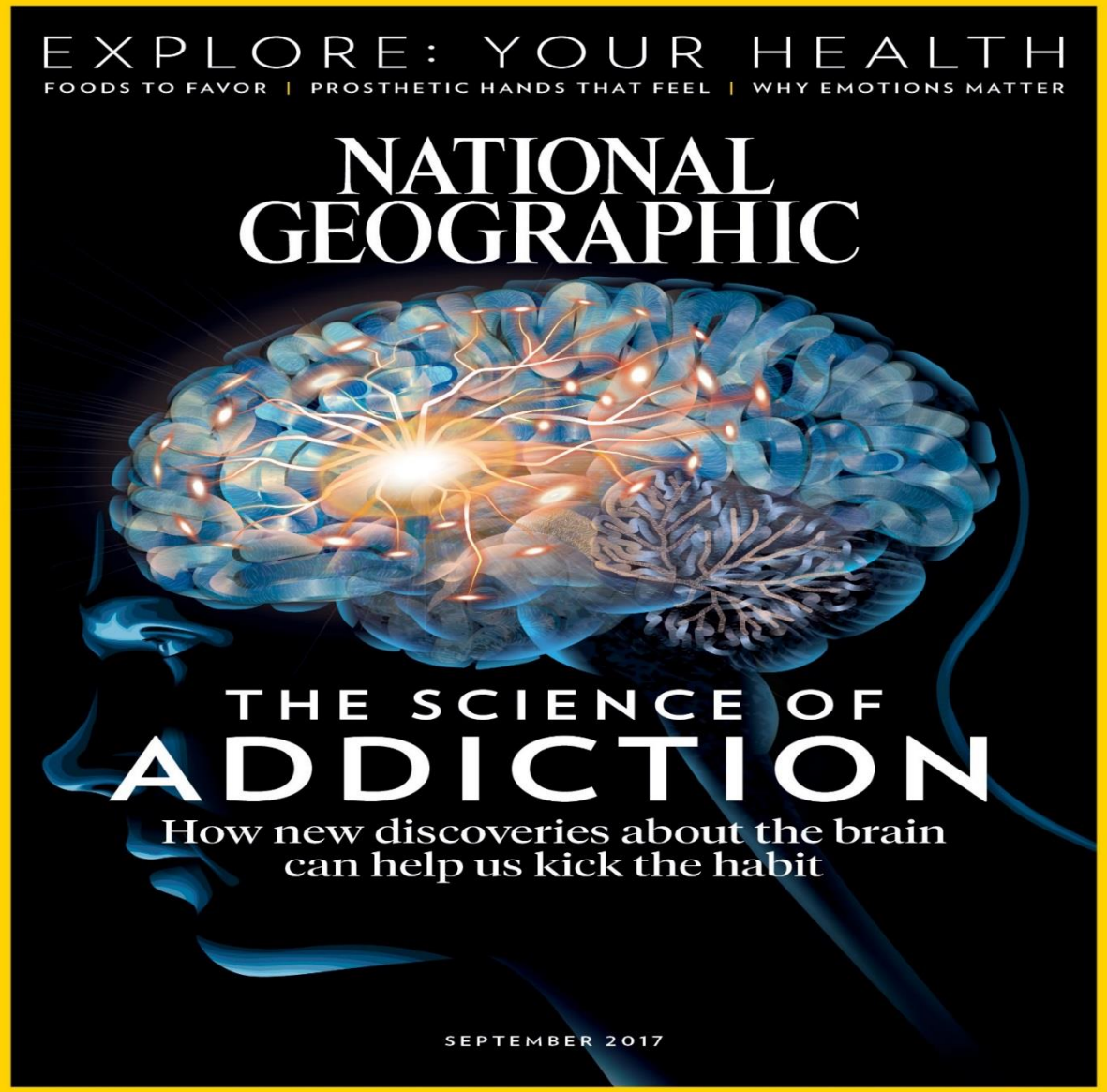
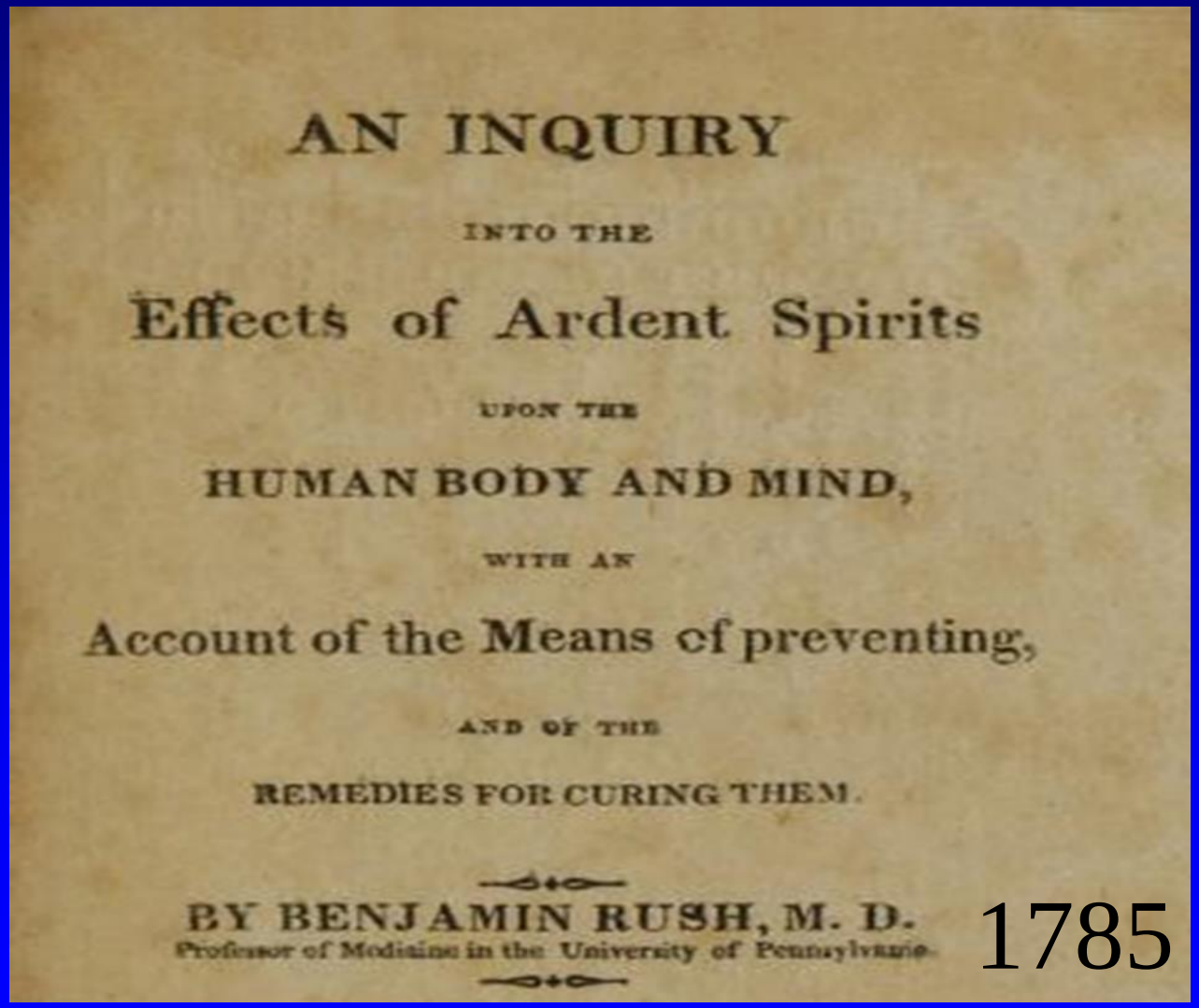


Addiction is a Brain Disease

Trip Gardner, MD
Chief Psychiatric Officer
Medical Director of Homeless Services
Penobscot Community Health Care
Bangor, Maine

Back to the Future



AN INQUIRY

INTO THE

Effects of Ardent Spirits

UPON THE

HUMAN BODY AND MIND,

WITH AN

Account of the Means of preventing,

AND OF THE

REMEDIES FOR CURING THEM.

BY BENJAMIN RUSH, M. D.
Professor of Medicine in the University of Pennsylvania.

1785

This evil is confined to no class or occupation. It numbers among its victims some of the best women and men of all classes. Prompt action is then demanded, lest our land should become... stupefied by the direful effects of narcotics and thus diseased physically, mentally, and morally, the love of liberty swallowed up by the love of opium, whilst the masses of our people would become fit subjects for a despot.

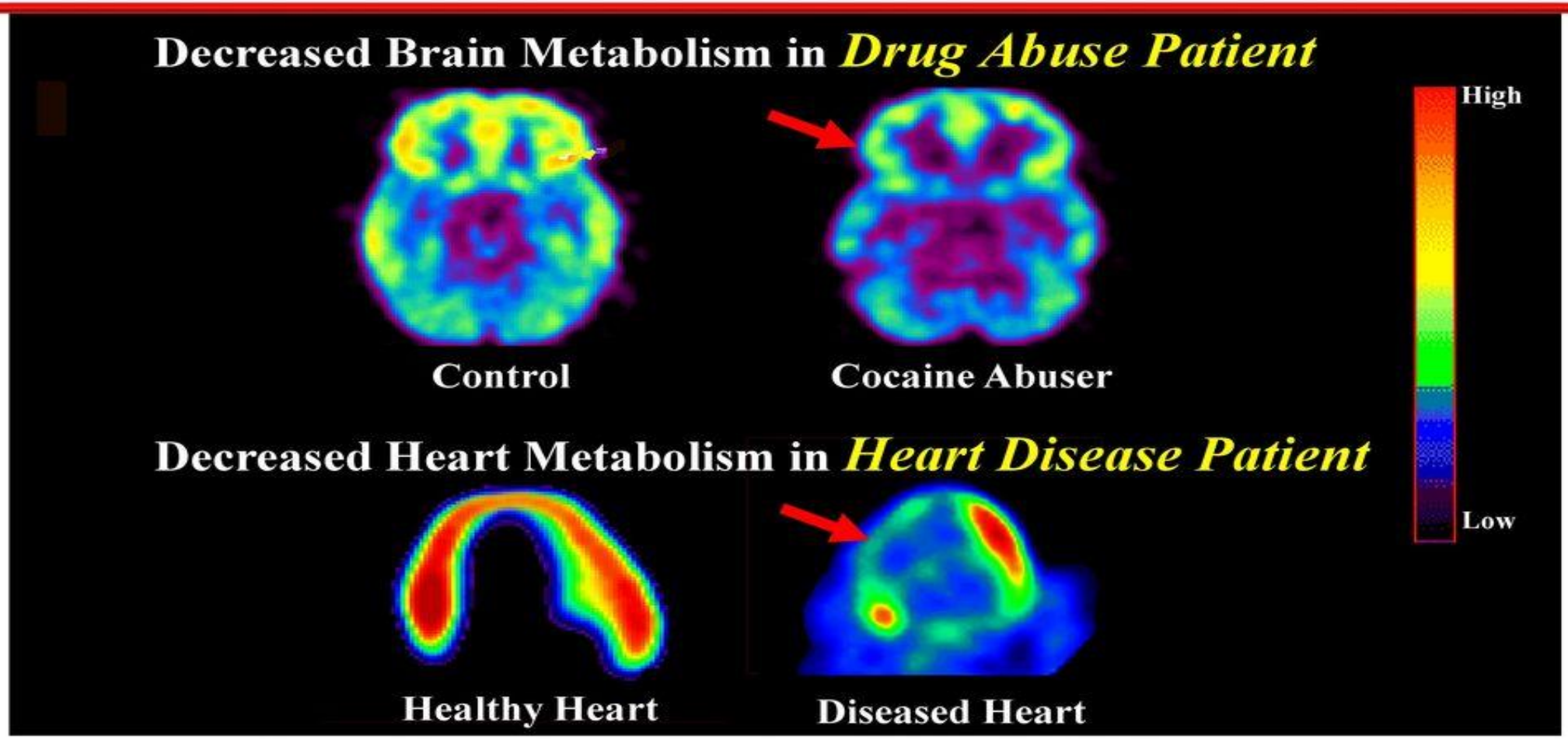
—Dr. W. G. Rogers, writing in *The Daily Dispatch* (Richmond, VA), January 25, 1884

American Society of Addiction Medicine 2011 Public Policy Statement

- **Addiction is a primary, chronic disease of brain reward, motivation, memory and related circuitry**
- **Dysfunction in these circuits leads to characteristic biological, psychological, social and spiritual manifestations**
- **This is reflected in an individual pathologically pursuing reward and/or relief by substance use and other behaviors**
- **Like other chronic diseases, addiction often involves cycles of relapse and remission. Without treatment, addiction is progressive and can result in disability or premature death.**

ADDICTION IS A DISEASE OF THE BRAIN

as other diseases it affects the tissue function

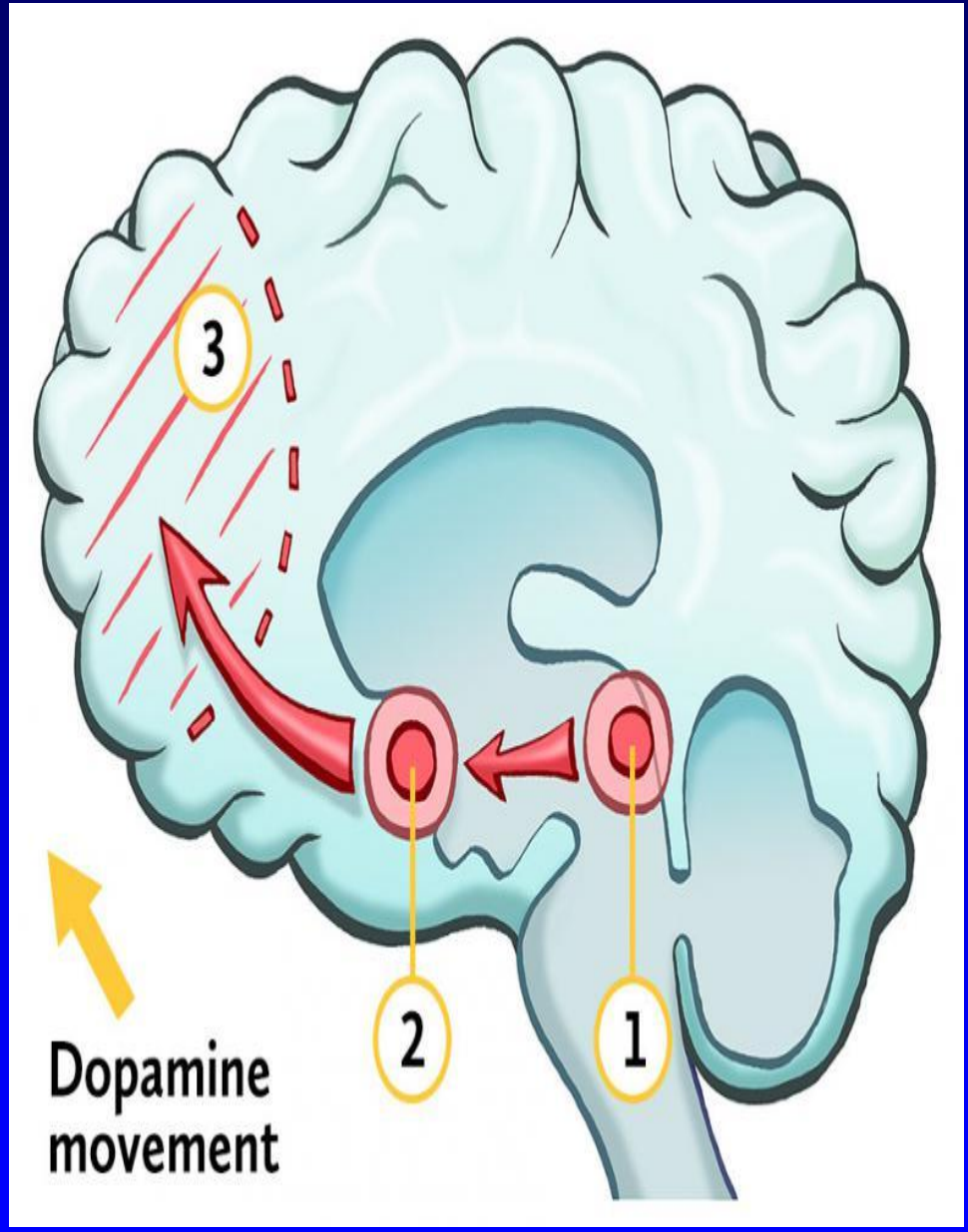


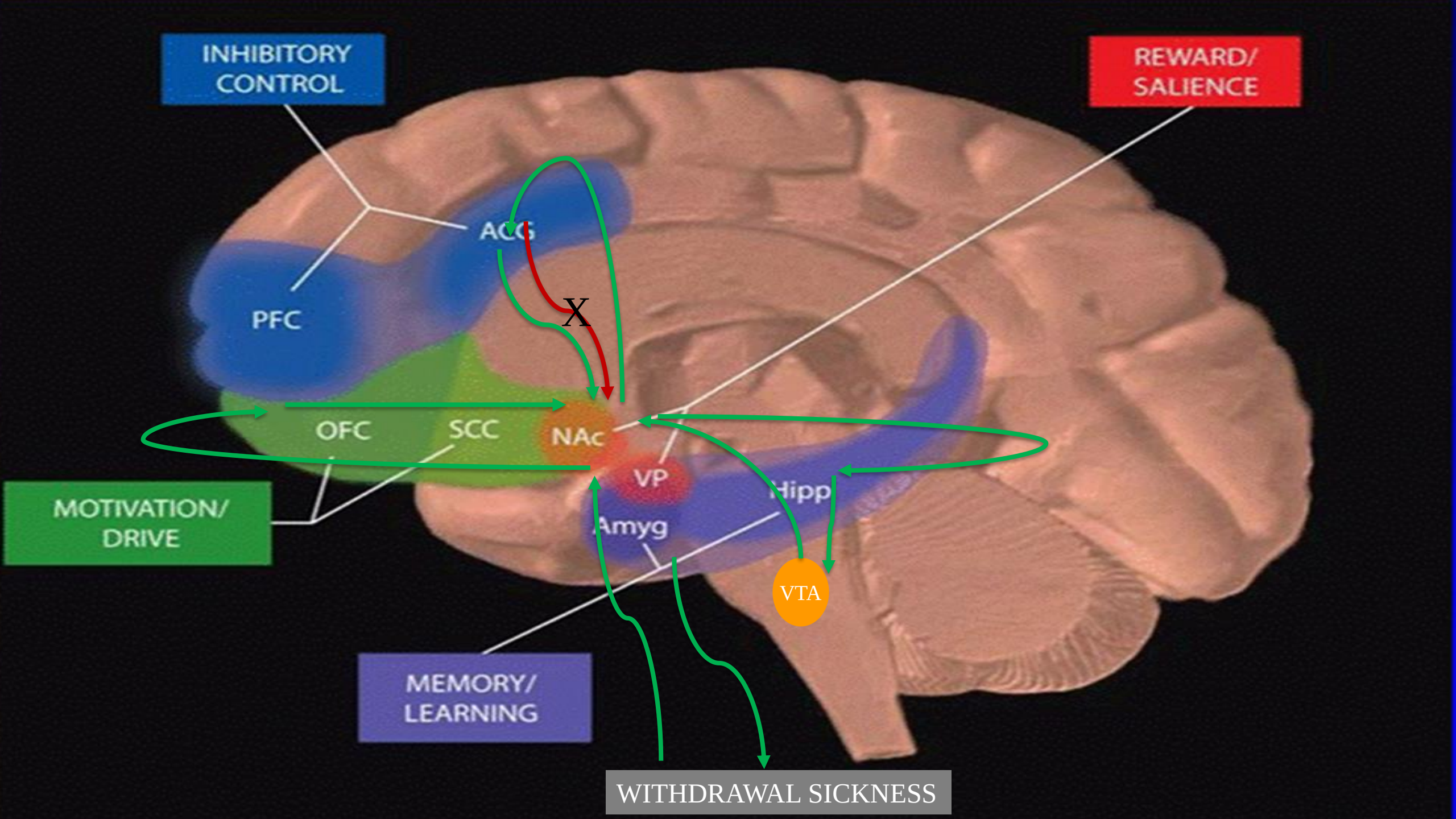
Sources: From the laboratories of Drs. N. Volkow and H. Schelbert

"The brain is modified by the drug in such a way that absence of the drug makes a signal to their brain that is **equivalent to the signal of starving**. It is as if the individual was in a state of deprivation, where taking the drug is indispensable for **survival.**"

