

# Addiction Research: *Progress, Priorities, & Challenges*

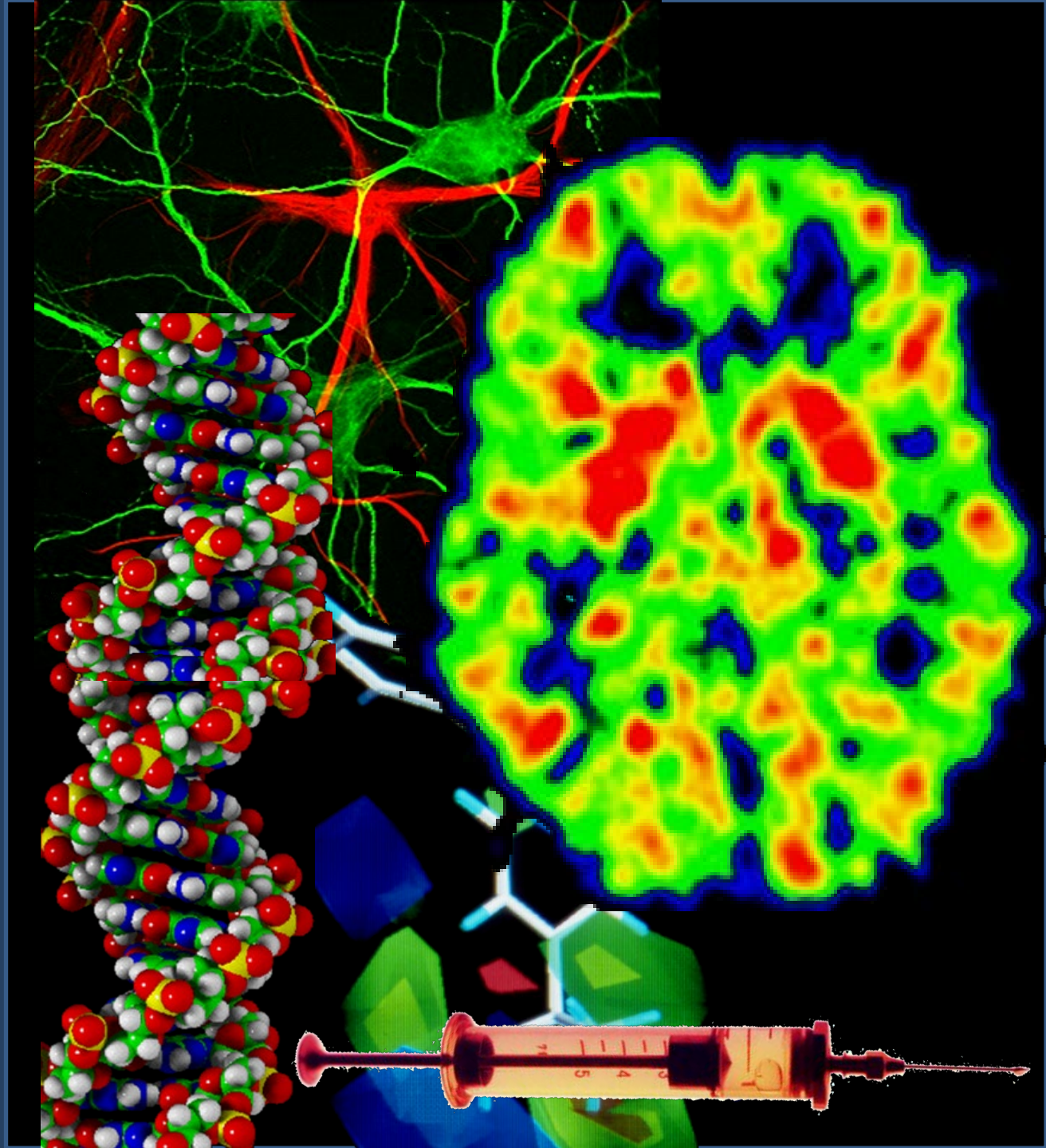
Nora D. Volkow, M.D.  
Director



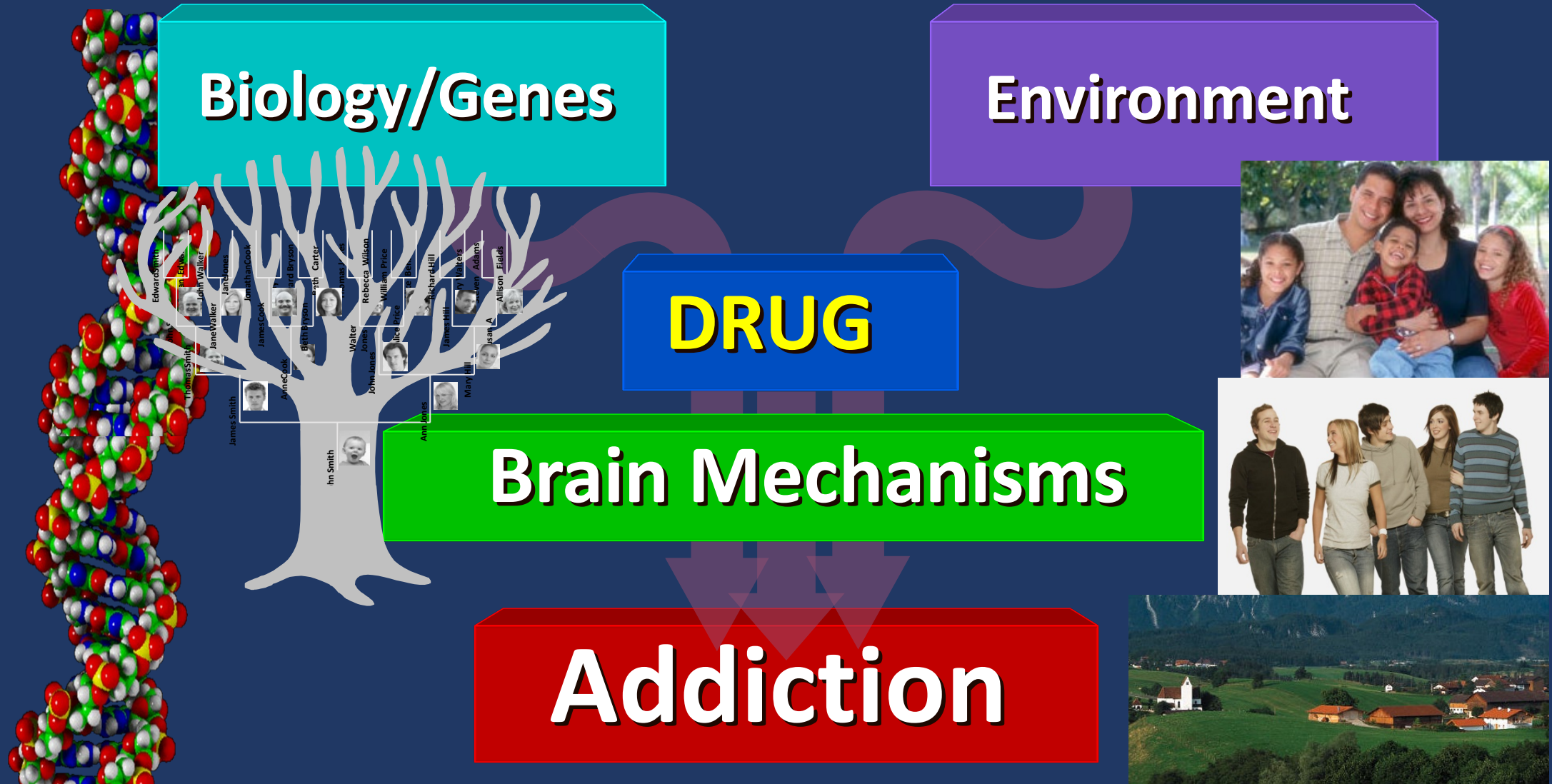
National Institute  
on Drug Abuse



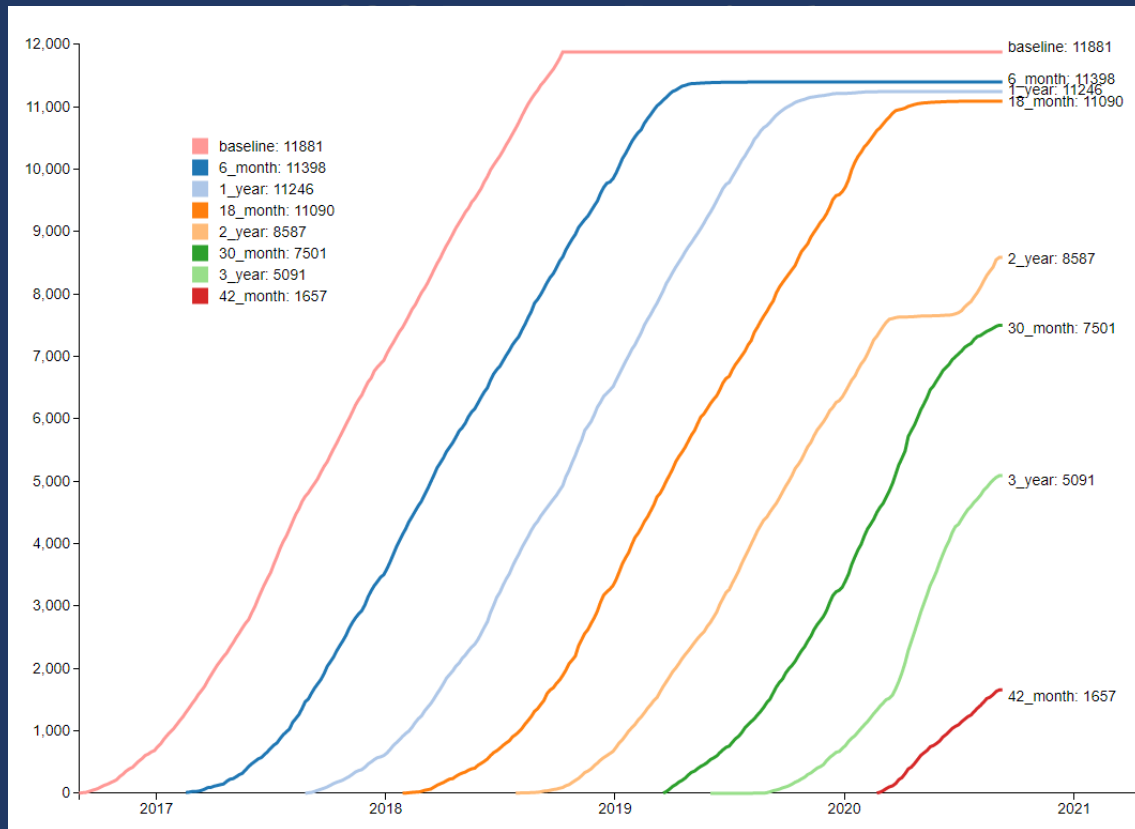
@NIDAnews



# Addiction Involves *Multiple Factors*



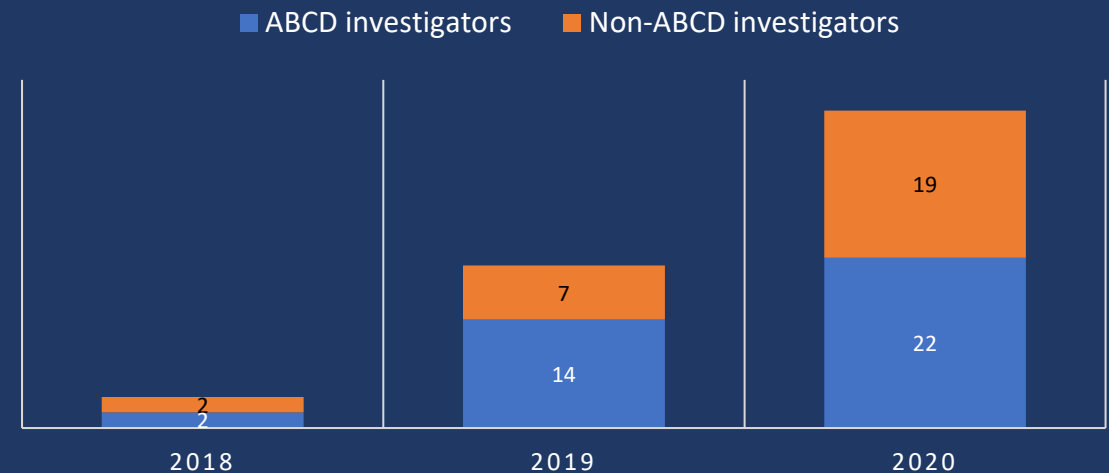
# Adolescent Brain Cognitive Development (ABCD) Study



## COVID-19 Adjustments

- Resumed 2-year follow-up visits (either virtually or hybrid)
  - In-person - brain imaging, select neurocog assessments and sensitive questionnaires
- No biospecimen collection
- 3-year follow-ups continuing virtually

