of drugs on
individual brain development trajectories*



Summary

- **Neuroscience reminds us of the importance of development and provides a background for prevention intervention development**
- **Current and emerging drug abuse issues require our creative and vigorous responses**



Principles of Adolescent Substance Use Disorder Treatment: A Research-Based Guide

NIH National Institute on Drug Abuse

Treatment Publication Principles of Adolescent Substance Use Disorder Treatment: A Research Based Guide

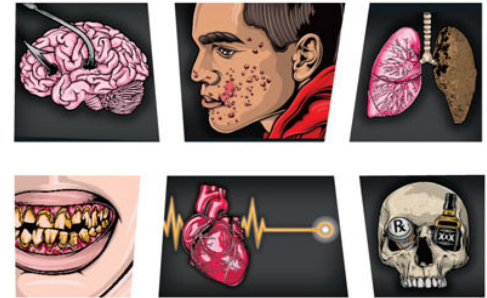
Outlines thirteen principles and evidence-based approaches for treating adolescent substance use disorders (SUD).

Medical School Curriculum The Substance Use Disorder in Adolescents: Screening and Engagement in Primary Care Settings

Provides a series of videos demonstrating effective screening techniques.

DRUGS + YOUR BODY: **It Isn't Pretty**

- **Web Interactive**
- **scholastic.com/drugsandyourbody_web**



Web interactive

Drugs + Your Body: It Isn't Pretty

Includes graphics, videos, quizzes and much more on the wide-ranging harmful effects of drugs on the brain and body.