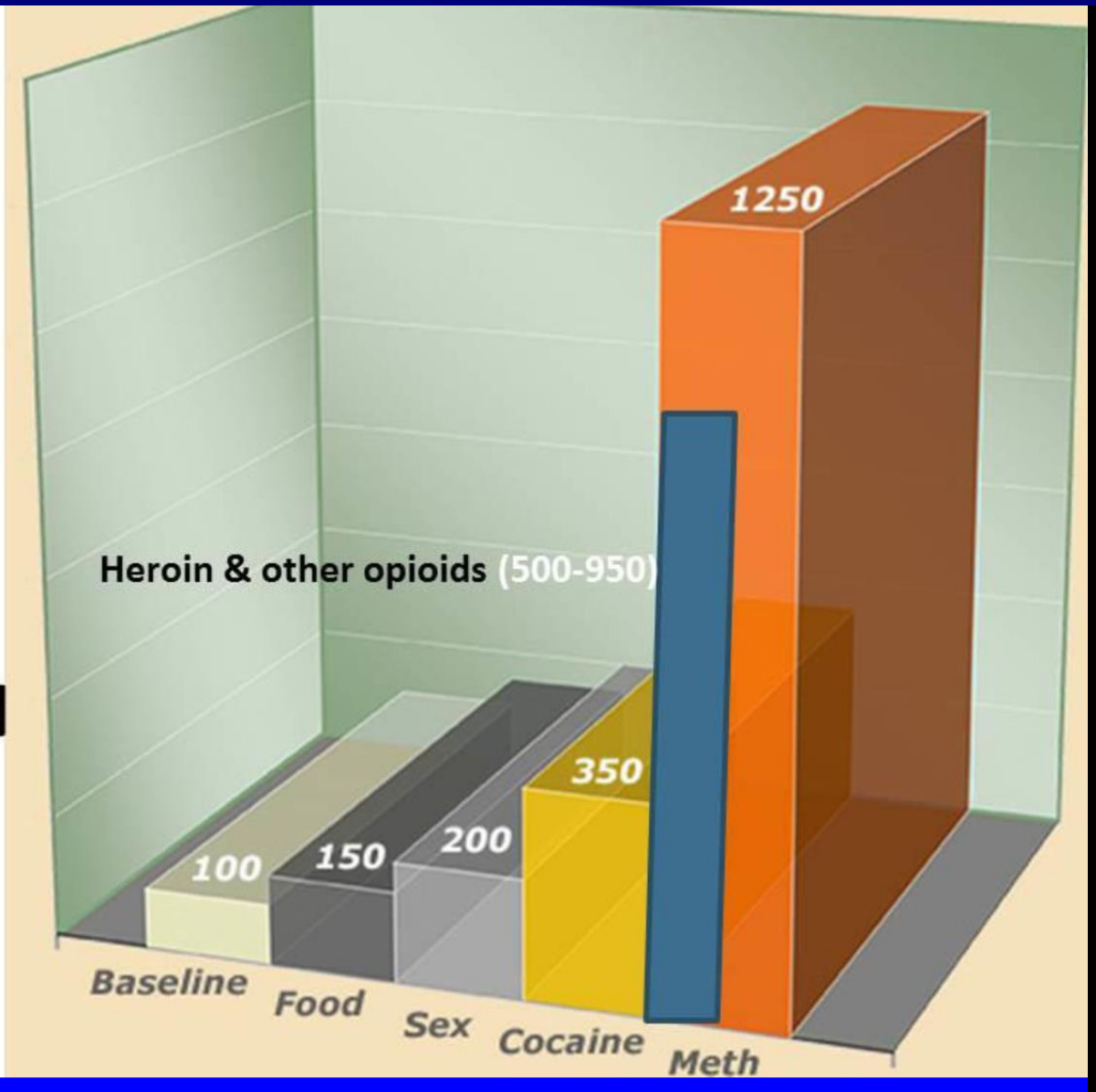
Brain's Survival Reward Pathway

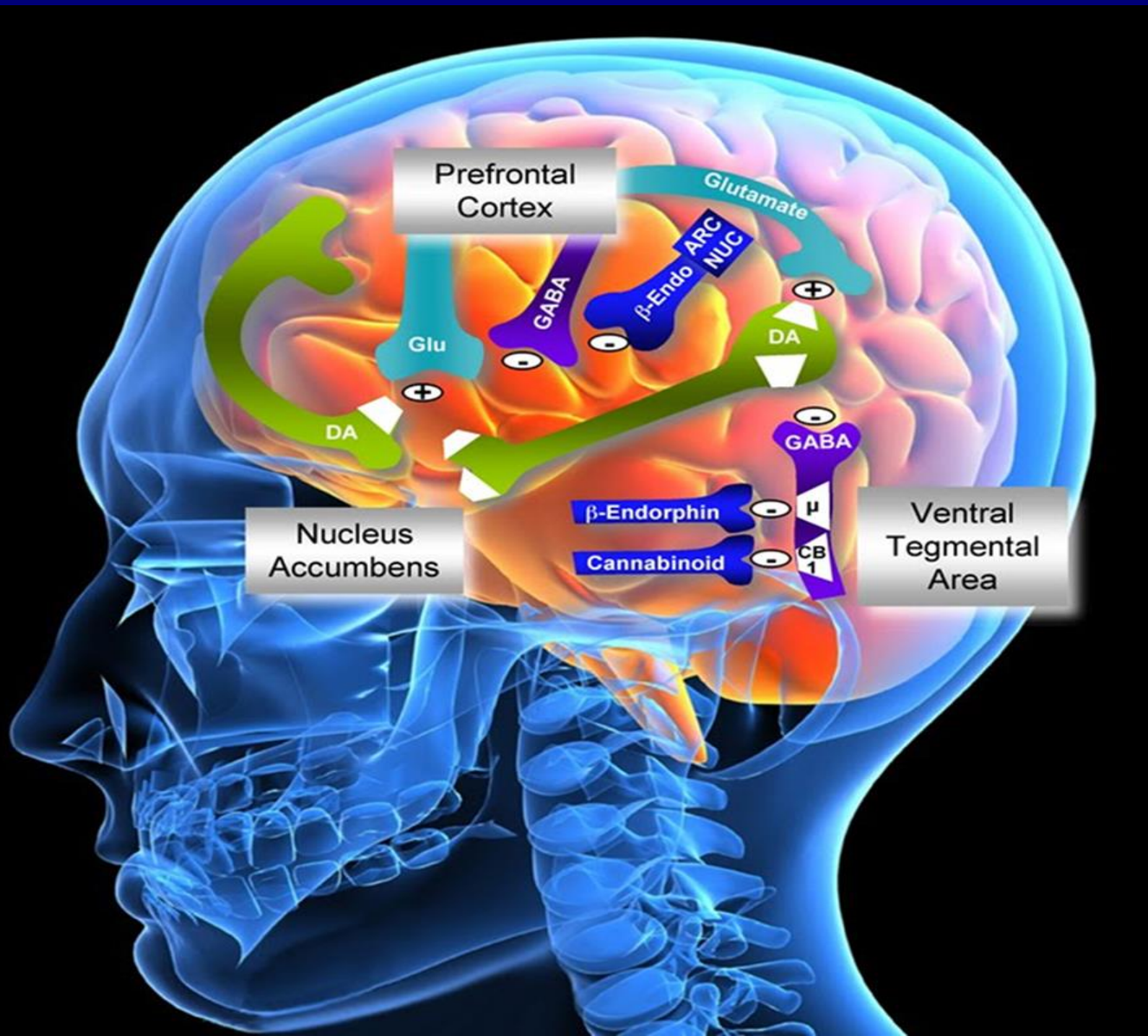
- Eating, Hydrating, Attaching
- Drives us toward survival with a reward
- Reward is dopamine (DA)
- Brain learns to do automatically
- Little consistently gets in the way
- Consequences outweighed by reward



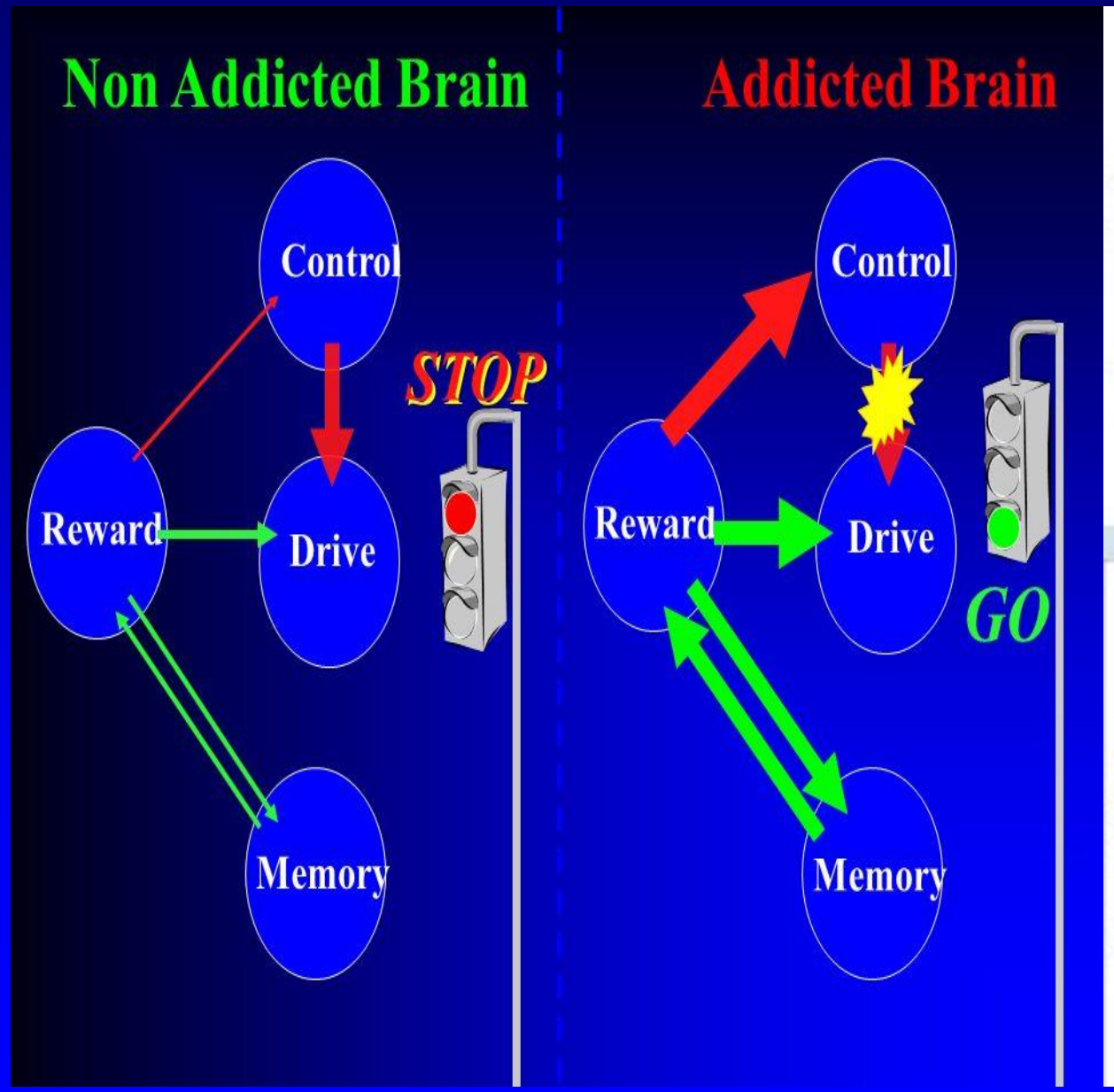

INHIBITORY CONTROL
REWARD/ SALIENCE
ACC
PFC
X
OFC
SCC
NAc
VP
Hipp
Amyg
MOTIVATION/ DRIVE
VTA
MEMORY/ LEARNING
WITHDRAWAL SICKNESS