## PUBLICATIONS USING ABCD DATA



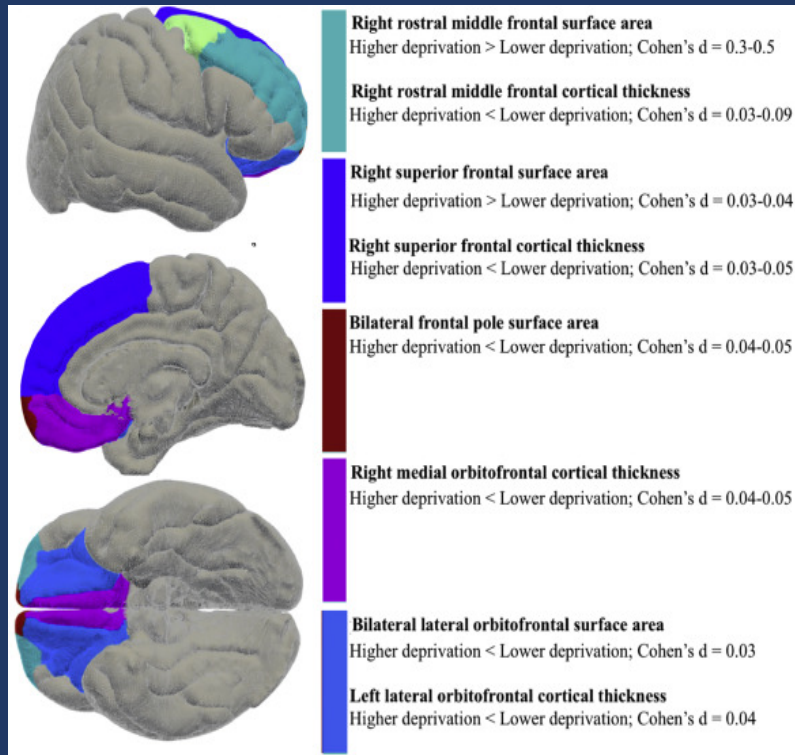
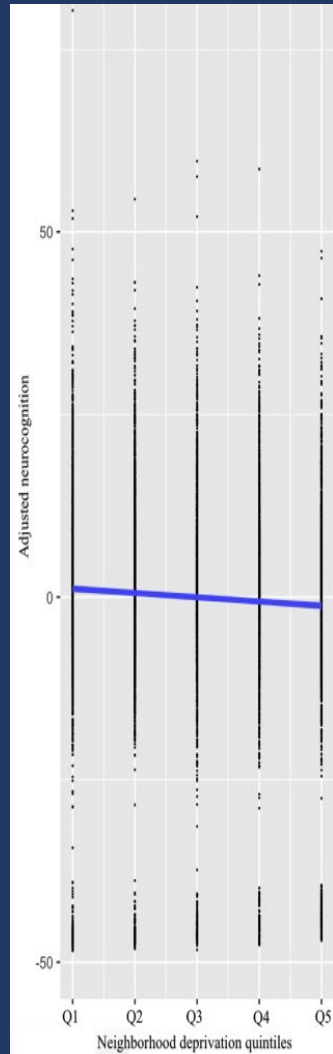
## COVID-19 Data Collection

- Monthly COVID-19 questionnaires beginning May
  - Funded by NSF, NIDA, NIMH, OBSSR, Children and Screens
- Characterize community- and regional-level impacts of COVID -19 by geocoding measures of incidence, spatial distancing, changes in (un)employment, and timing of state and/or local policies on mitigation practices
  - Funded by NIH COVID-19 Social, Behavioral, and Economic Impacts Group

**ABCD Data Release 3.0 Fall 2020** – 6-month and 1-year follow-up data for the full cohort; interim 18-, 24-, 30-month data

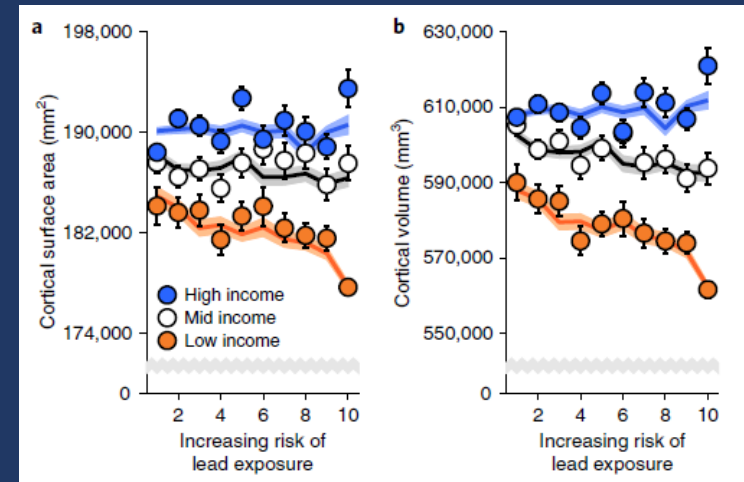
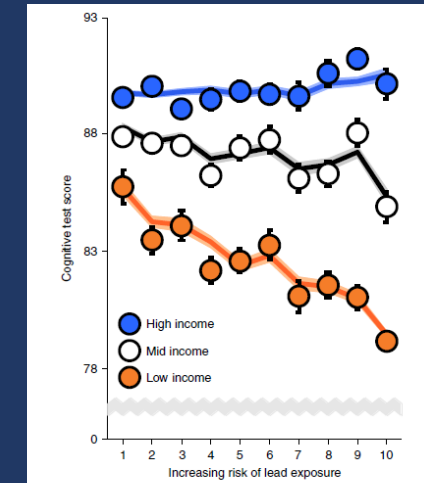


# Neighborhood Deprivation, Prefrontal Morphology and Neurocognition



Vargas T et al., Neuroimage 2020.