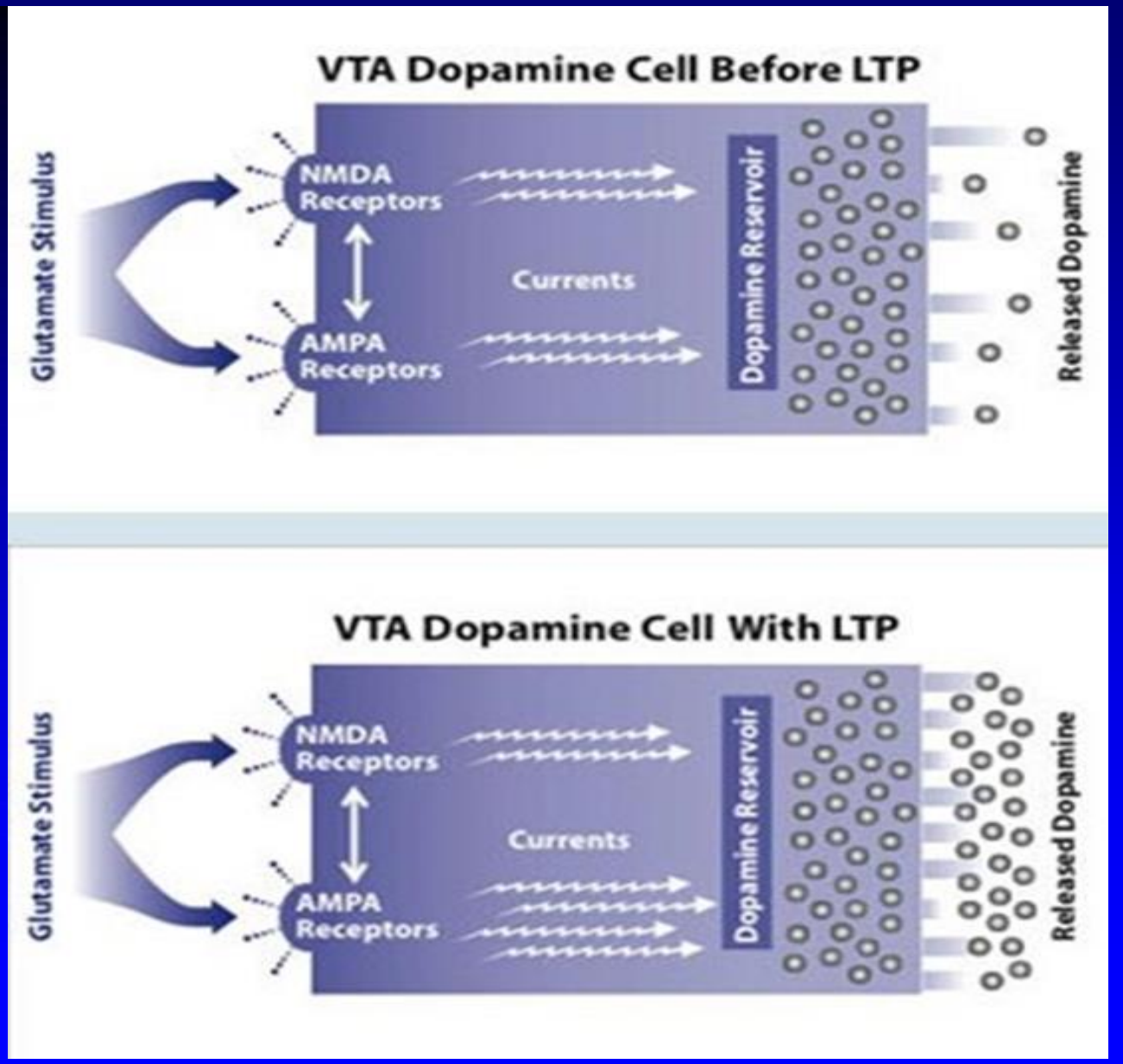
Dopamine – Reward of Pleasure



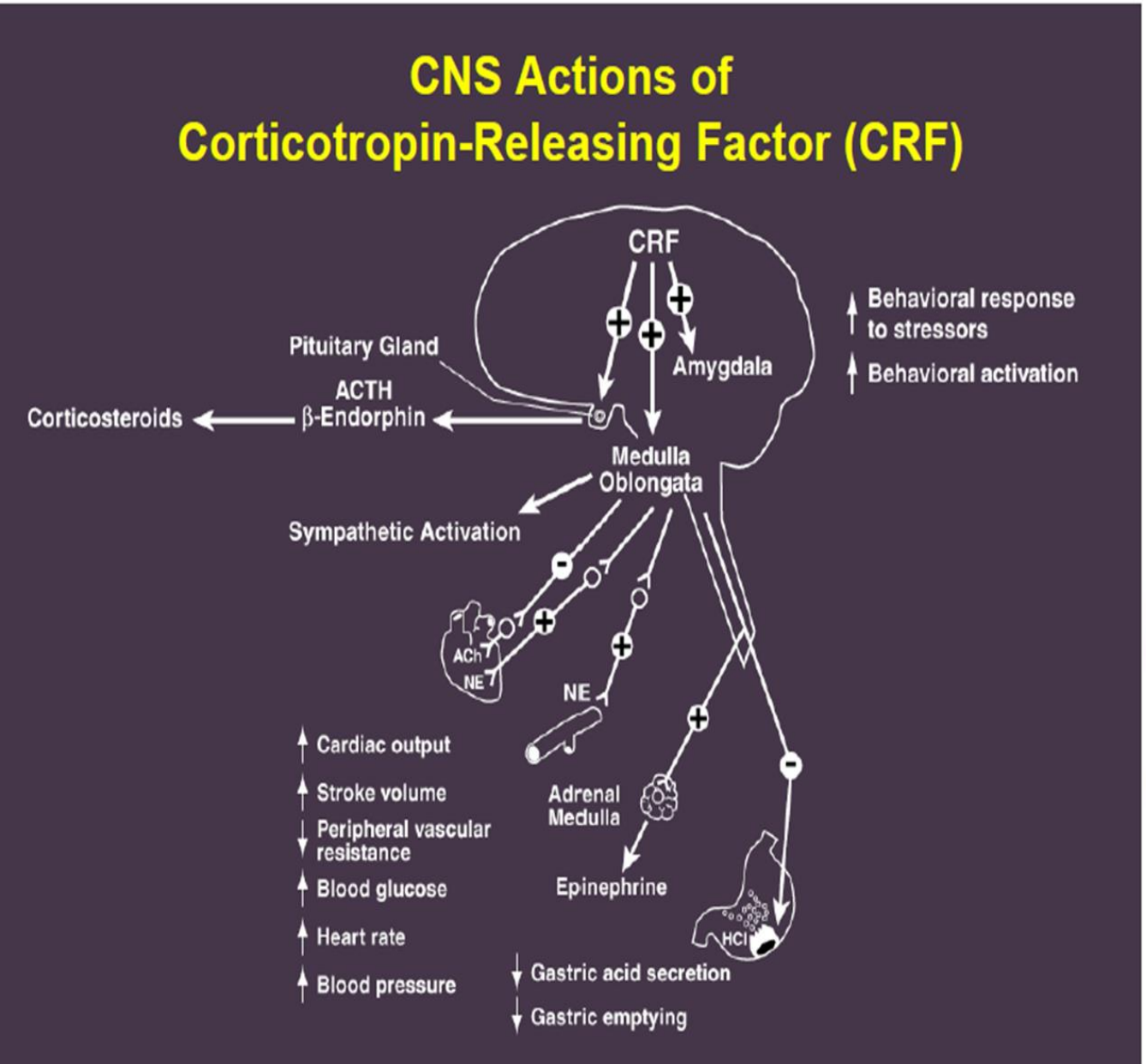


Glutamate – Drug Seeking, Drug Memory

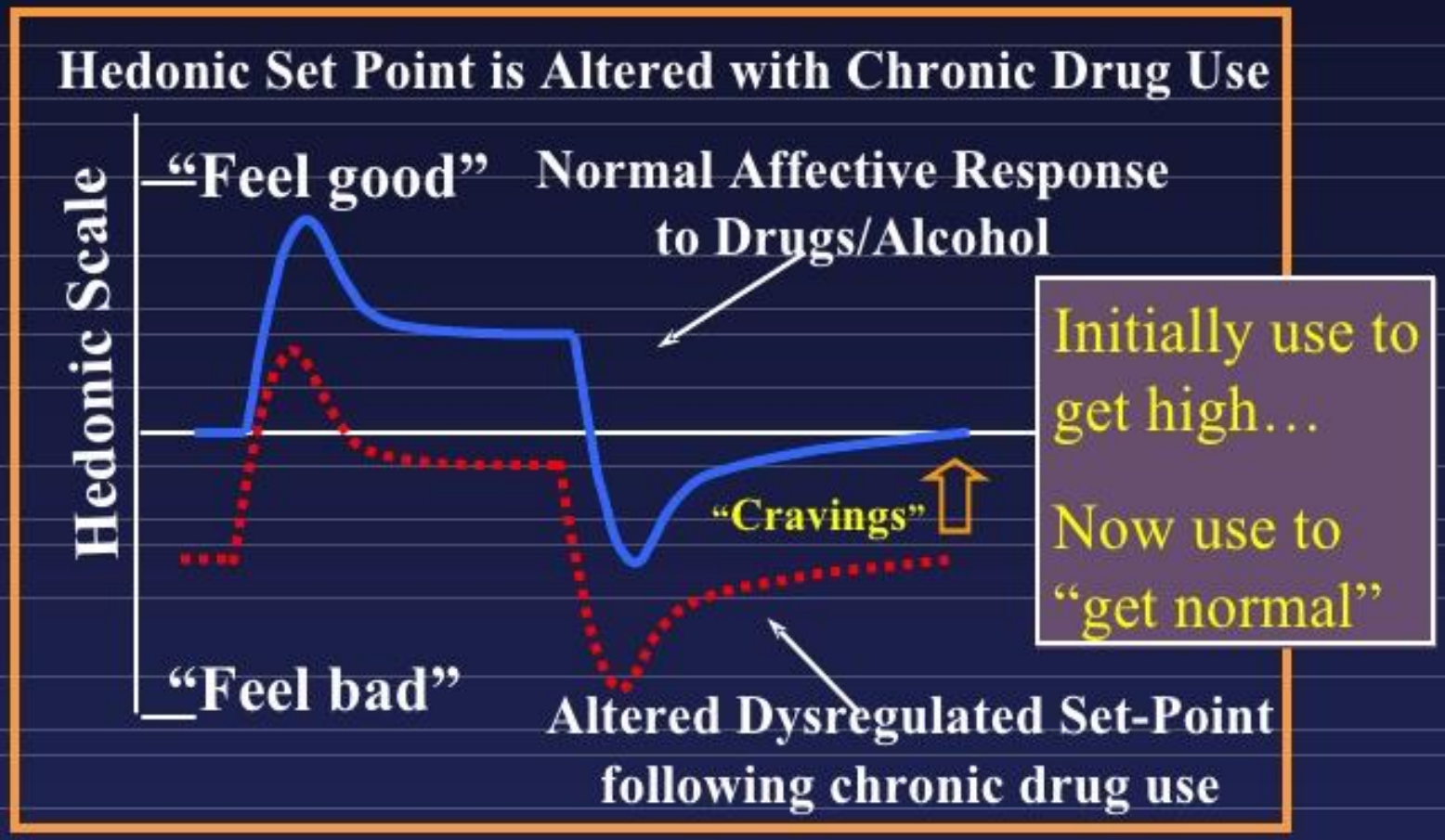


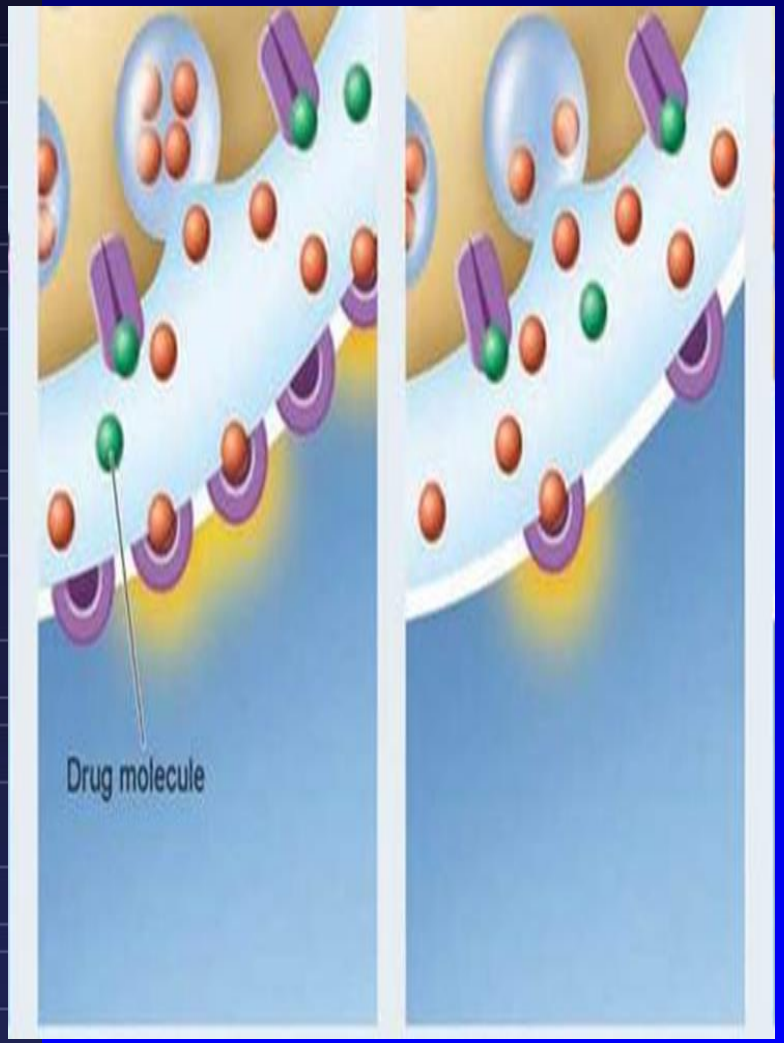


Stress Hormone and Withdrawal

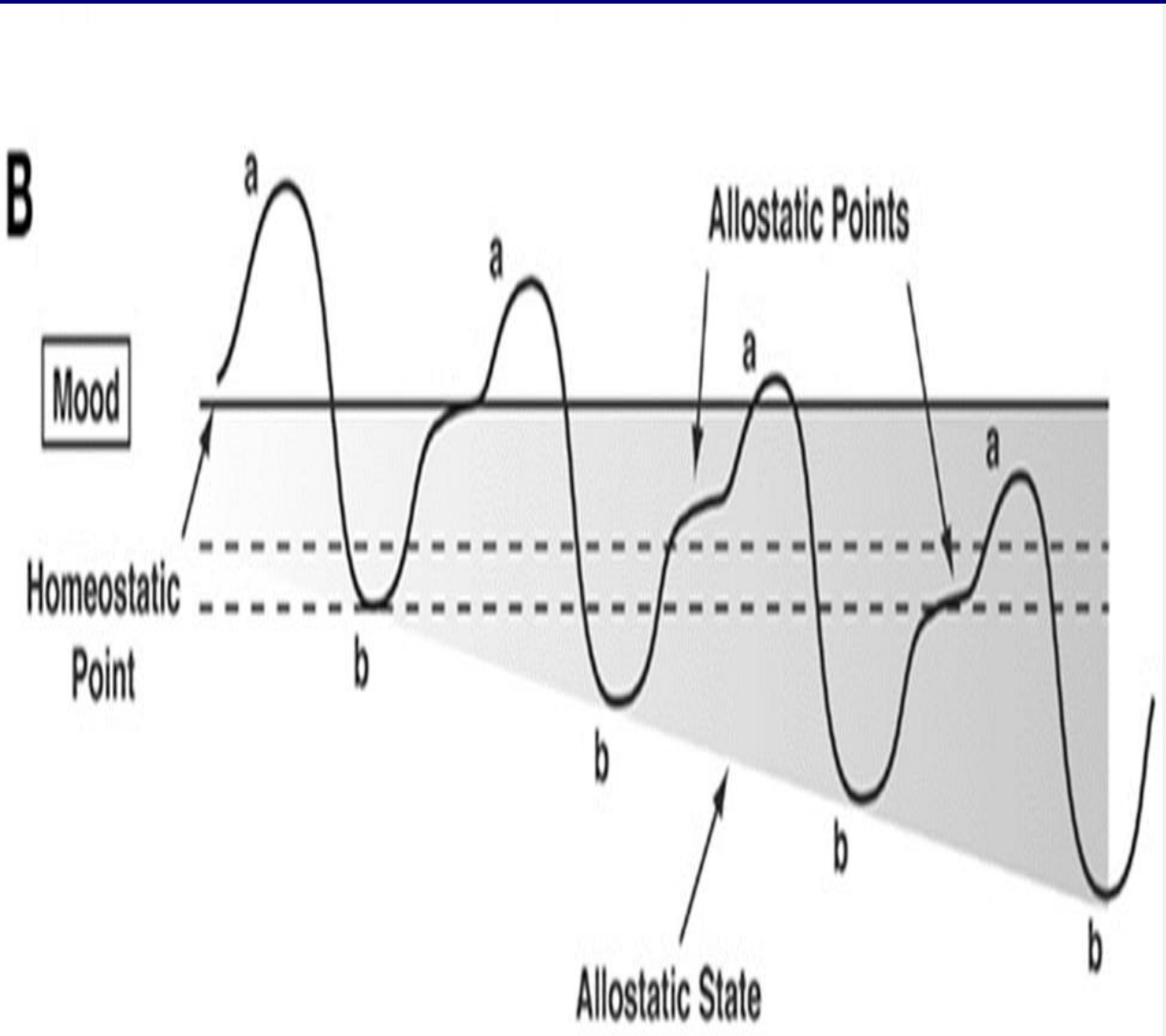


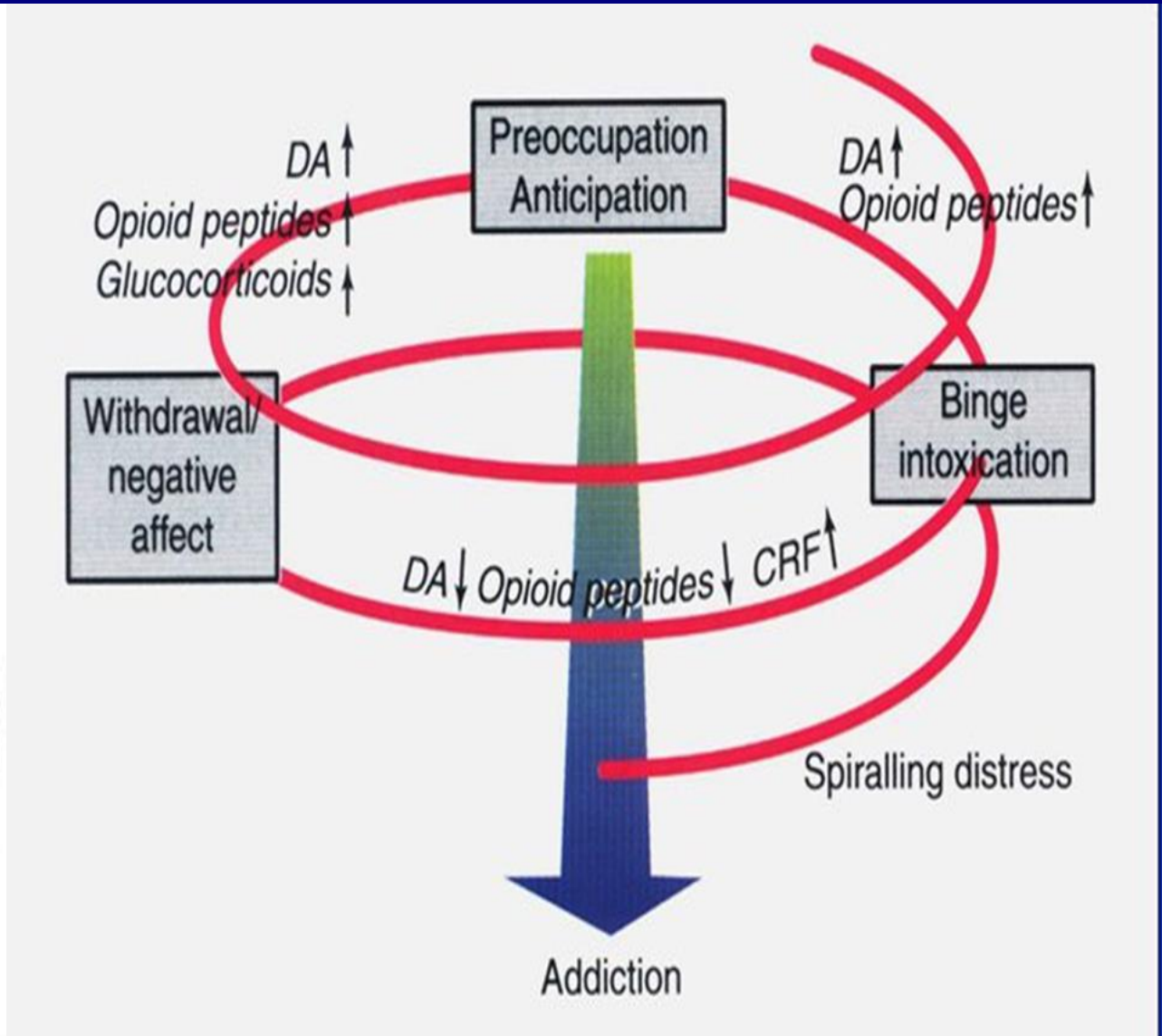
Chronic Use: Hedonic Homeostatic Dysregulation



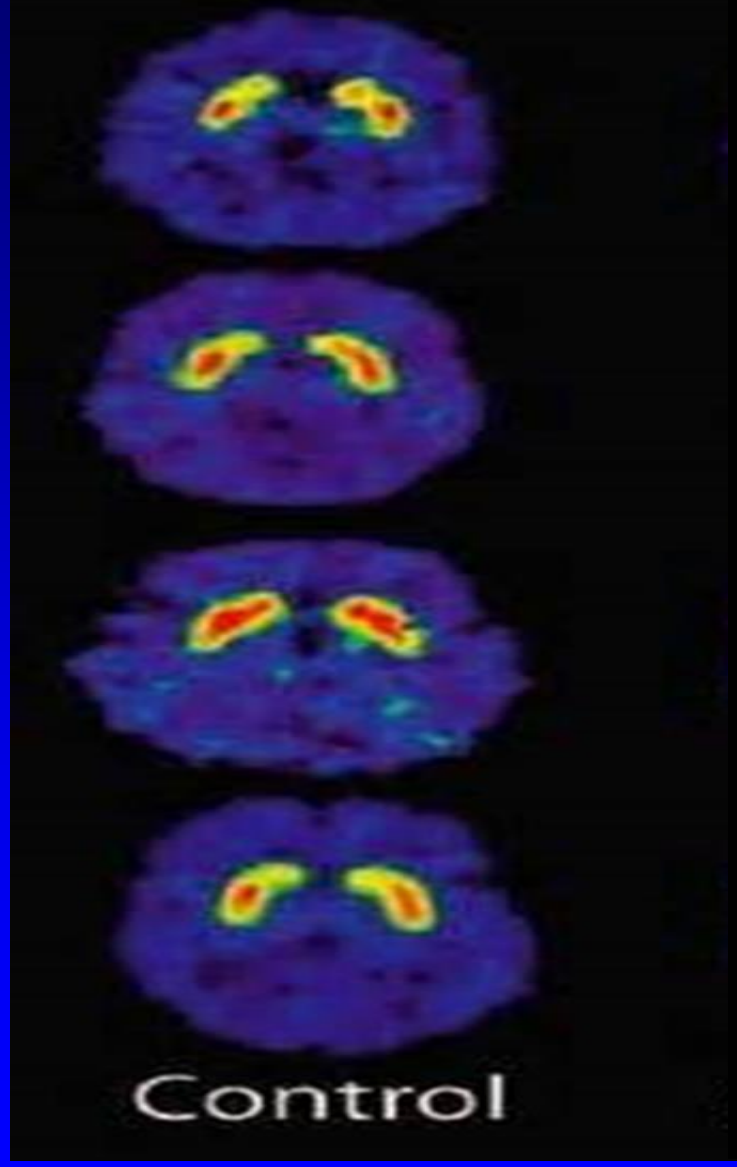


The Disease Deepens As Time Goes On





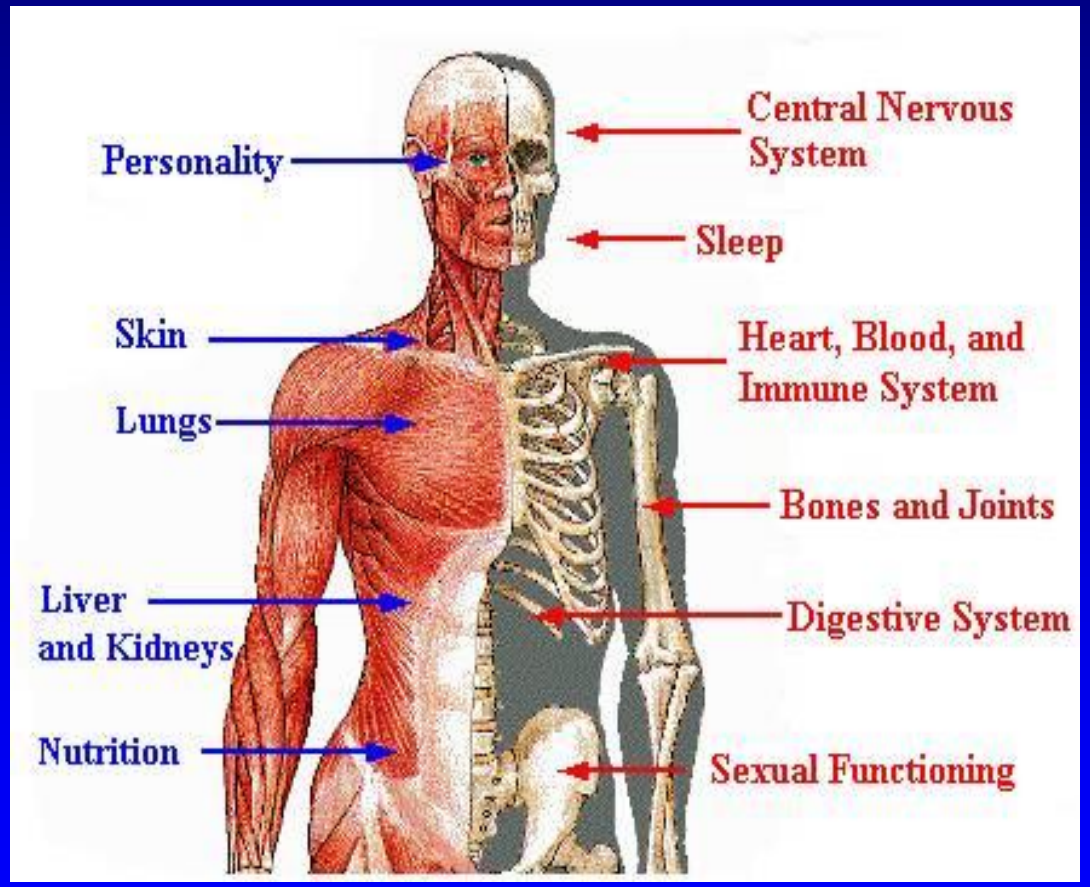
Dopamine D2 Receptors Are Lower in Addiction



ABCDE of Addiction

- **A**bstaining – inability to consistently abstain
- **B**ehavioral control impaired
- **C**raving like you need it to survive
- **D**iminished consequence recognition
- **E**motional dysfunctional response

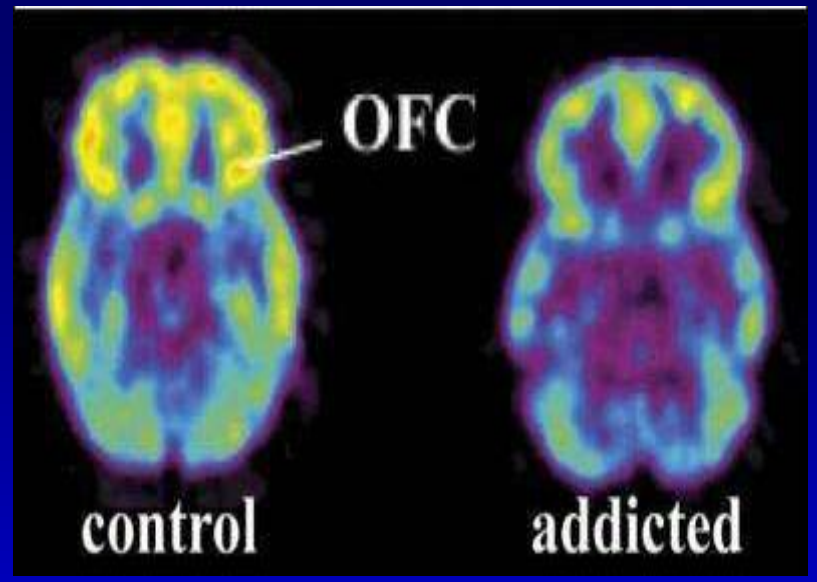
Biological

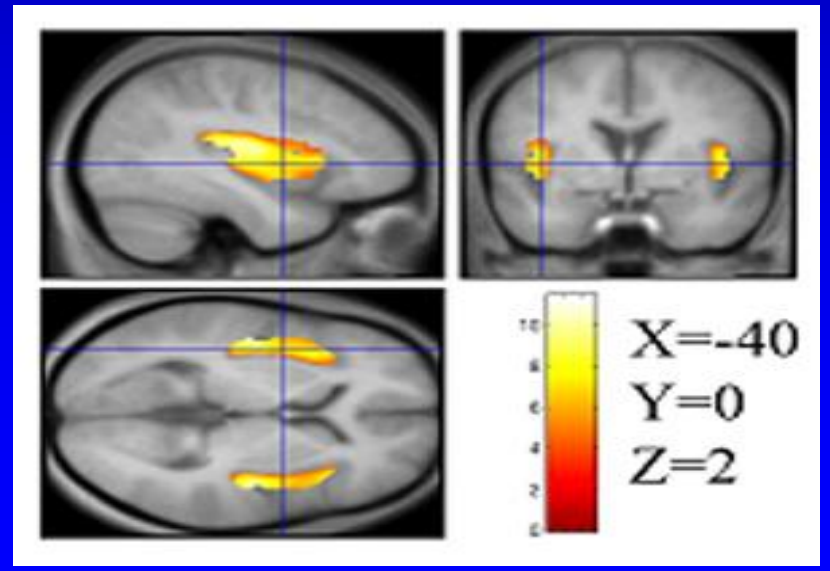


Physiologic tolerance develops to the high but not to the low

Psychological

- Do behaviors not like you to get substance
  - Perfect manipulation /lying
- Only aware of the substance
- Lose ability to tolerate feelings
- Increased anxiety sensitivity to stressors
- Pursue rewards/relief despite consequences
  - **Brake is not consistently working**
- SHAME, SHAME, SHAME





Social

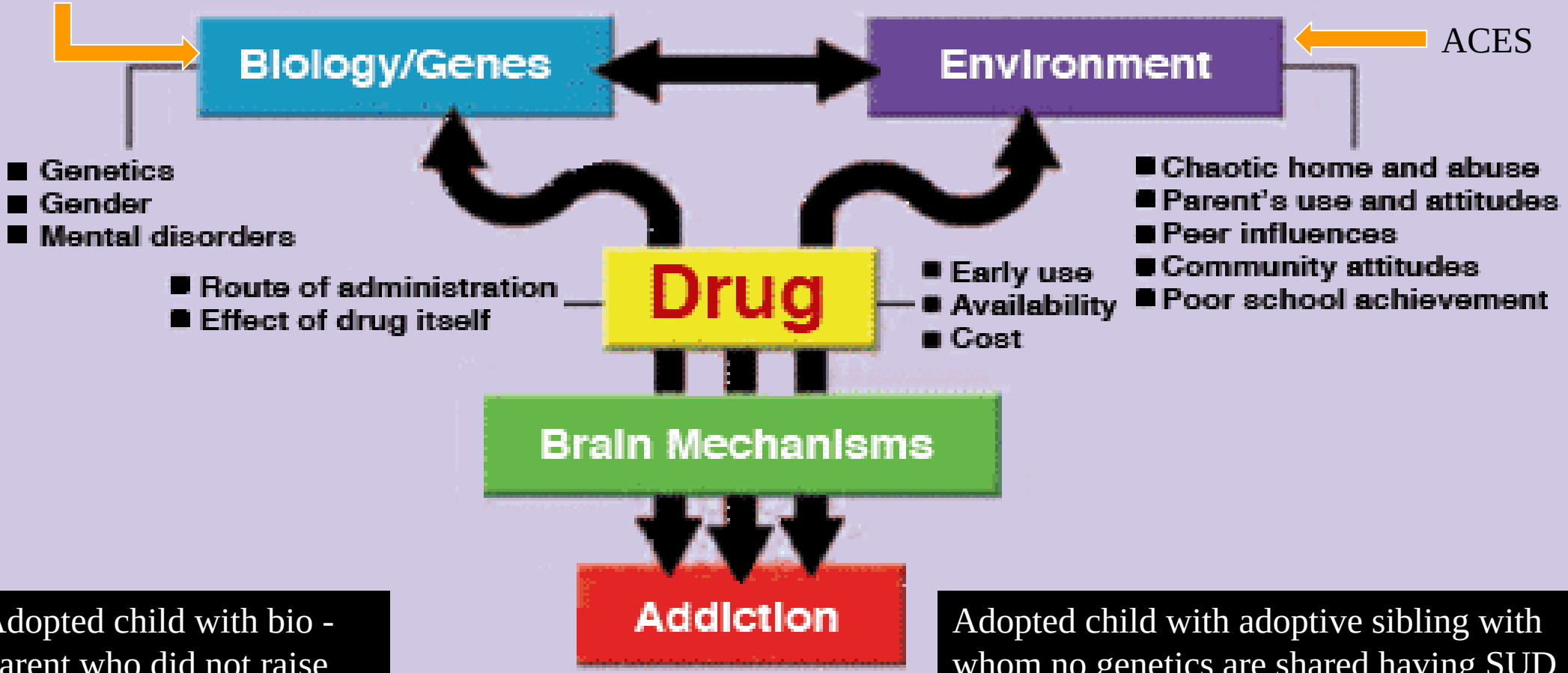
- Exclusion
- Not reliable or trustworthy while using
- Social network connected by the substance
- Chaotic and unstable
  - Housing
  - Income
  - Relationships
- Increased Legal Involvement
- Lose social skills - Do not keep up with peers

Spiritual

- Focus is moment to moment survival
- External connections lose importance
- Self – Centered
- Disconnected from life
- Lose values
- Hate their place in the world

RISK FACTORS

Adolescent Stage of Brain Development

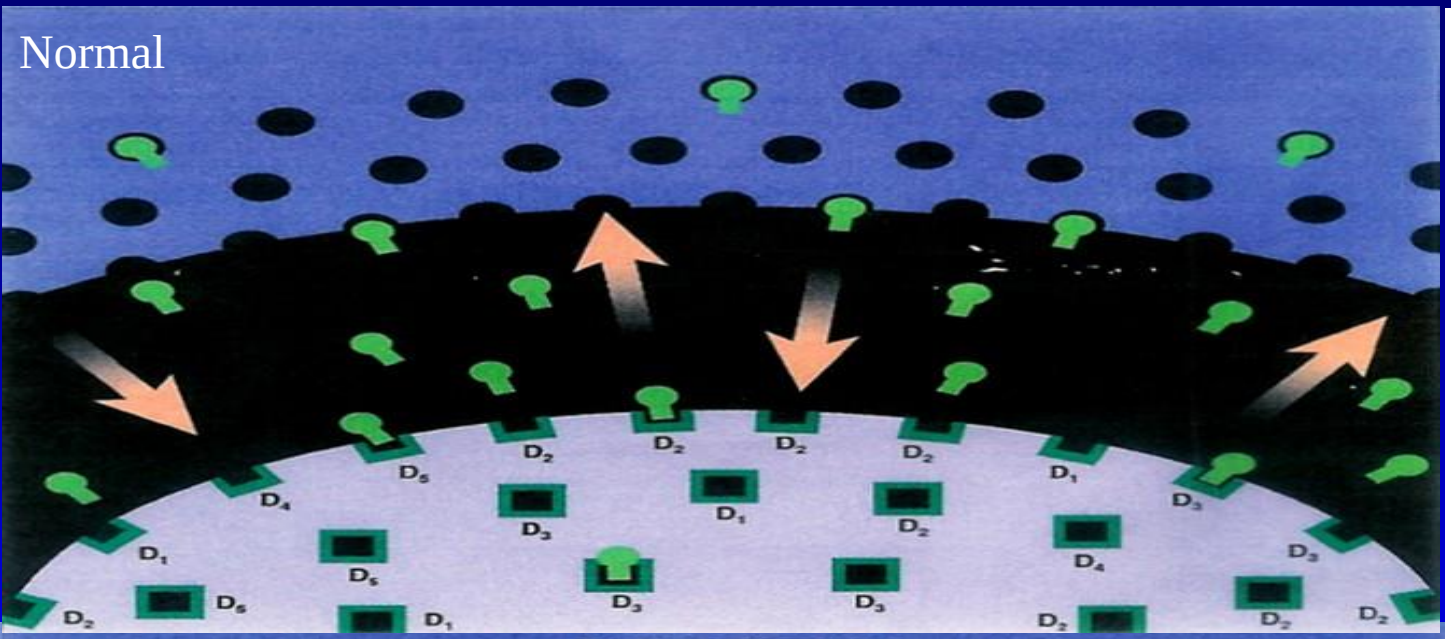


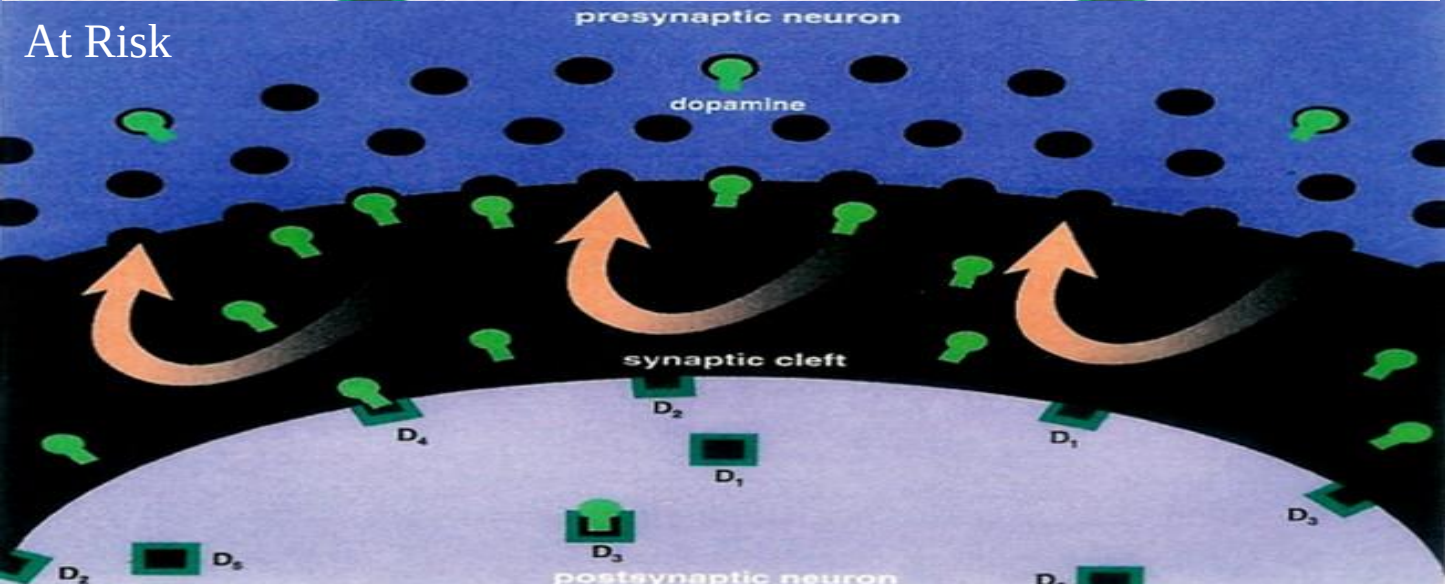
Adopted child with bio - parent who did not raise with SUD doubles risk

Adopted child with adoptive sibling with whom no genetics are shared having SUD doubles the adopted child's risk

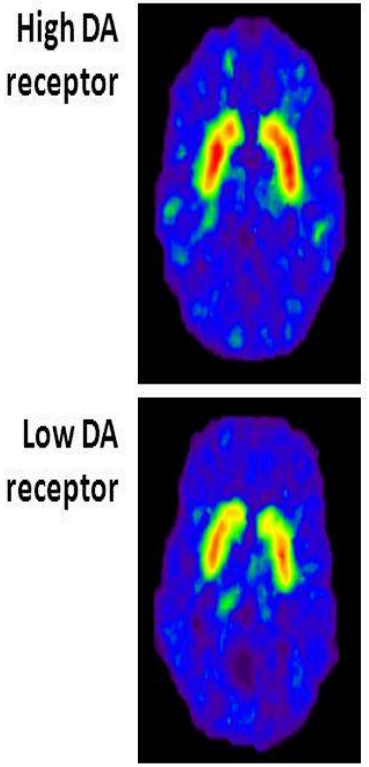
Kendler KS, Sundquist K, Ohlsson H, et al. Genetic and Familial Environmental Influences on the Risk for Drug Abuse: A National Swedish Adoption Study. Arch Gen Psychiatry. 2012;69(7):690-697. doi:10.1001/archgenpsychiatry.2011.2112. https://www.drugabuse.gov/sites/default/files/images/content/sciencefair_risk.gif

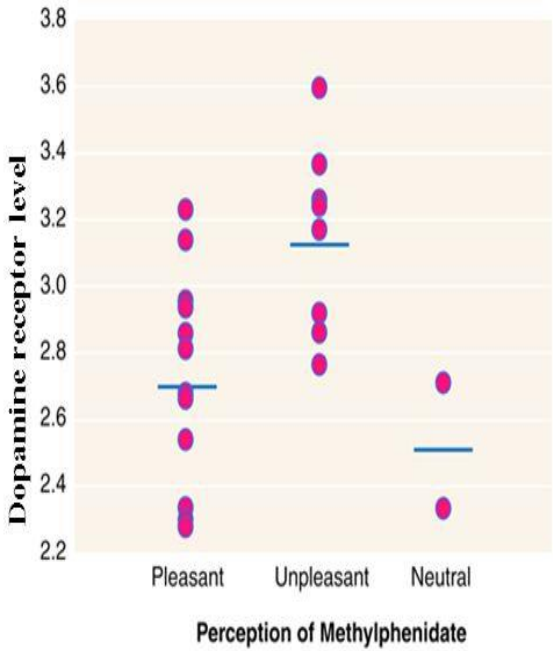
Genetics





DA Receptors and the Response to Methylphenidate (MP)





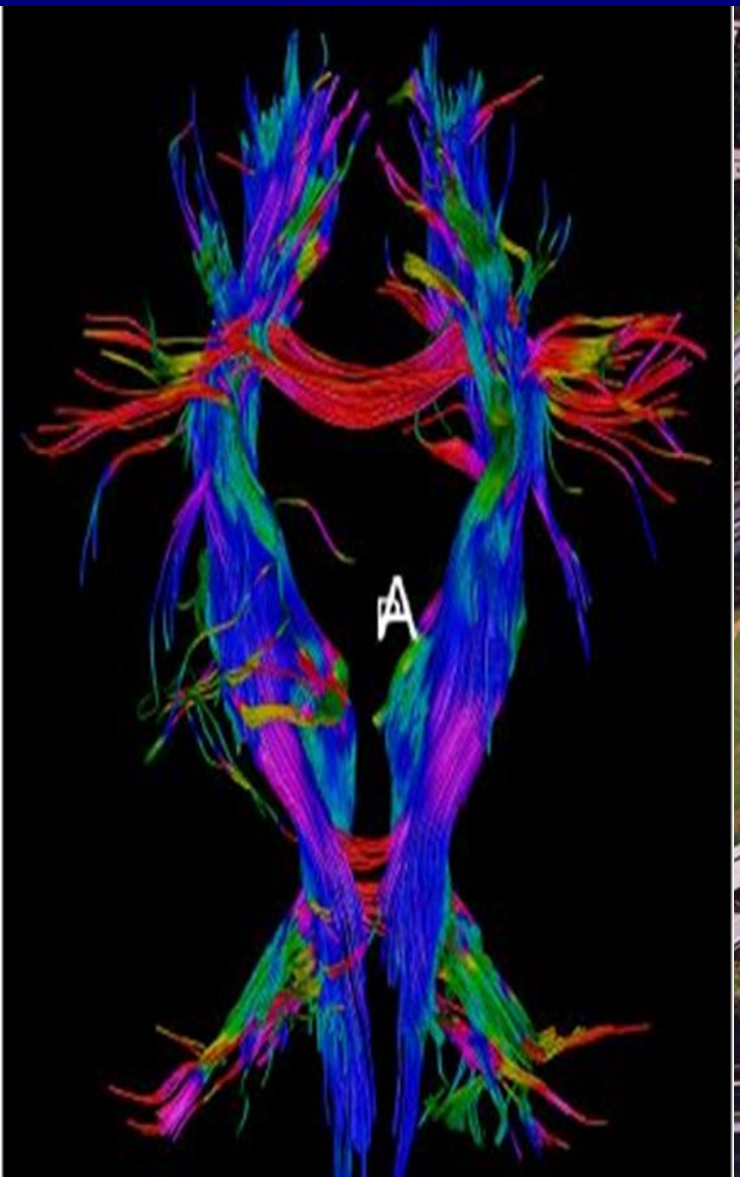
As a group, subjects with low receptor levels found MP pleasant while those with high levels found MP unpleasant

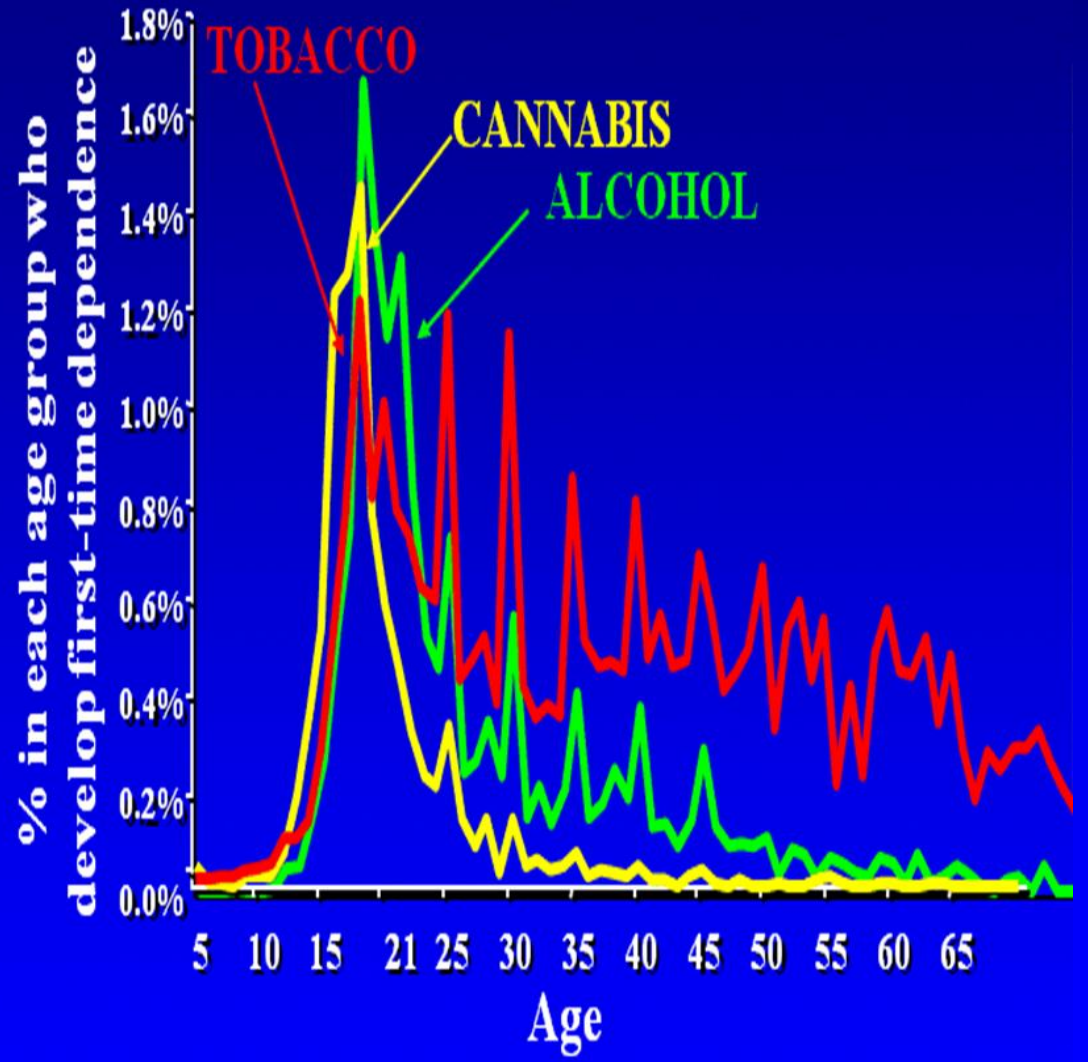
Adapted from Volkow et al., Am. J. Psychiatry, 1999.