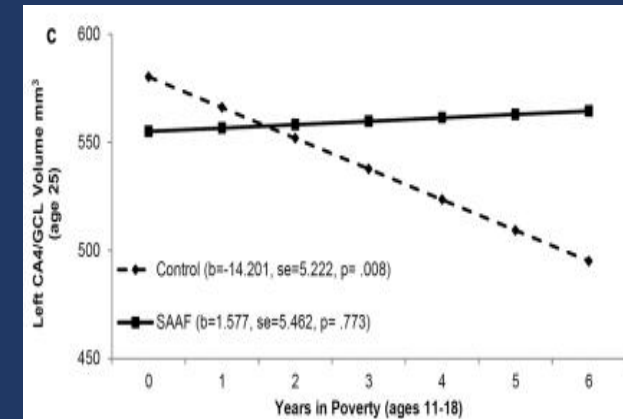
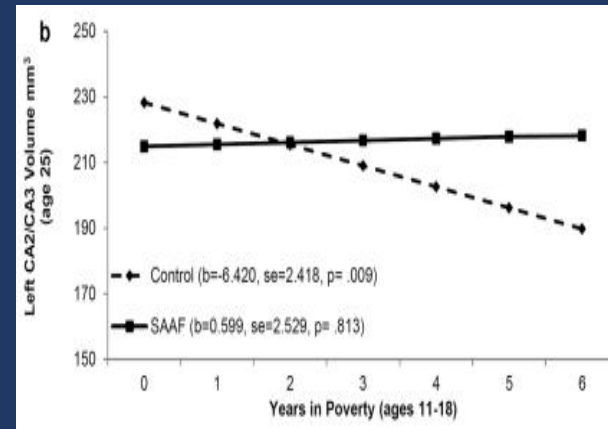
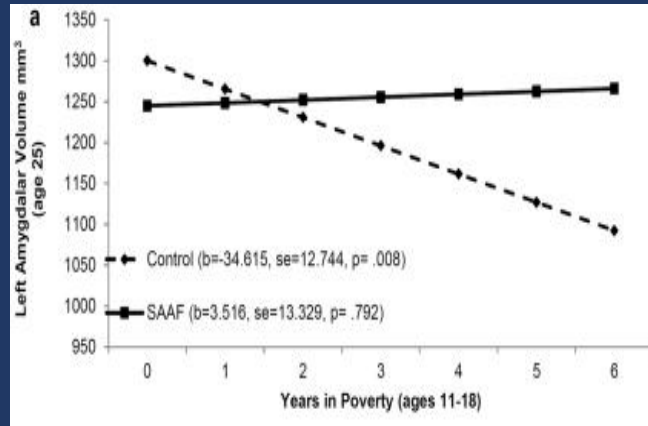
# Effects of Lead Exposure on Cognition and Brain Structure Modulated by Socioeconomics



Marshall AT et al., Nature Medicine, 2020; 91–97.

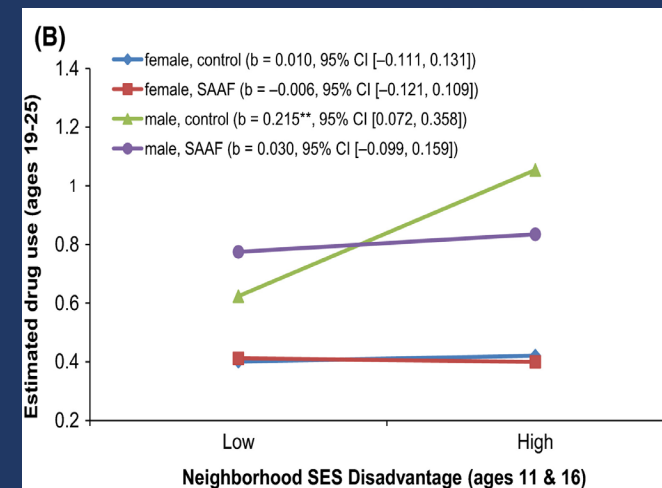
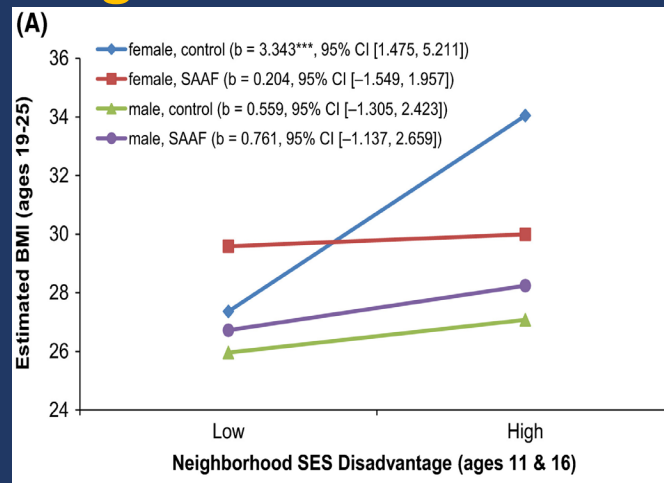
# Protective Effects of a Supportive Parenting Intervention (SAAF n=59) on Poverty's Effects on Brain Development (Control n=57)

Strong African American Families (SAAF)



Brody GH et al. JAMA Pediatr. 2017;171(1):46-52.

# Preventive Parenting Intervention (SAAF n=290) During Childhood and Young Black Adults' Unhealthful Behaviors (Control n=219)



Brody GH et al., J Child Psychology Psychiatry. 2019 60(1):63-71.

# Medical Treatment for Addictions

## Nicotine Addiction

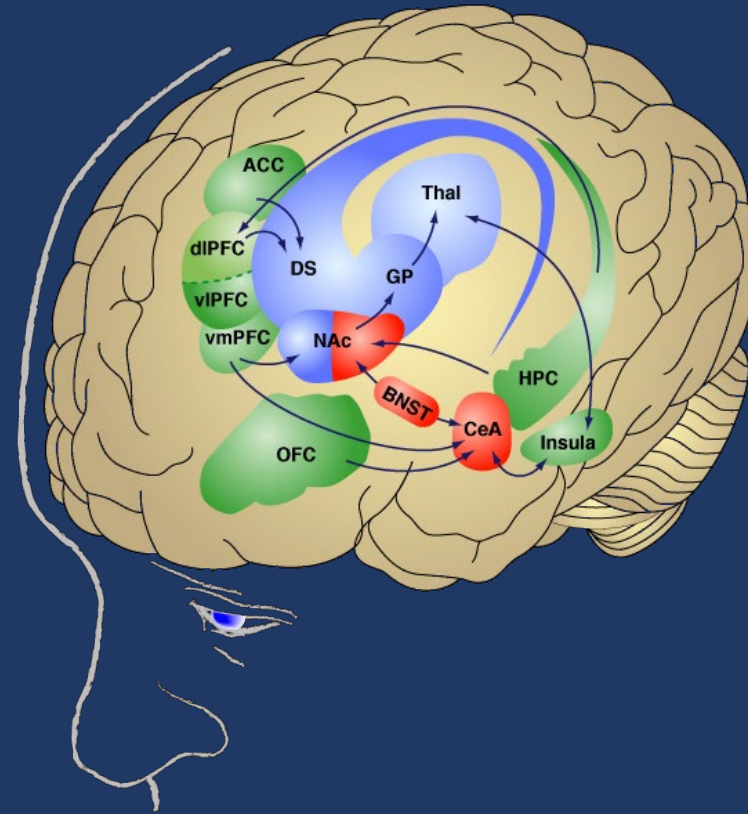
- Nicotine Replacement
- Bupropion
- Varenicline