Environment

- Stress can turn on genes
- Adverse childhood events (ACEs)– 5 or > Aces =10 x risk for SUD
- Modeling use and not modeling healthy coping skill development
- Peers
- Drug availability
- Community Attitude
- Low Expectations
- Low Opportunity

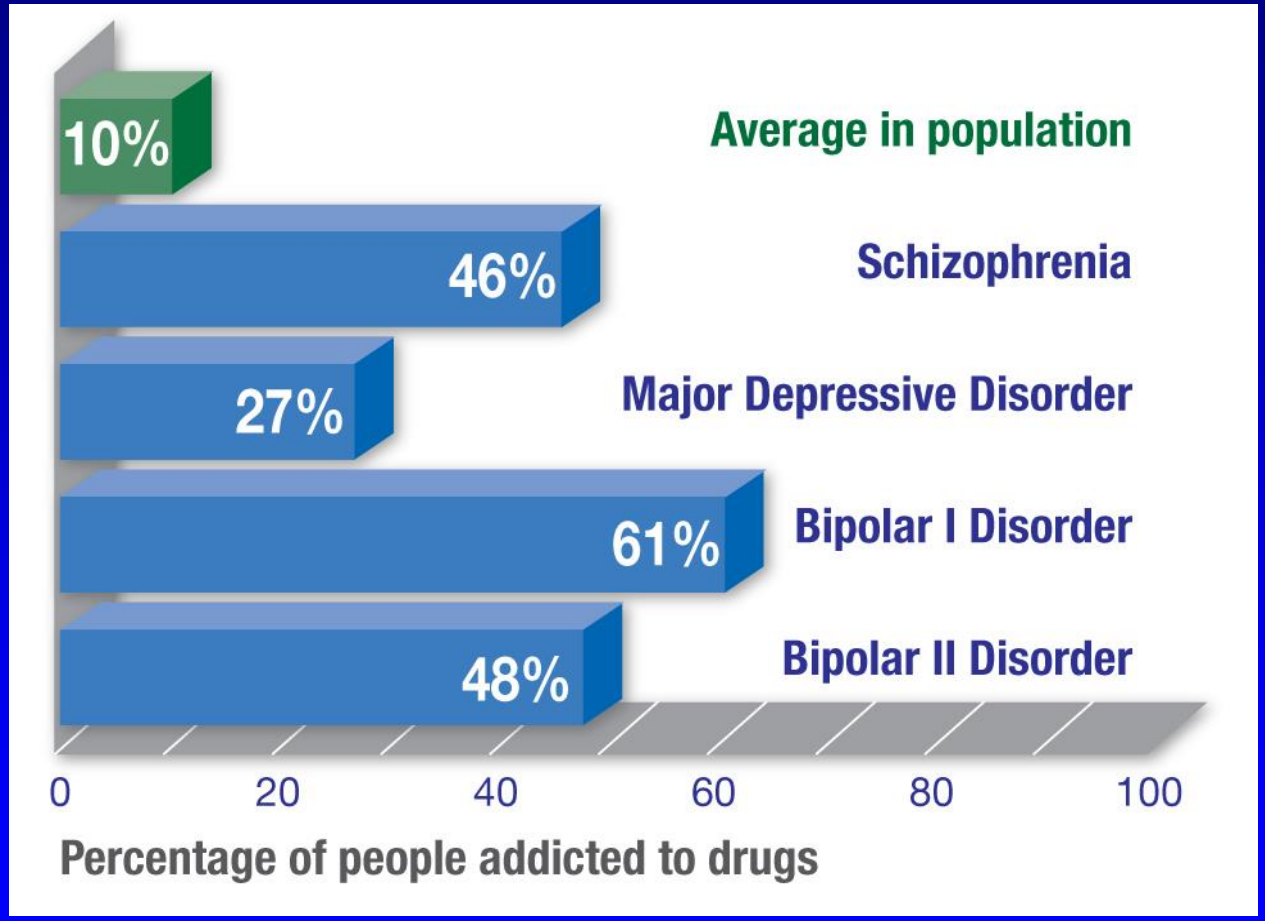
Developmental Disease -Begins in Adolescence





Other Brain Diseases Increase Risk

- "Self Medication"
- Causal – increase vulnerability to other mental illnesses
- Common causes and risk factors



Addiction Increases Risk for Addiction

Nearly all people who used heroin also used at least 1 other drug.

Most used at least 3 other drugs.

Heroin is a highly addictive opioid drug with a high risk of overdose and **death** for users.

People who are addicted to...

ALCOHOL

are

2x

MARIJUANA

are

3x

COCAINE

are

15x

Rx OPIOID PAINKILLERS

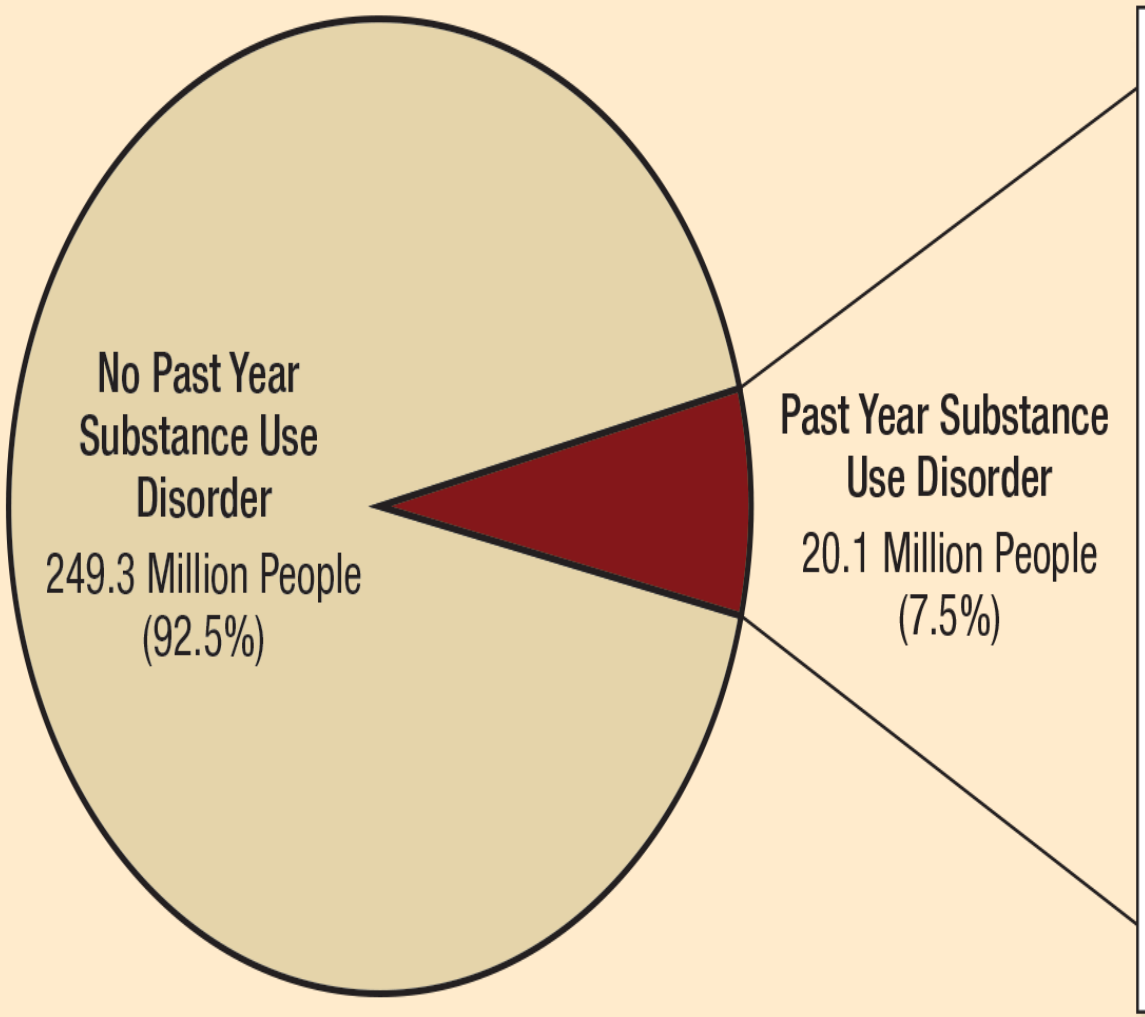
are

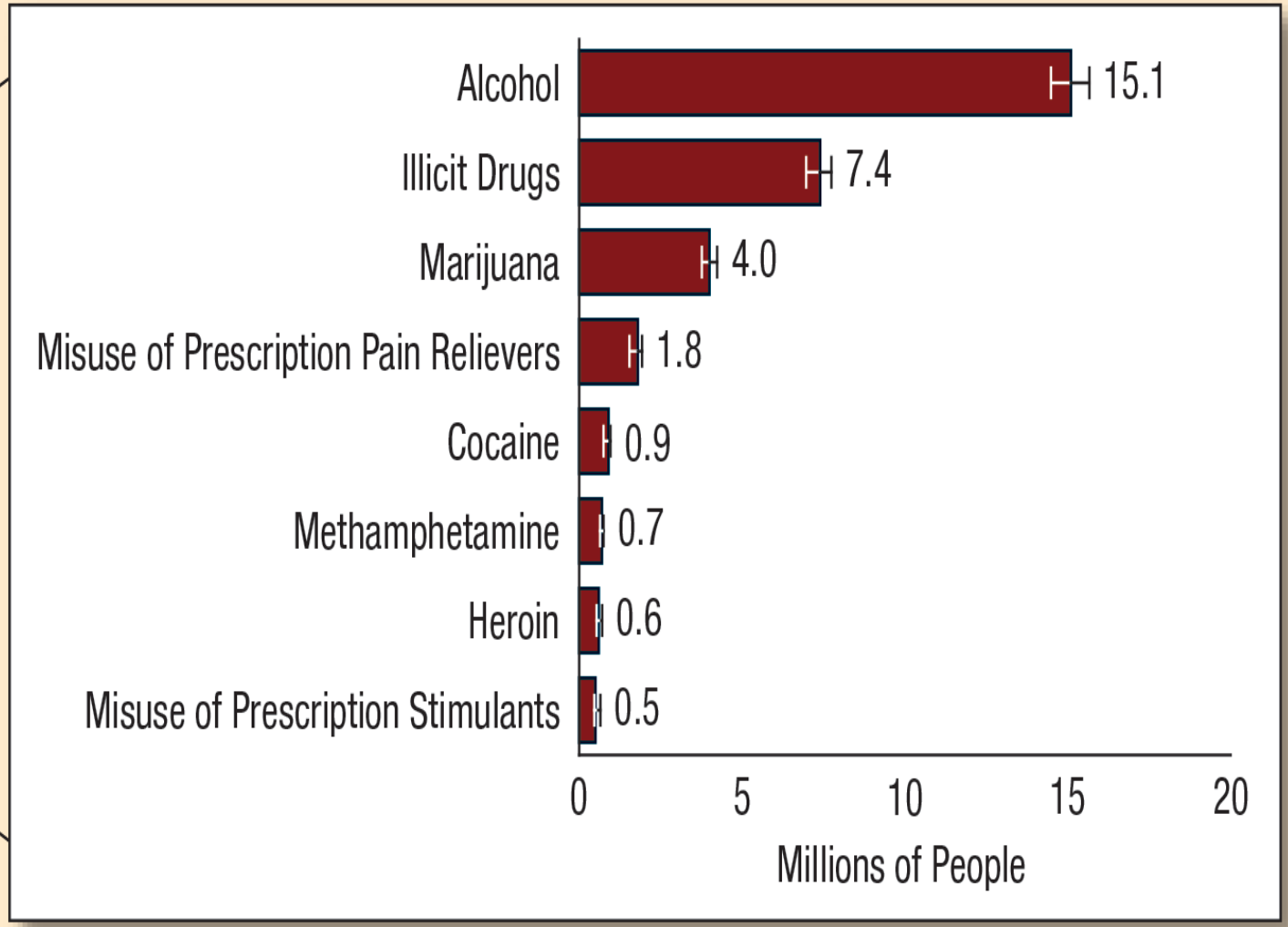
40x

...more likely to be addicted to heroin.

SOURCE: National Survey on Drug Use and Health (NSDUH), 2011-2013.

2016 Substance Use Disorder (SUD = Addiction) – in US



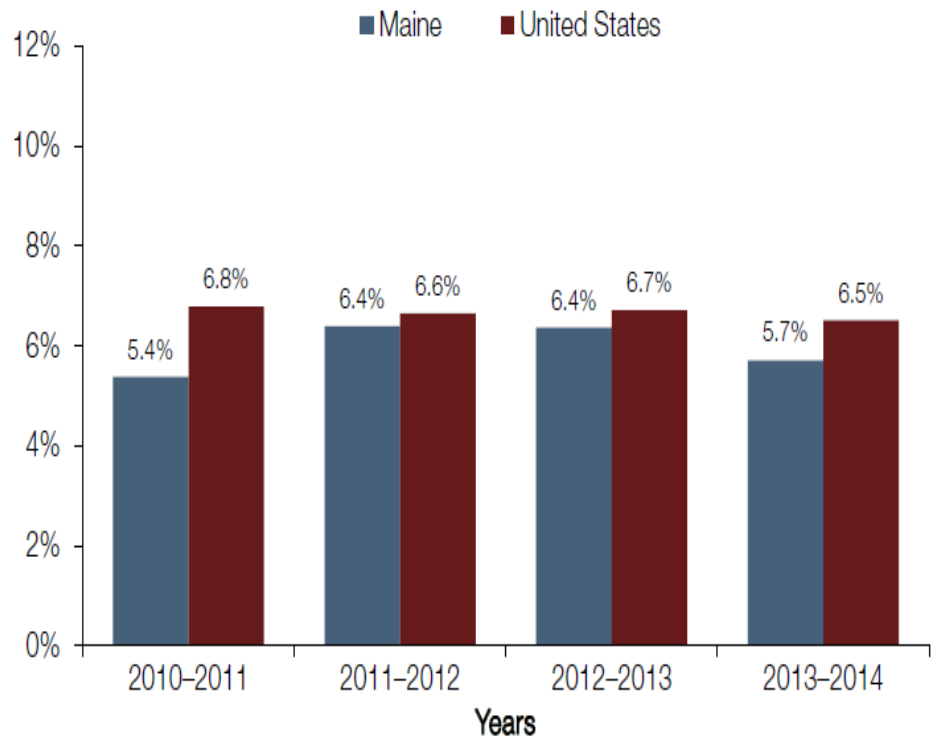


https://www.samhsa.gov/data/sites/default/files/NSDUH-FFR1-2016/NSDUH-FFR1-2016.htm

Past Year Alcohol Dependence or Abuse Among Individuals Aged 12 or Older in Maine and the United States (2010–2011 to 2013–2014)[1]

Maine's percentage of alcohol dependence or abuse among individuals aged 12 or older was similar to the national percentage in 2013–2014.

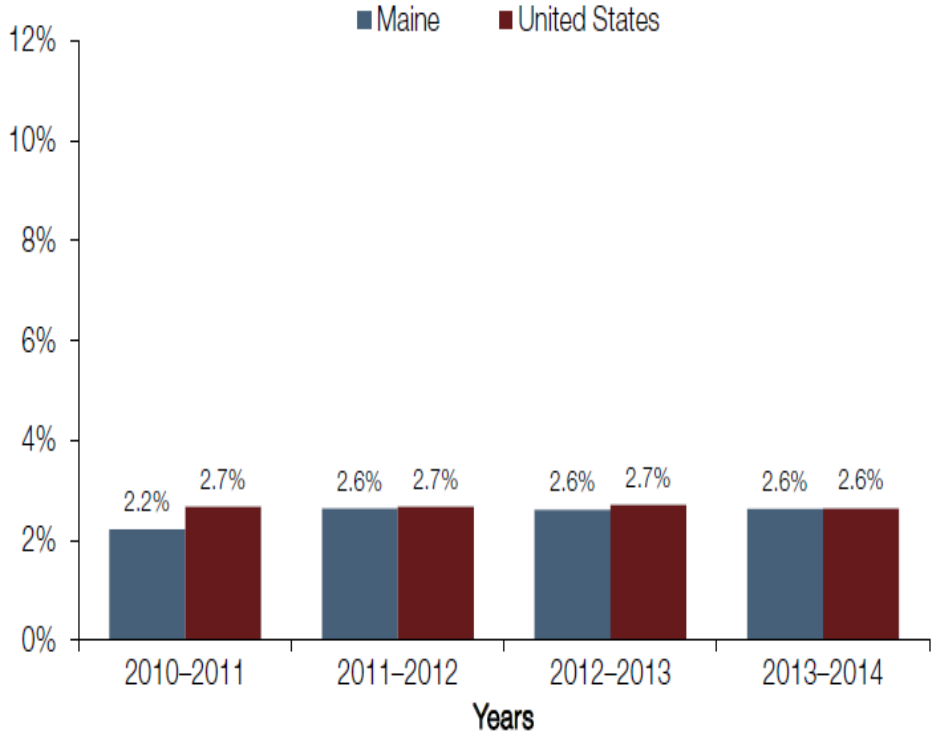
5.7%



Past Year Illicit Drug Dependence or Abuse Among Individuals Aged 12 or Older in Maine and the United States (2010–2011 to 2013–2014)[1]

Maine's percentage of illicit drug dependence or abuse among individuals aged 12 or older was similar to the national percentage in 2013–2014.

2.6%



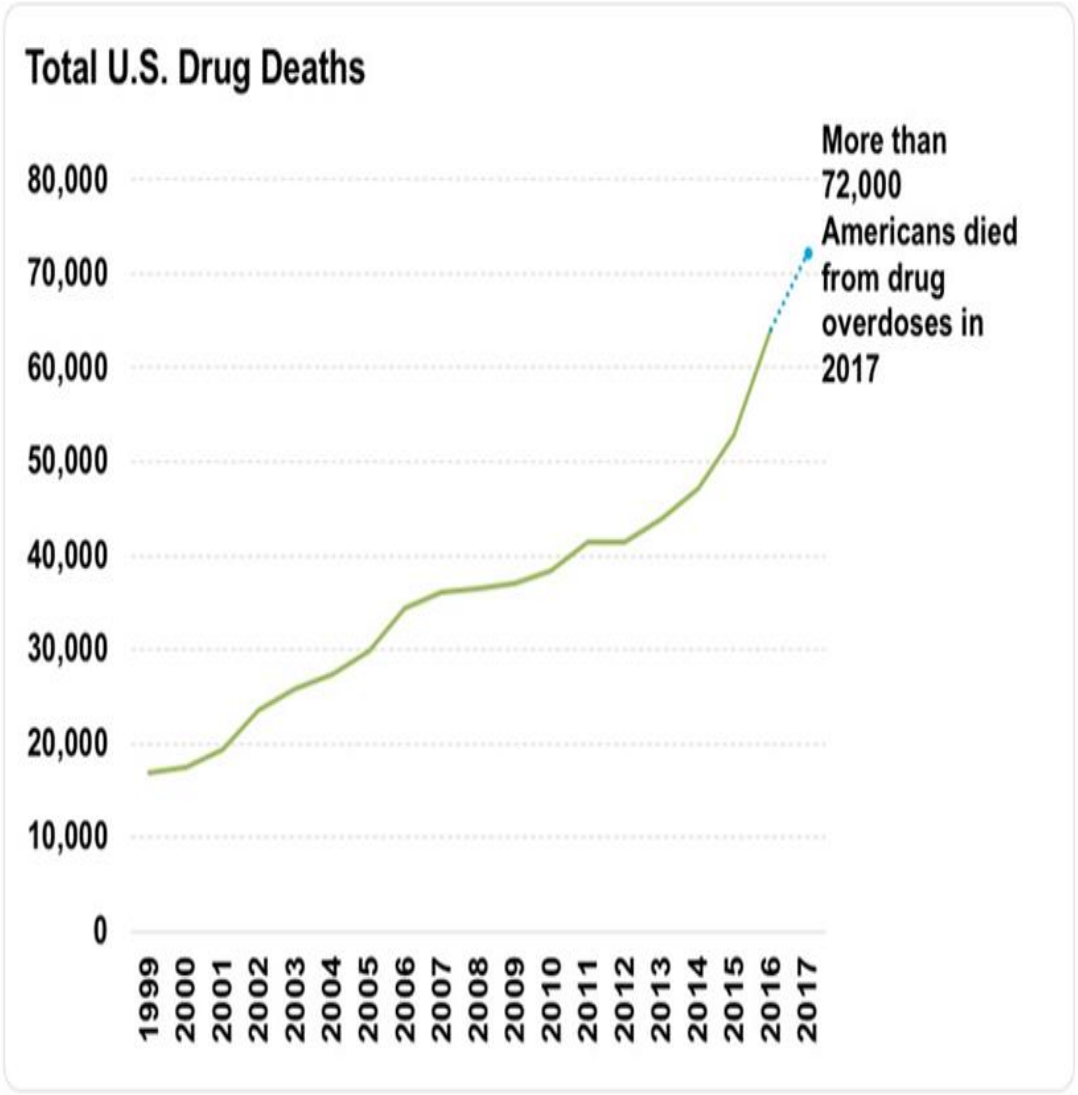
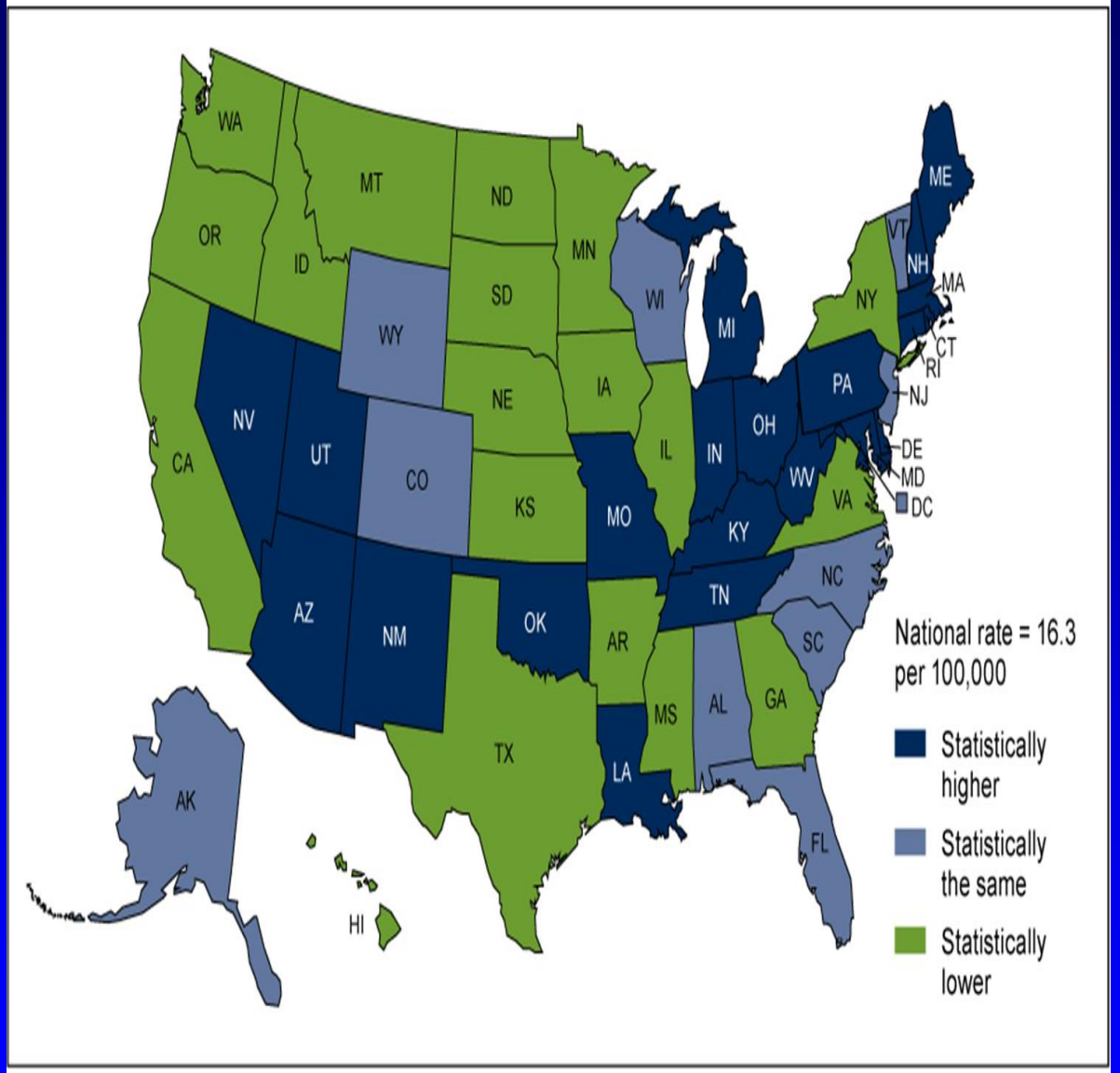