## Alcoholism

- Disulfiram
- Naltrexone
- Acamprosate
- Naltrexone ER

## Opioid Addiction

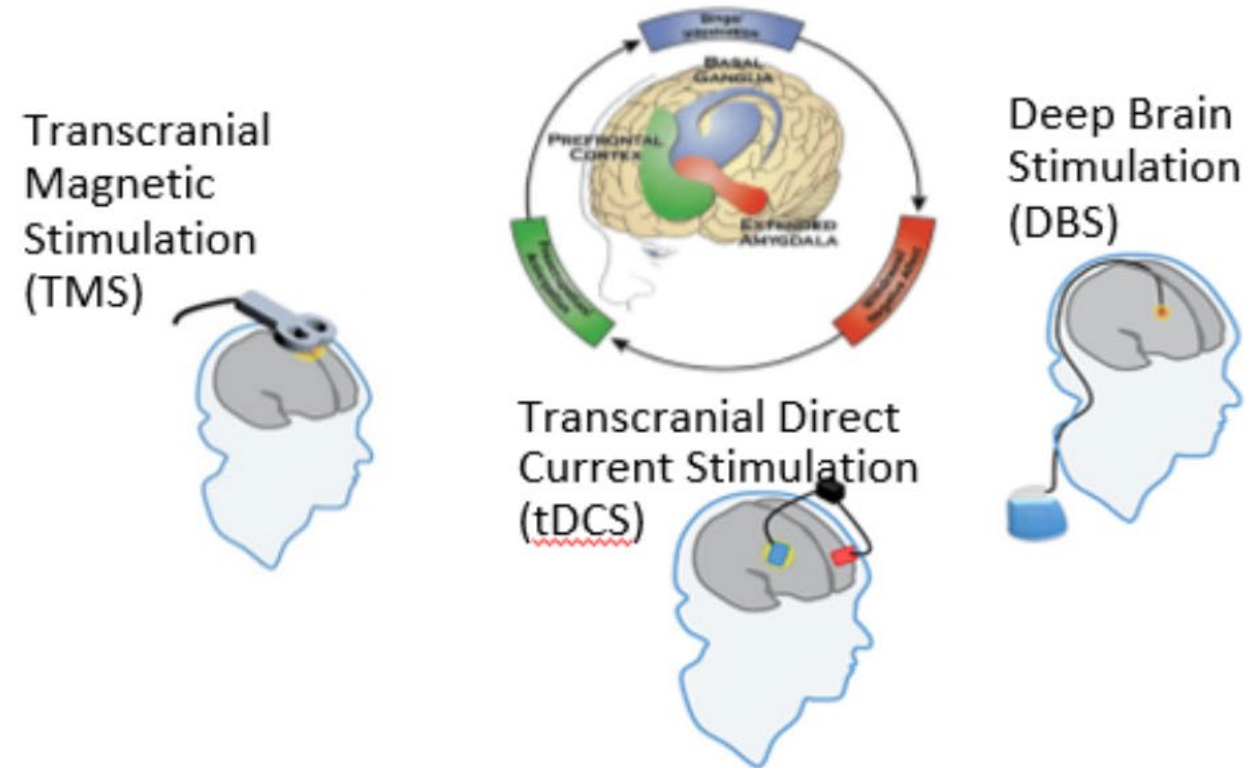
- Methadone
- Naltrexone ER
- Buprenorphine



*Planning, decision-making, impulse control, memory, language, processing social cues*

# EXPAND THERAPEUTIC OPTIONS

## ADDICTION CYCLE AND RELEVANT BRAIN REGIONS



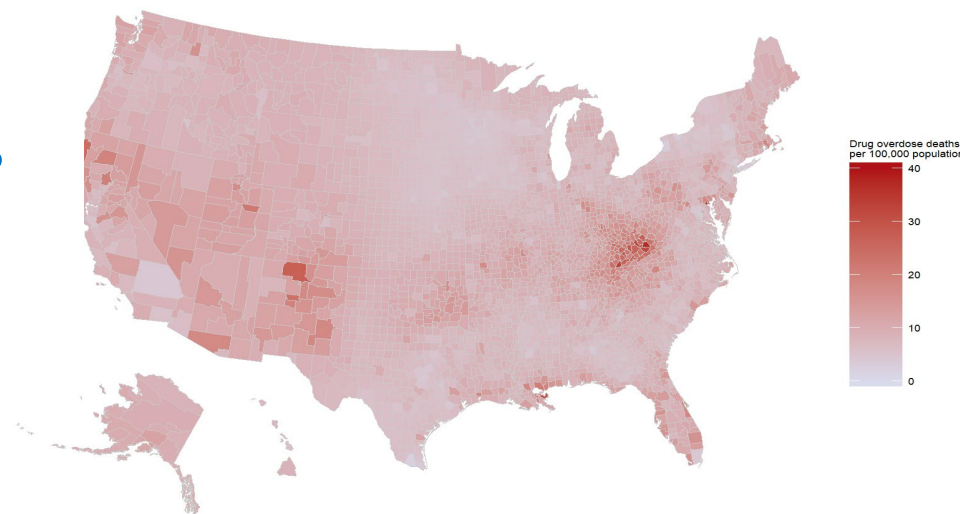


# THE CRISIS: NATIONAL OVERDOSE DEATH RATES

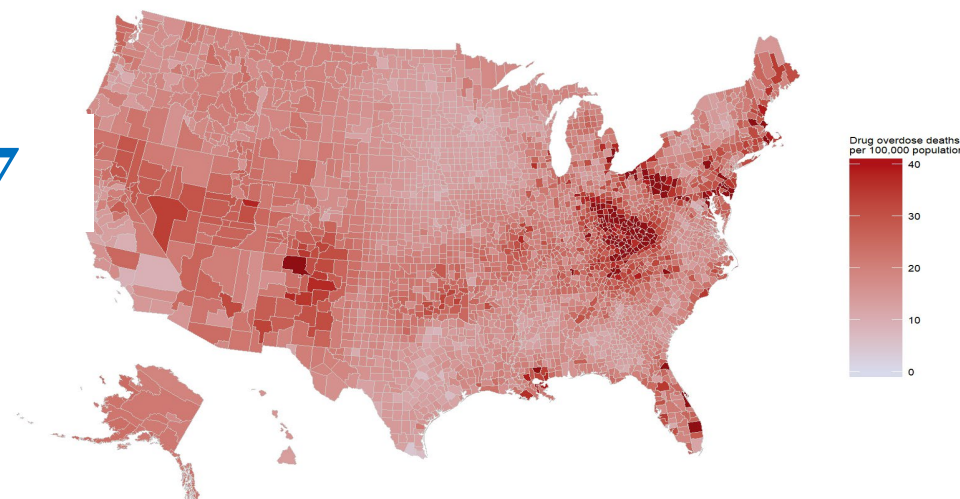
IN 2017, THERE WERE  
70,237 OVERDOSE  
DEATHS (9.6% HIGHER  
THAN 2016)