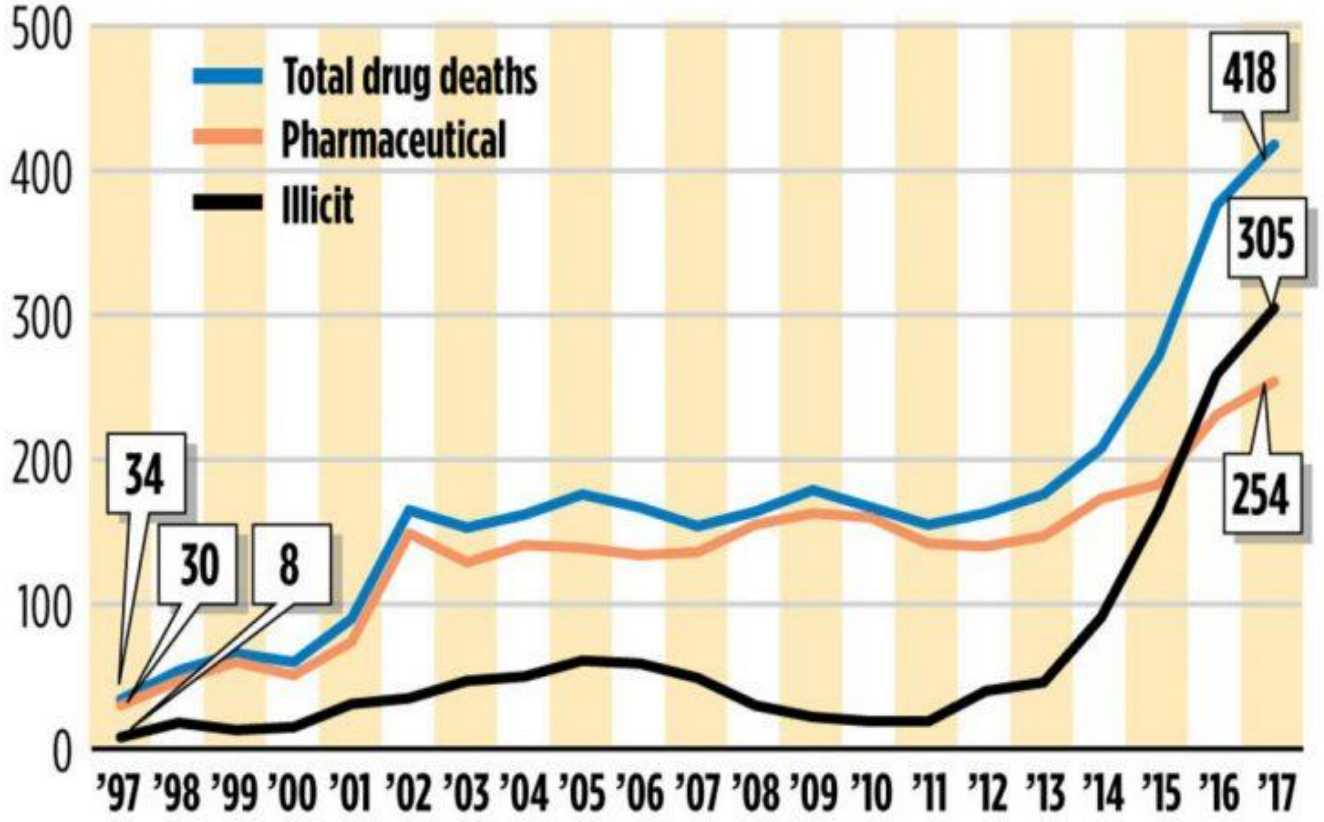
Figure 4. Age-adjusted drug overdose death rates, by state: United States, 2015



NOTES: Deaths are classified using the *International Classification of Diseases, Tenth Revision*. Drug overdose deaths are identified using underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. Access data table for Figure 4 at: https://www.cdc.gov/nchs/data/databriefs/db273_table.pdf#4.
SOURCE: NCHS, National Vital Statistics System, Mortality.

Drug deaths in Maine

The number of overdose deaths hit a record 418 in 2017. Opioids, both illicit and prescription, were responsible for the vast majority of fatal overdoses. In many cases, more than one drug was listed as a cause of death or significant contributing factor.

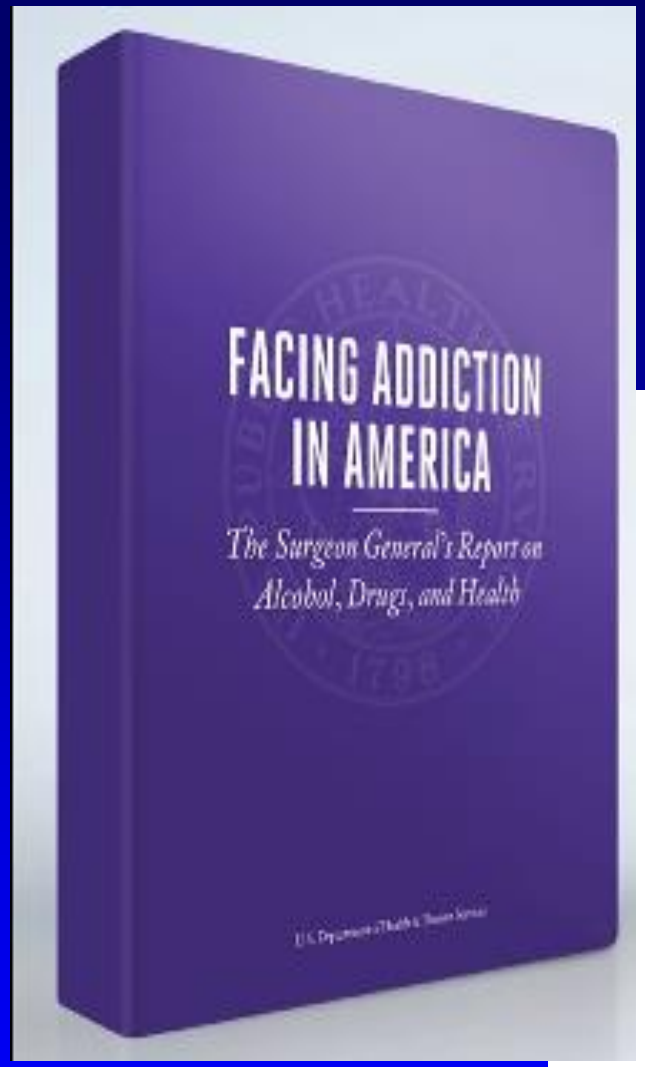


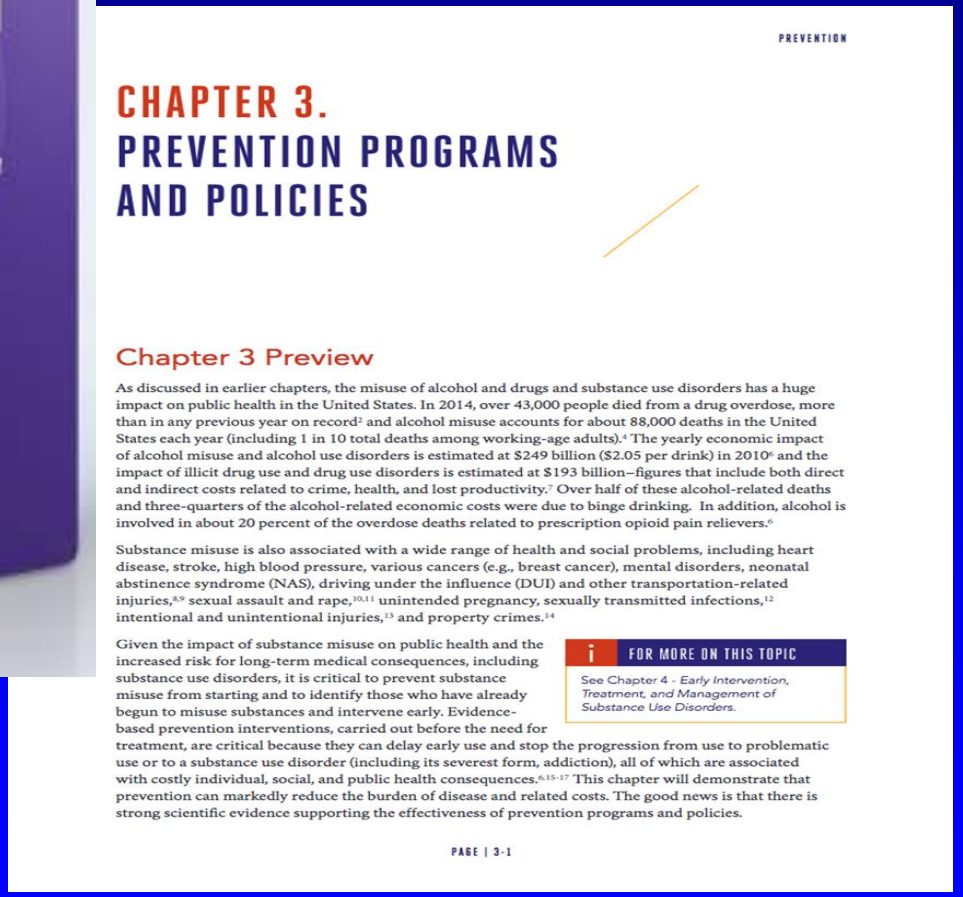
SOURCES: Office of the Maine Attorney General

STAFF GRAPHIC | MICHAEL FISHER

Surgeon General Report Evidenced Based Interventions

- Children Under Age 10
  - 7 Programs
- Youth 10 to 18
  - 18 Programs
- Age 18 +
  - 7 programs
- Community Implementation Systems/Coalition Models and Environmental Interventions
  - 10 Programs





PREVENTION

CHAPTER 3.
PREVENTION PROGRAMS AND POLICIES

Chapter 3 Preview

As discussed in earlier chapters, the misuse of alcohol and drugs and substance use disorders has a huge impact on public health in the United States. In 2014, over 43,000 people died from a drug overdose, more than in any previous year on record[2] and alcohol misuse accounts for about 88,000 deaths in the United States each year (including 1 in 10 total deaths among working-age adults).[4] The yearly economic impact of alcohol misuse and alcohol use disorders is estimated at $249 billion ($2.05 per drink) in 2010[6] and the impact of illicit drug use and drug use disorders is estimated at $193 billion–figures that include both direct and indirect costs related to crime, health, and lost productivity.[7] Over half of these alcohol-related deaths and three-quarters of the alcohol-related economic costs were due to binge drinking. In addition, alcohol is involved in about 20 percent of the overdose deaths related to prescription opioid pain relievers.[6]

Substance misuse is also associated with a wide range of health and social problems, including heart disease, stroke, high blood pressure, various cancers (e.g., breast cancer), mental disorders, neonatal abstinence syndrome (NAS), driving under the influence (DUI) and other transportation-related injuries,[8,9] sexual assault and rape,[10,11] unintended pregnancy, sexually transmitted infections,[12] intentional and unintentional injuries,[13] and property crimes.[14]

Given the impact of substance misuse on public health and the increased risk for long-term medical consequences, including substance use disorders, it is critical to prevent substance misuse from starting and to identify those who have already begun to misuse substances and intervene early. Evidence-based prevention interventions, carried out before the need for treatment, are critical because they can delay early use and stop the progression from use to problematic use or to a substance use disorder (including its severest form, addiction), all of which are associated with costly individual, social, and public health consequences.[6,15-17] This chapter will demonstrate that prevention can markedly reduce the burden of disease and related costs. The good news is that there is strong scientific evidence supporting the effectiveness of prevention programs and policies.

FOR MORE ON THIS TOPIC

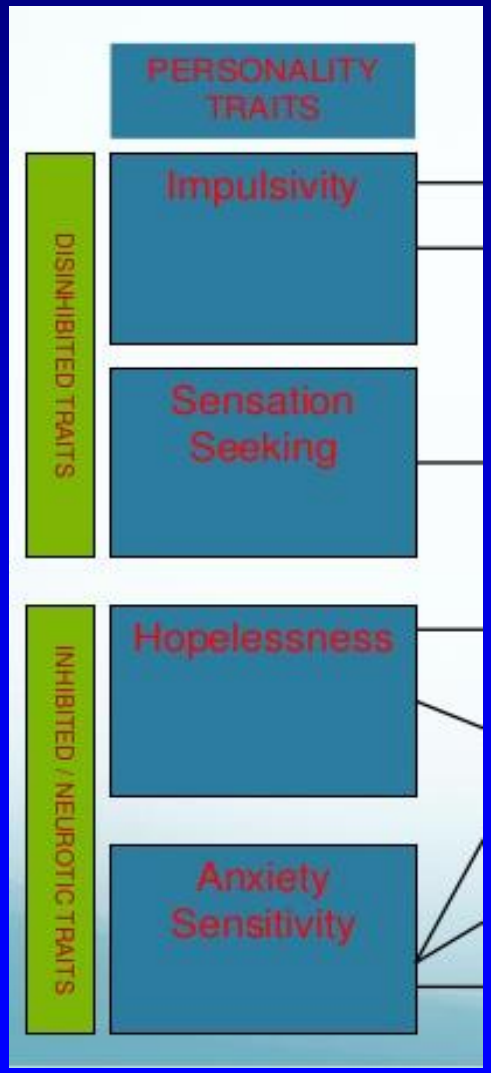
See Chapter 4 - *Early Intervention, Treatment, and Management of Substance Use Disorders.*

PAGE | 3-1

Increase Protective Factors
Decrease Modifiable Risk Factors

- Reduce ACEs
- Instill Sense of Purpose
- High Expectations
- High Opportunities
- Teach Coping Skills
- Change Culture of Comfort

Effectiveness of a Selective, Personality-Targeted Prevention Program for Adolescent Alcohol Use and Misuse: A Cluster Randomized Controlled Trial
Patricia J. Conrod, PhD;
***JAMA Psychiatry.* 2013;70(3):334-342. doi:10.1001/jamapsychiatry.2013.651.**



- 29% reduced odds of drinking

Responding to the Heroin Epidemic

PREVENT People From Starting Heroin

Reduce prescription opioid painkiller abuse.
Improve opioid painkiller prescribing practices and identify high-risk individuals early.

REDUCE Heroin Addiction

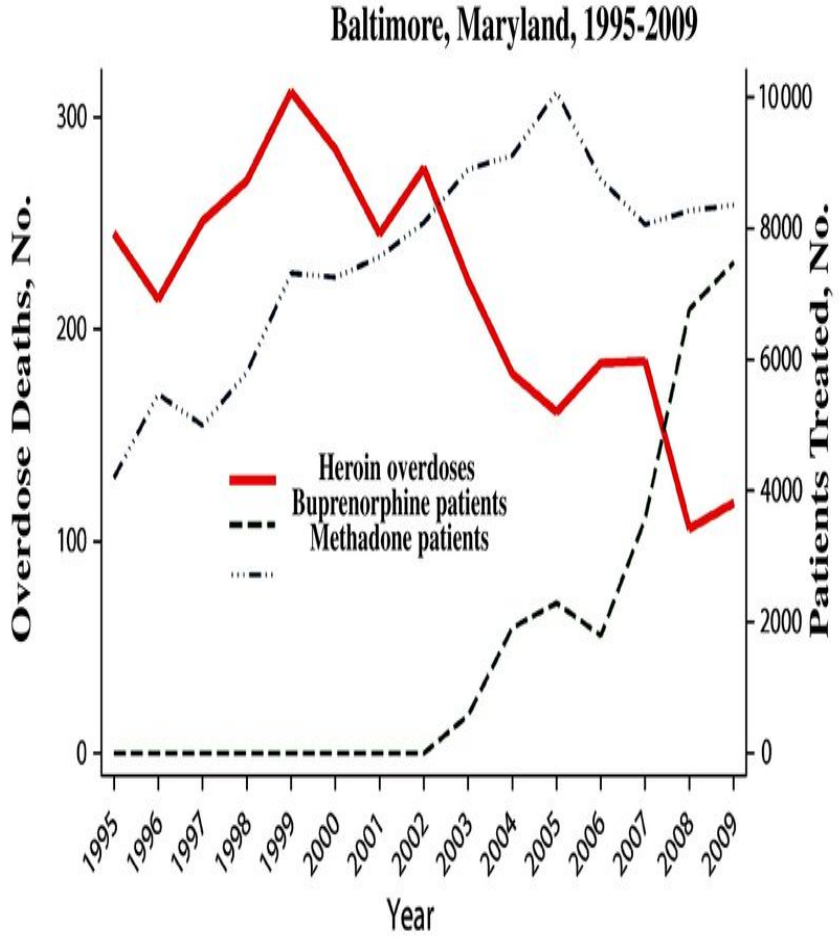
Ensure access to Medication-Assisted Treatment (MAT).
Treat people addicted to heroin or prescription opioid painkillers with MAT which combines the use of medications (methadone, buprenorphine, or naltrexone) with counseling and behavioral therapies.

REVERSE Heroin Overdose

Expand the use of naloxone.
Use naloxone, a life-saving drug that can reverse the effects of an opioid overdose when administered in time.

SOURCE: CDC Vitalsigns, July 2015

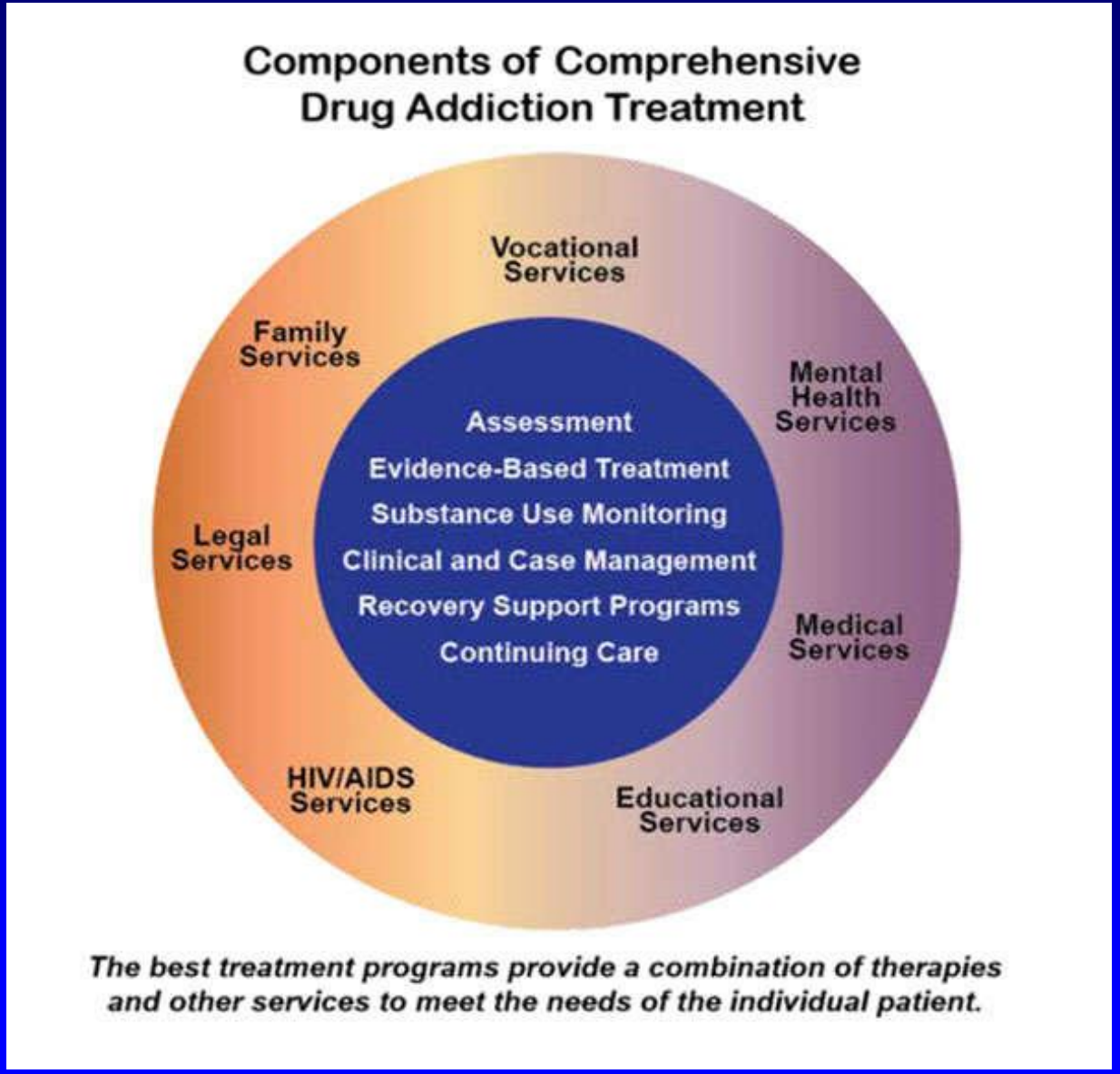
Opioid Agonist Treatments Decreased Heroin Overdose Deaths



Schwartz RP et al., Am J Public Health 2013;1 03: 917-922.