Source: <https://www.cdc.gov/nchs/data-visualization/drug-poisoning-mortality/index.htm>

2003



2017



- **SOURCE:** National Center for Health Statistics, National Vital Statistics System, mortality data (<http://www.cdc.gov/nchs/deaths.htm>).
- **SUGGESTED CITATION:** Rossen LM, Bastian B, Warner M, Khan D, Chong Y. Drug poisoning mortality: United States, 2003–2017. National Center for Health Statistics. 2019. (Available from: <https://www.cdc.gov/nchs/data-visualization/drug-poisoning-mortality/>).

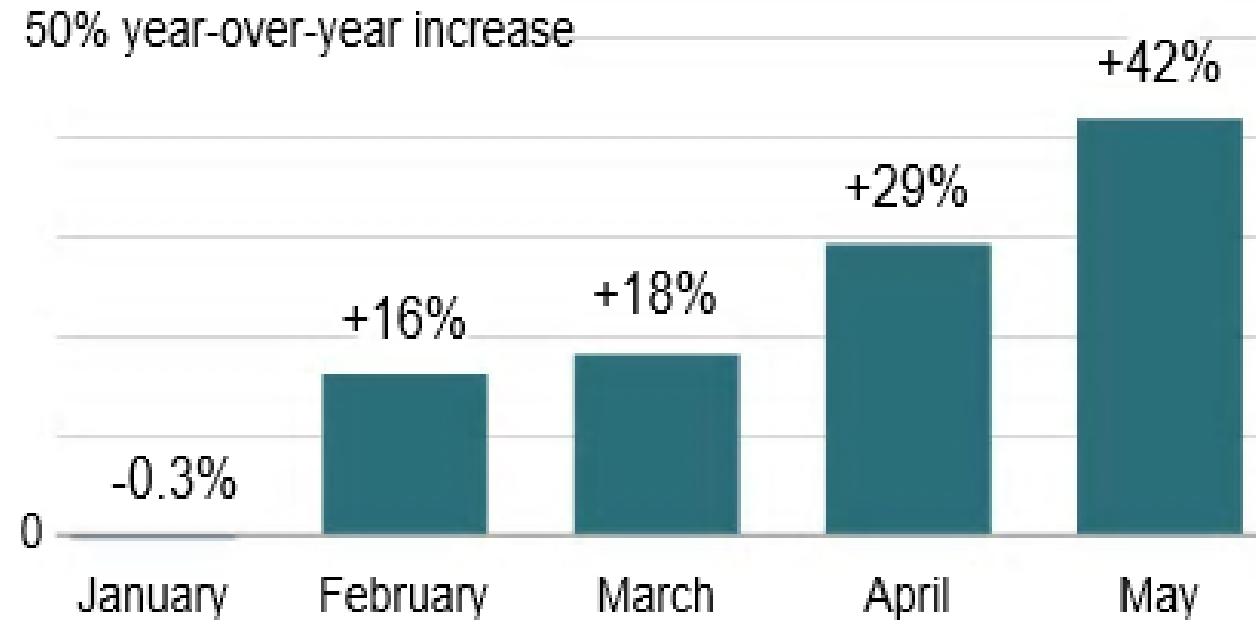


# *Intersection Between COVID-19 and SUD*



# Overdoses Grew Dramatically During COVID Pandemic

Overdoses increased up to 42% per month during the pandemic, as compared to the same months in 2019.



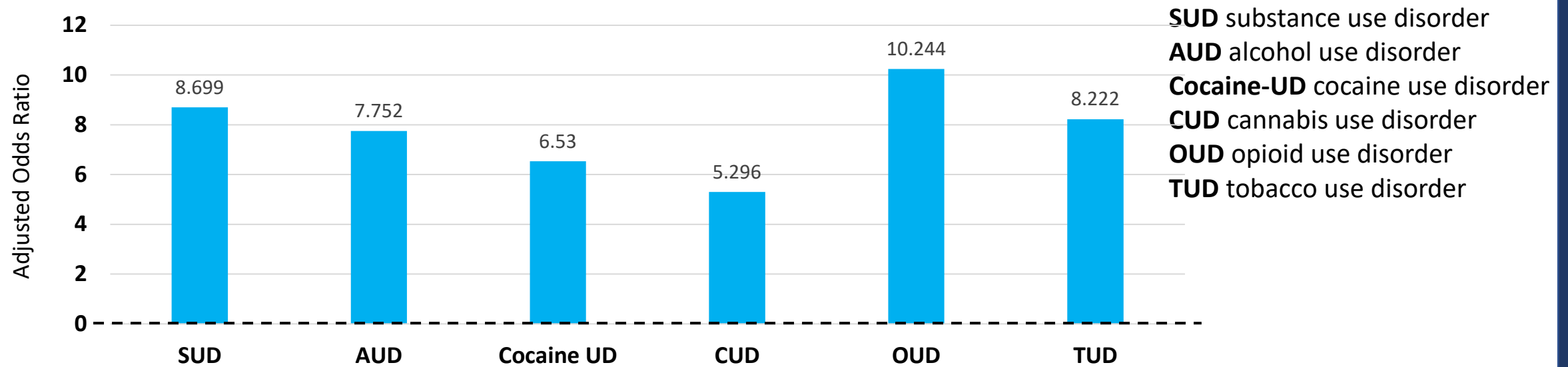
Note: Percent growth references the 1,201 agencies reporting to ODMAP by January