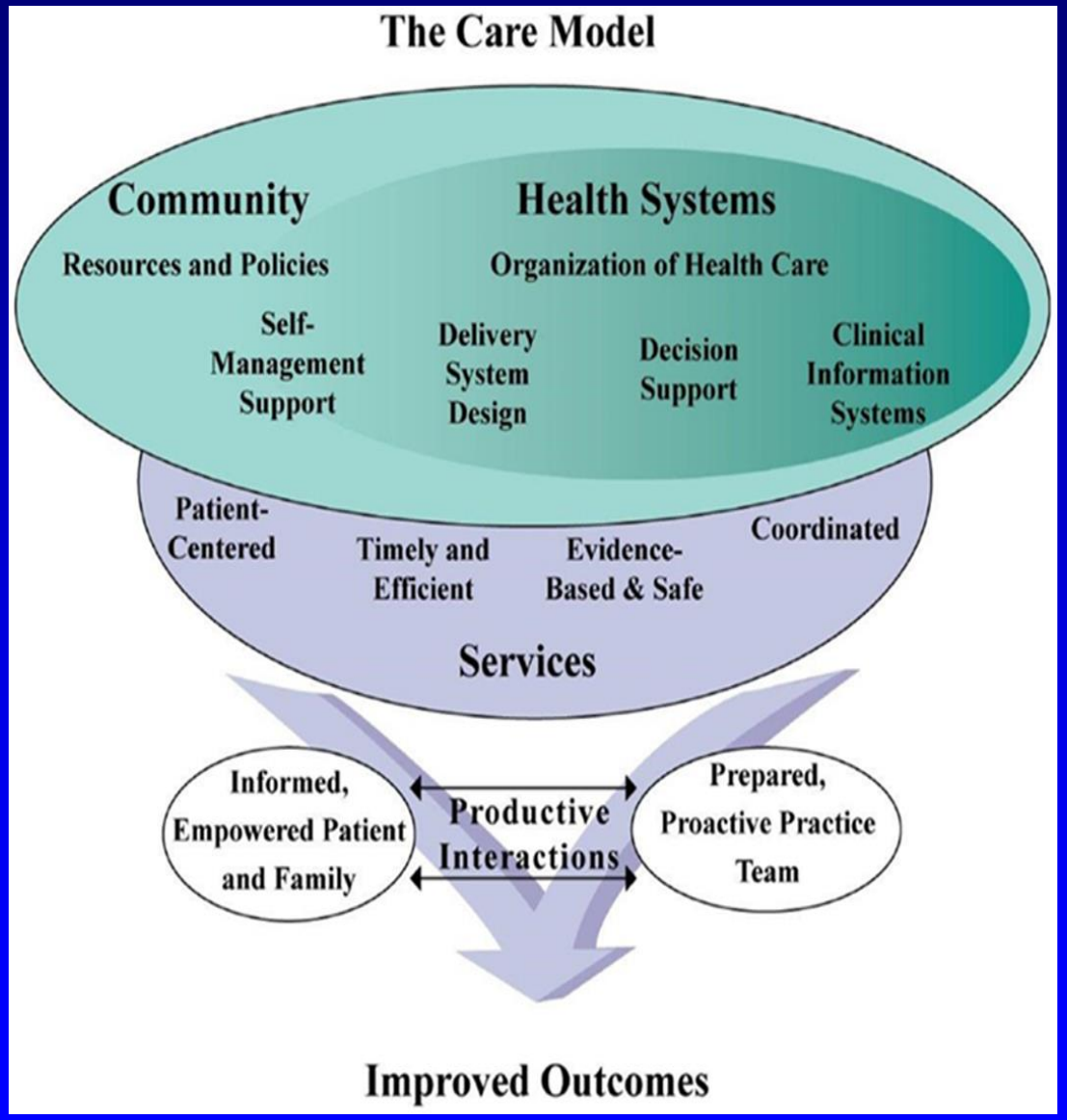
Essentials of Effective Treatment

1. Biopsychosocialspiritual
2. No same brain
3. No same environment
4. No same path
5. Stay with recovery plan
6. Treat other brain disorders
7. Does not need to be voluntary
8. Rock bottom is not necessary

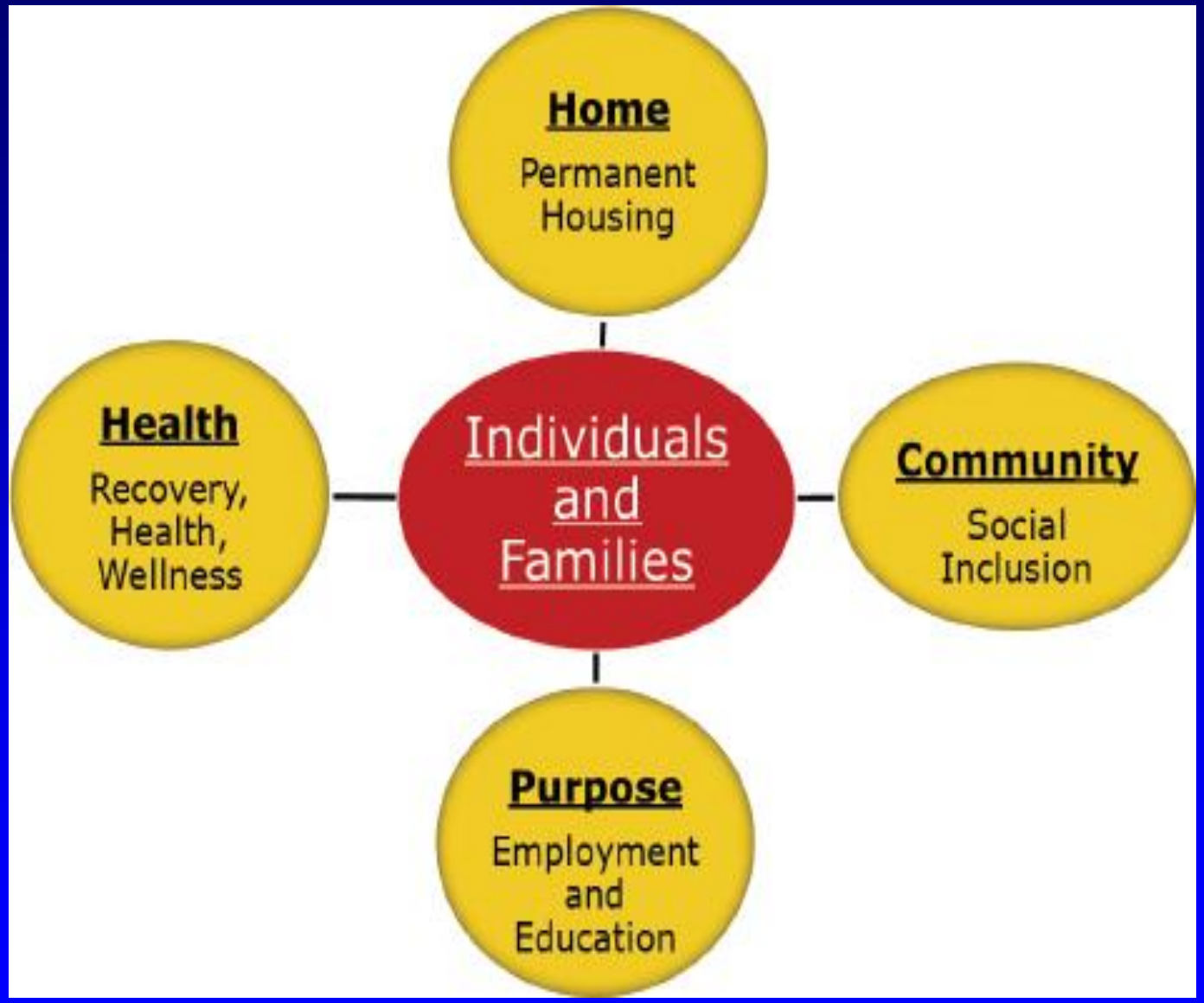


Continuum of Care – Chronic Illness Treatment

- Brief education/intervention
- Risky use counseling (“pre diabetes”)
- Outpatient counseling
- Medication assisted treatment
- Intensive outpatient
- Partial hospitalization
- Hospitalization
- Intensive long term care



Chronic Care



- Combines:
  1. Self – management
  2. Social support
  3. Professional care
- Must be monitored and managed over time
  1. Decrease the frequency and intensity of relapses
  2. Optimize functioning during periods of remission

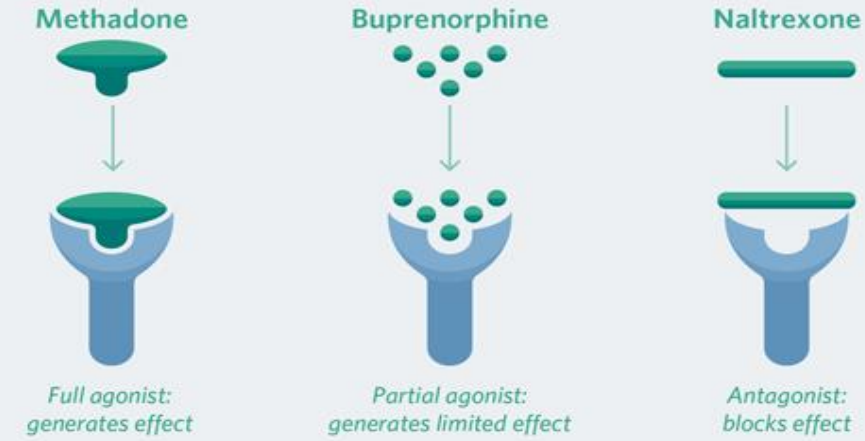
Medications cannot take the place of an individual's willpower, but they aid addicted individuals in resisting the constant challenges to their resolve."

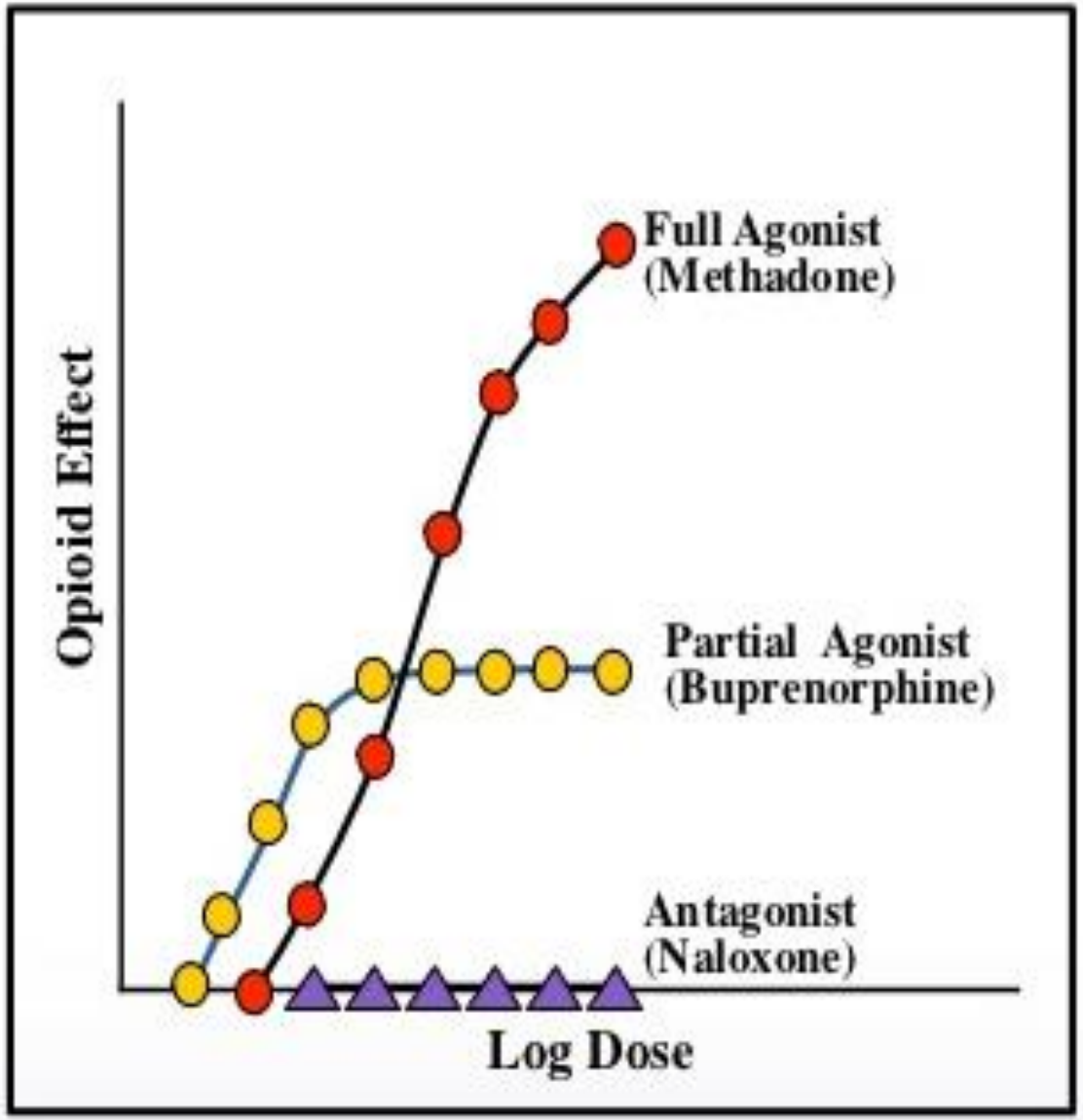
–DR. NORA VOLKOW

NIH National Institu
on Drug Abuse

Figure 1

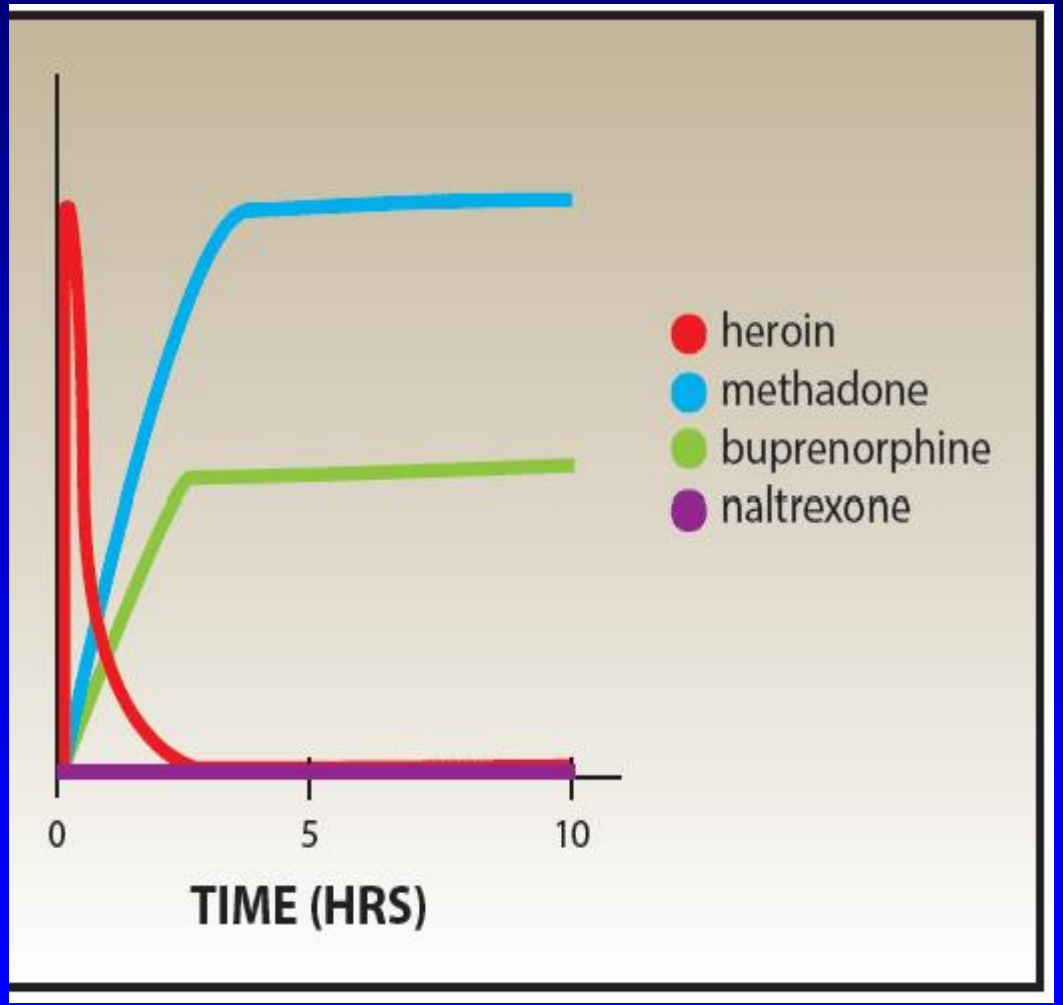
How OUD Medications Work in the Brain



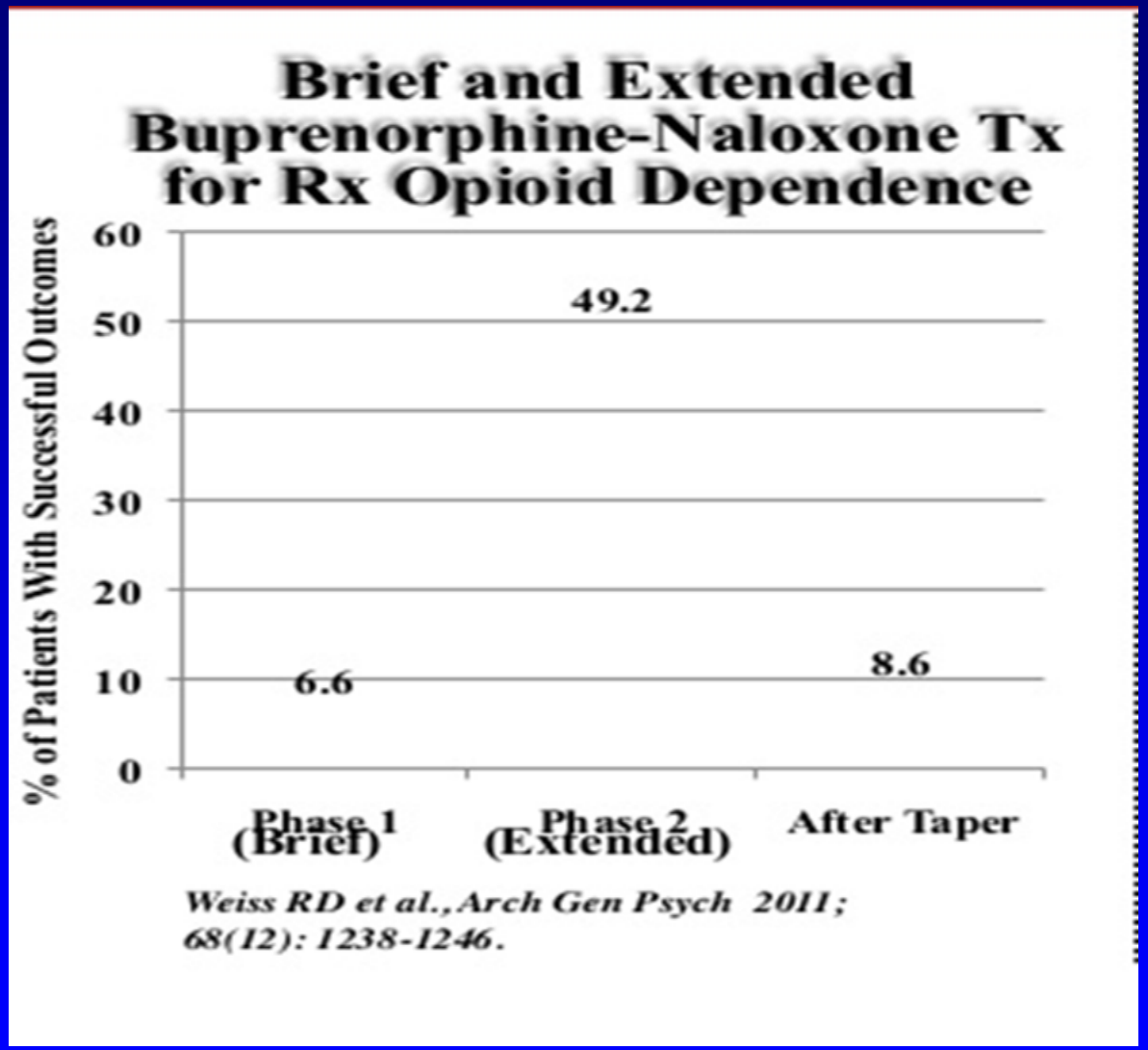


Methadone and Buprenorphine are Medicines

- Monitored RX
- Suppresses the euphoric effects of other opioids
- Blocks withdrawal
- Allows patients to:
  - Hold jobs
  - Avoid street crime and violence
  - Reduce their exposure to HIV/Hepatitis
  - Engage in counseling/essential interventions
  - Find wellness and recovery
    - Care for biopsychsocialspiritual health
    - Stable housing
    - Strong community connectedness
    - Healthy purpose