Source: **ODMAP**  
OVERDOSE DETECTION  
MAPPING APPLICATION PROGRAM

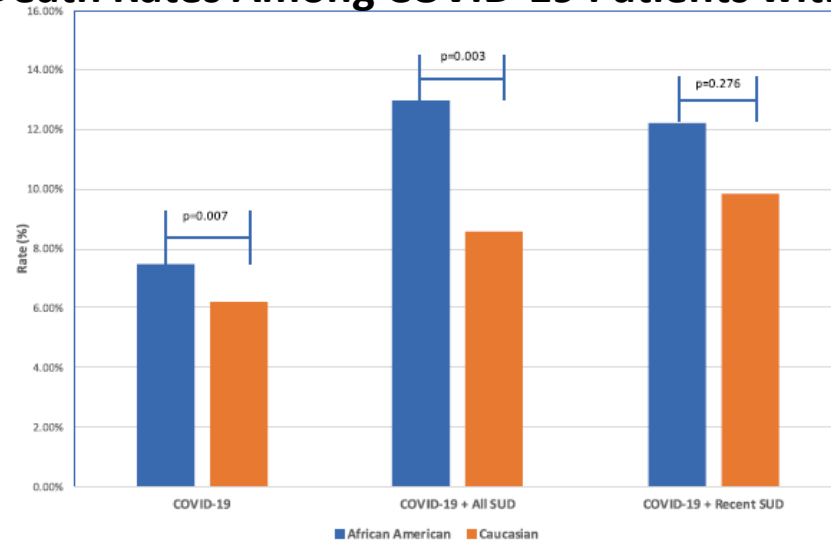
ALYSSA FOWERS/THE WASHINGTON POST

# COVID-19 Risk In Patients With Substance Use Disorders

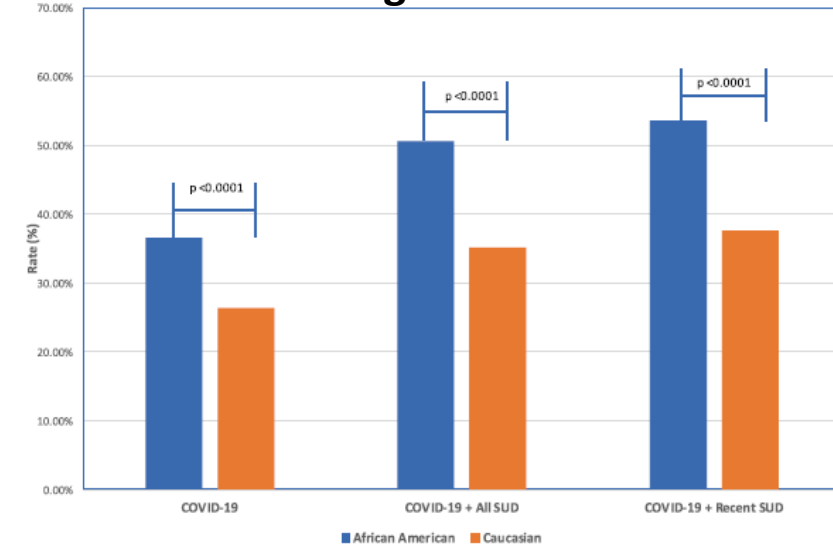
## Risk Associations Between Recent SUD Diagnosis and COVID-19



## Death Rates Among COVID-19 Patients with SUD



## Hospitalization Rates Among COVID-19 Patients with SUD





## By TIM PADMORE

**T**HE RATS IN Rat Park have friends, room to roam and things to climb on and explore. Heroin is no curse here: the rats can take it or leave it, and mostly they leave it alone.

The rats in Rat Oaklands are in solitary, penned up in little 18-by-25 centimetre cages, with nothing to do but sleep, eat and, if they choose, take a blast of the white stuff. They're nearly all far-gone junkies.

The scene is the Simon Fraser University laboratory of psychologist Bruce Alexander where he and two graduate students have been studying the influence of environment on narcotic addiction.

Their experiments give fascinating insights into the mechanisms of addiction. They also remove the cornerstone of a cherished belief of many addiction experts that heroin addiction is a weakness of the flesh from which people must be carefully protected.

Twenty years ago the first experiments were done in which rats were forcibly addicted and then offered a free choice of morphine solution or plain water to drink. The rats invariably chose morphine. In

Patricia Horvat and Robert Coombs, en-

"The three of us reacted in the same way. If it was true, it meant that addiction is a weakness of the flesh and it was an argument for political control. Keep the

Rats, he explained, are very gregarious

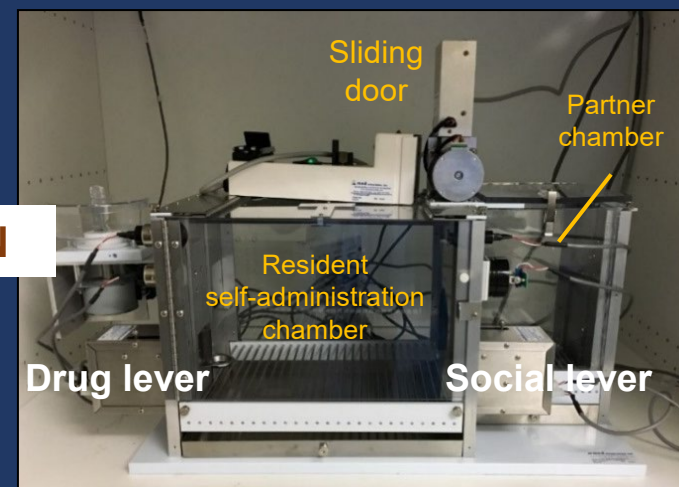
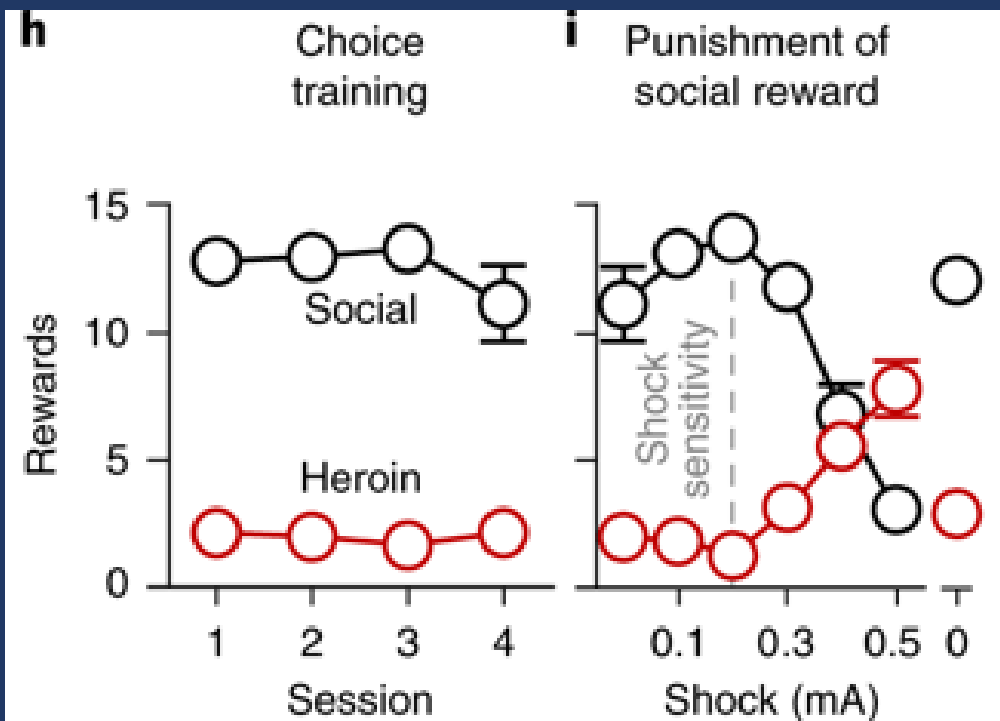
creatures, with intricate social and sexual behavior. Kept in cages, they are less active, gain weight and become extremely timid. Perhaps, the psychologists conjectured, caged rats are unhappy, lonely and frustrated and maybe that affects their