How Long on MAR? As Long as Needed



42 month follow up

- 375 Patients followed
- 61% were abstinent from illicit opioids, including 29% on buprenorphine-naloxone

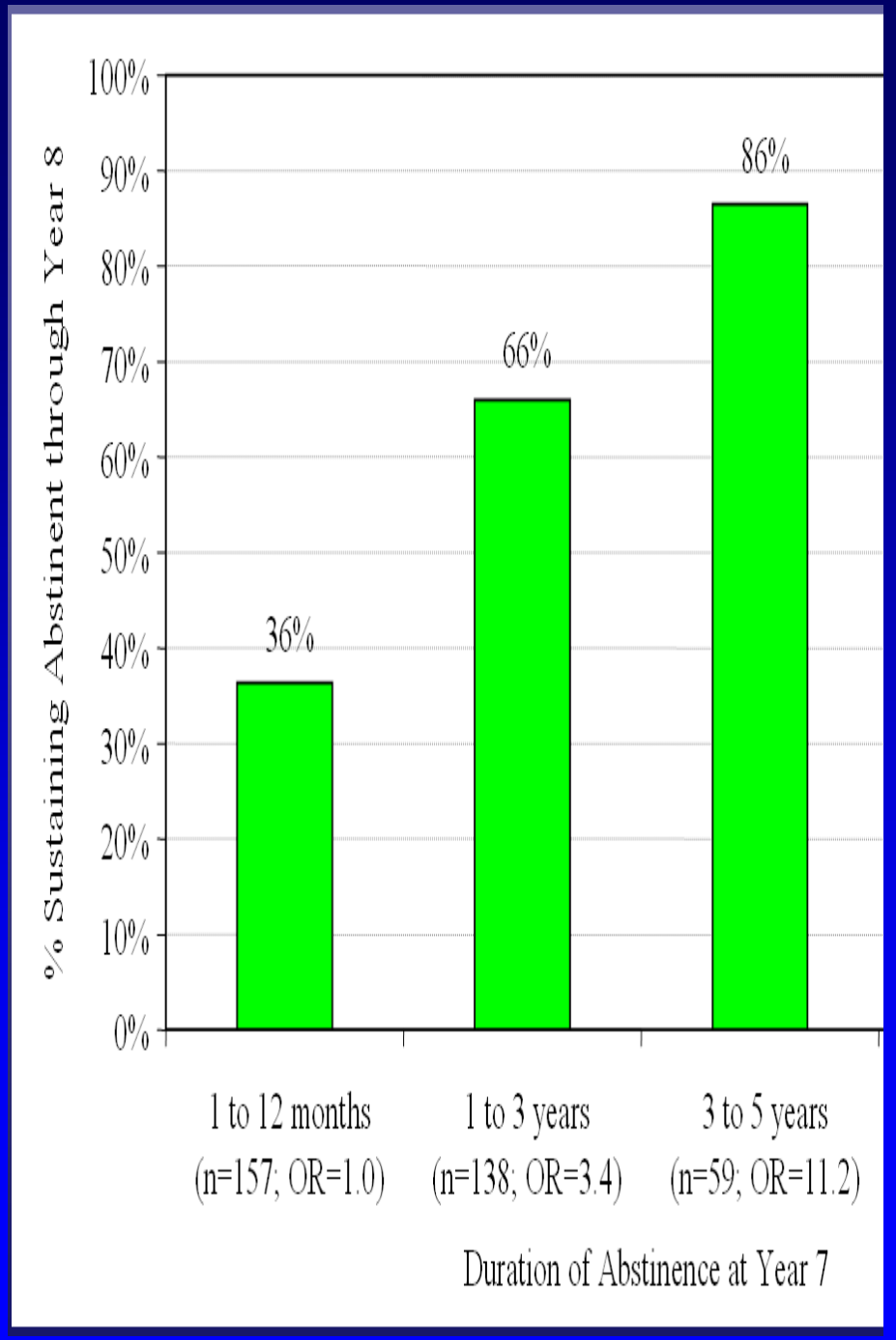
From: Weiss RD Drug Alcohol Dependence 2015 May 1;150:112-9. doi: 10.1016/j.drugalcdep.2015.02.030. Epub 2015 Mar 6.

- Tapering unlikely to be effective until 4 pillars of recovery are firmly in place
  - Health, Community, Housing, Purpose

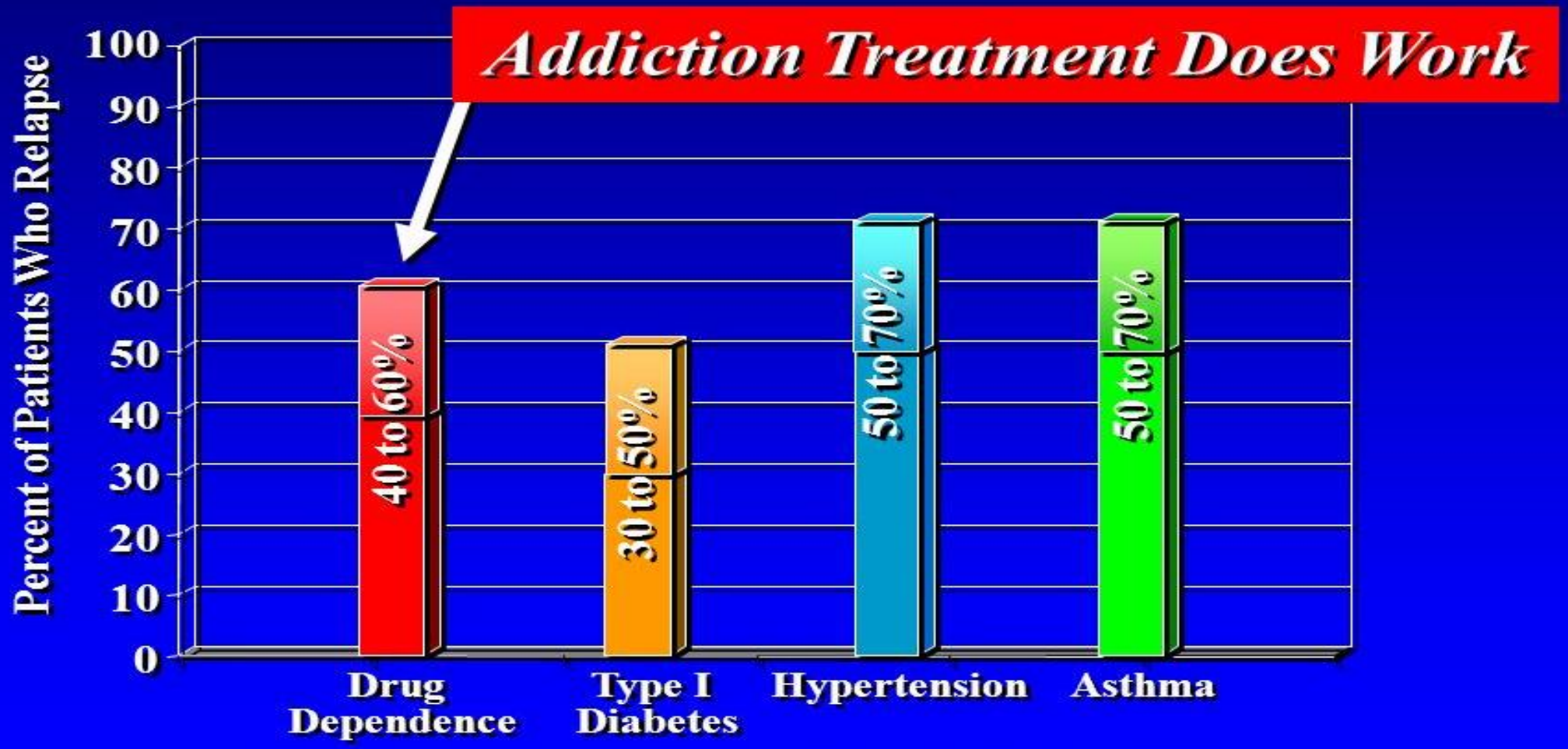
Outcomes

- 33% remission
- 30-40 % substantial improvement
- 20-30% little to no improvement

- Outcome challenges
  - Done on those with most severe illnesses
  - Disease is undiagnosed most of the time
  - Recovery is social secret

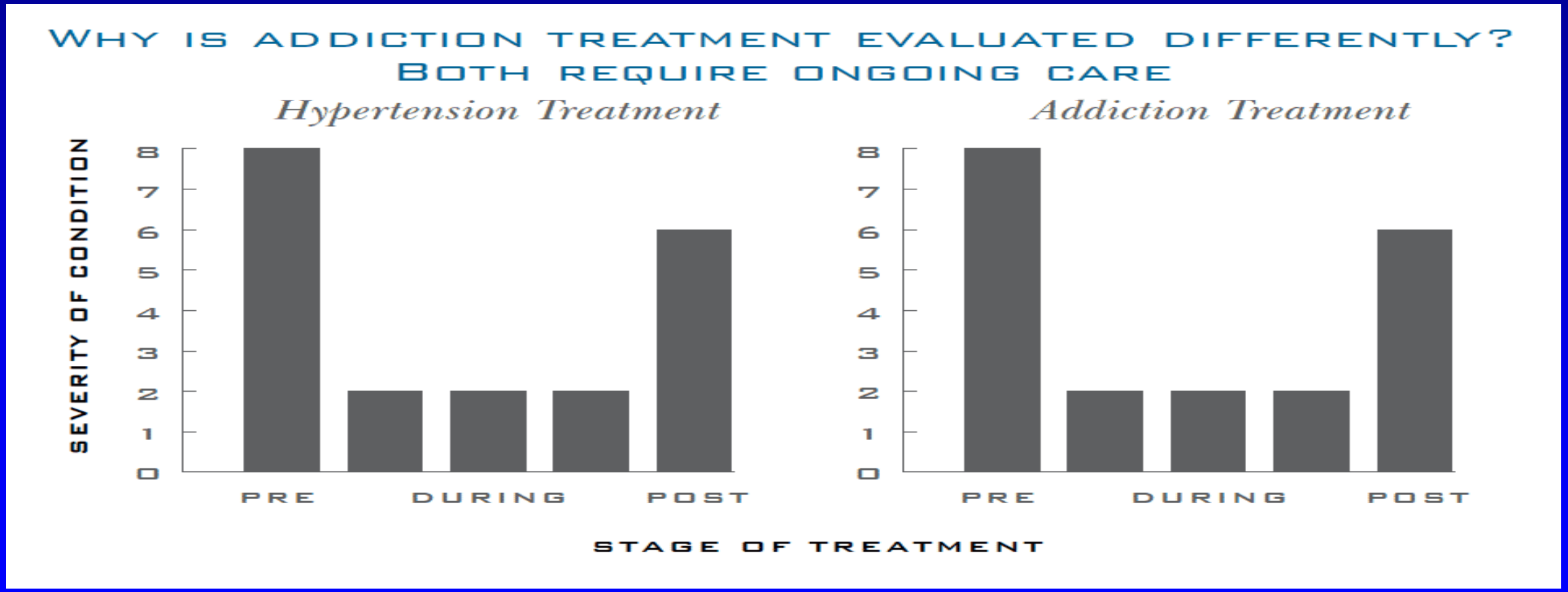


Outcomes - good as other chronic diseases

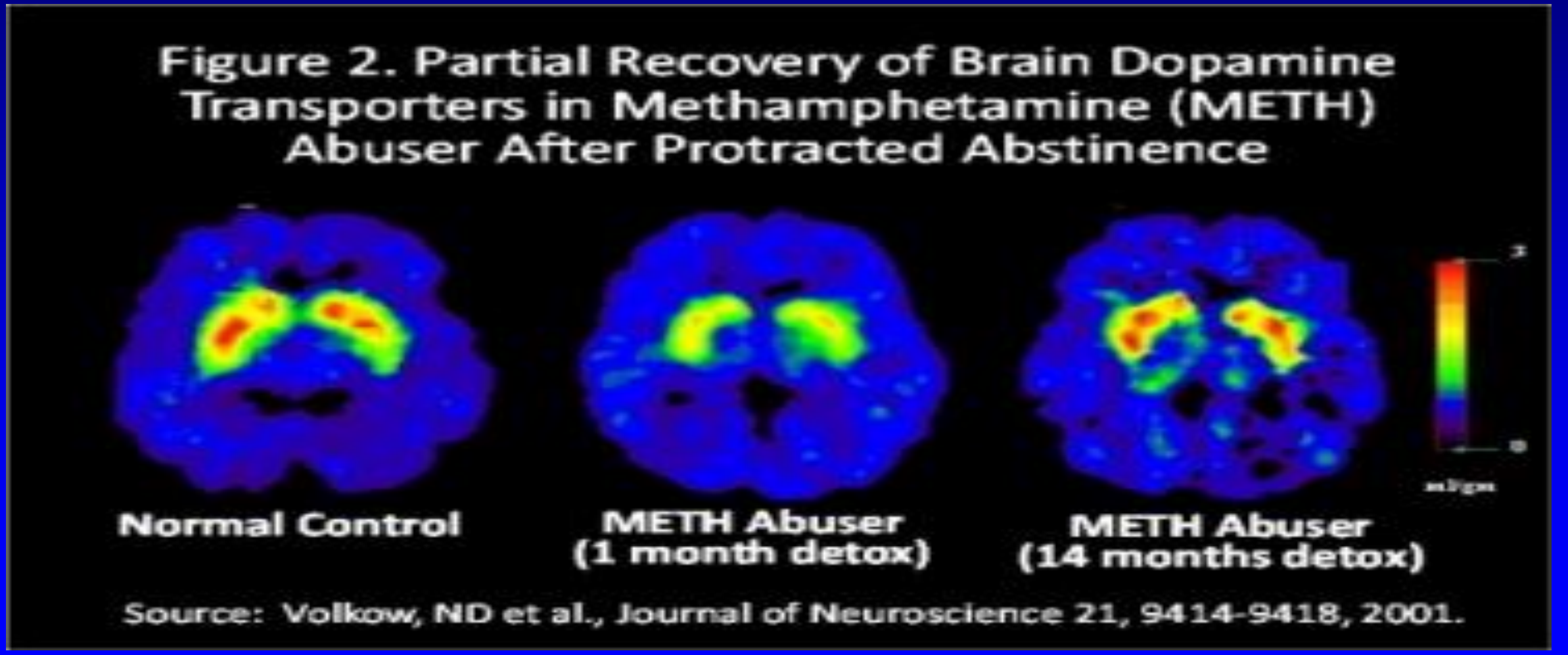


Source: McLellan, A.T. et al., JAMA, Vol 284(13), October 4, 2000.

If you stop your treatment plan, addiction returns – just like other chronic diseases

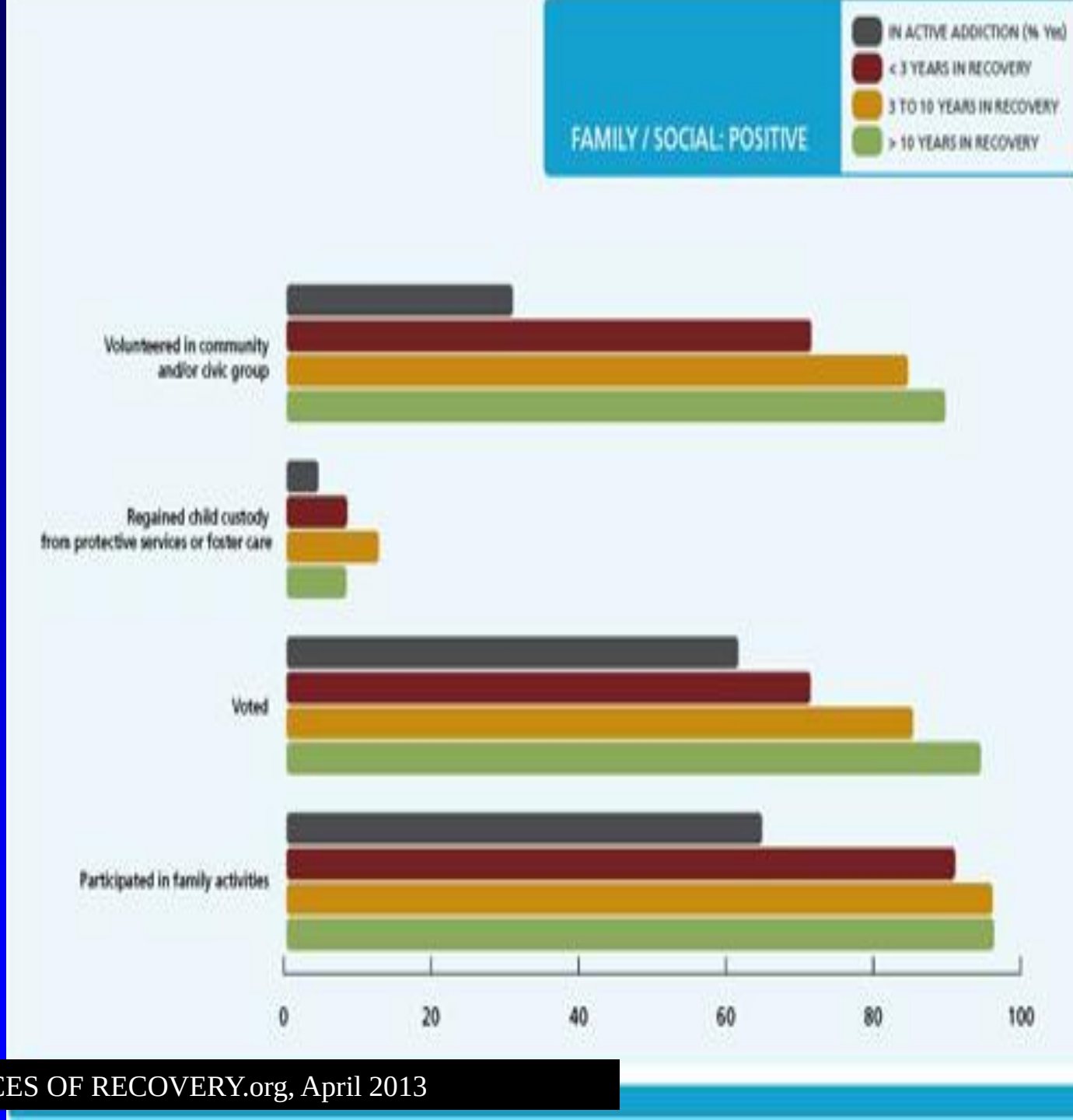


Some features of the brain may recover



ADDICTION RECOVERY > 10 years

- 93% vote vs 58% of the public
- 89% volunteer vs 25% of the public
- 93 % take care of their health
- 96% participate in family activities
- 89% are steadily employed
- 94 % get positive job evaluations
- 88% have furthered their education
- 39% have own their business.



Laudet A; "Life in Recovery" Report on Survey Findings, FACES ANDVOICES OF RECOVERY.org, April 2013

Penobscot Community Health Care offers Medication Assisted Treatment (MAT) integrated with psychotherapy and social work support services at our health centers in Old Town, Bangor, Brewer, Belfast.

To learn more
Please call (207) 404-8000 or go to www.pchc.com/recovery

To request a prescription for Naloxone (Narcan) for yourself or a loved one
Please call 207-404-8000 ext 2232 or 1157

http://www.recovery.org/learn/before-after-recovery/