To test the idea, they built Rat Park, an eight-square-metre plywood enclosure fitted out with open-ended boxes and poles to provide places to shelter in and explore. The lighting was timed to coincide with a normal day/night cycle. The walls were

pointed with a local landscape — although that was done more for the experimenters' benefit than for the rats', to ease the monotony of watching.

CONTENTED RAT SURVEYS HIS DOMAIN in Rat Park at Simon Fraser University

## HEROIN



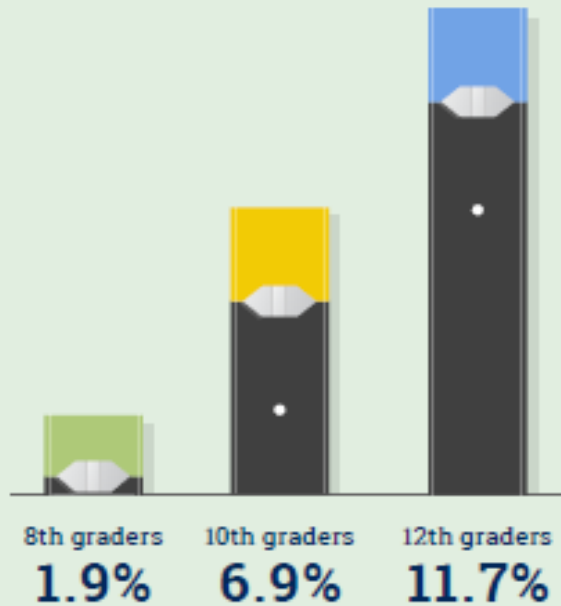
**Vennirol et al., Nature Neuroscience 2018**

# Significant Increases in Teens VAPING

## NICOTINE

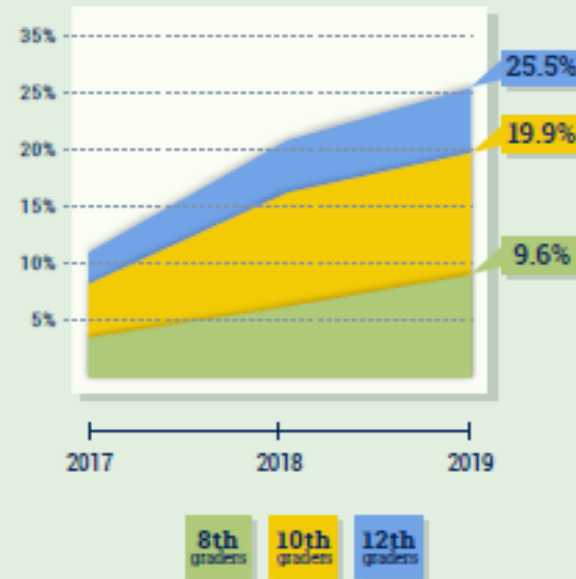
### DAILY NICOTINE VAPING<sup>1</sup>

Measured for the first time in 2019



### NICOTINE VAPING

Past month use



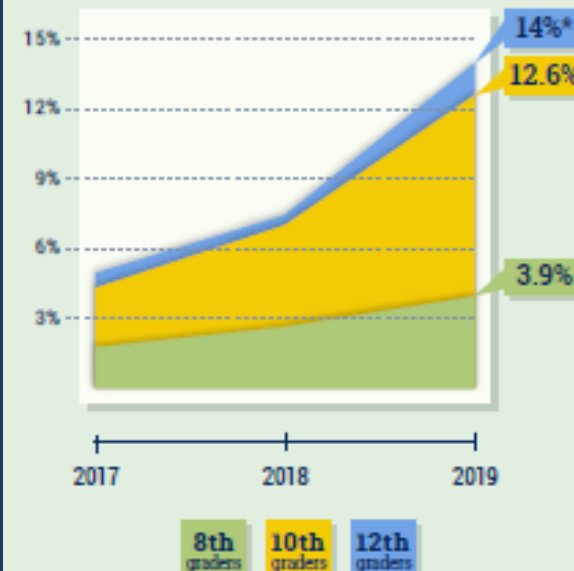
1. Miech R, Johnston L, O'Malley PM, Bachman JG, Patrick ME. Trends in adolescent vaping, 2017–2019. *N Engl J Med* 2019; 381:1490-1491

2019 Past Month Nicotine Vaping Equates to:  
1 IN 4 – 12TH GRADERS • 1 IN 5 – 10TH GRADERS • 1 IN 10 – 8TH GRADERS

## THC

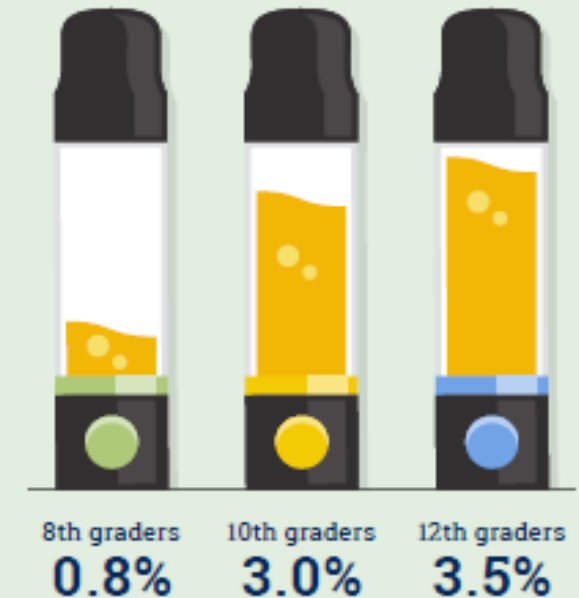
### THC VAPING

Past month use



### DAILY THC VAPING

Measured for the first time in 2019



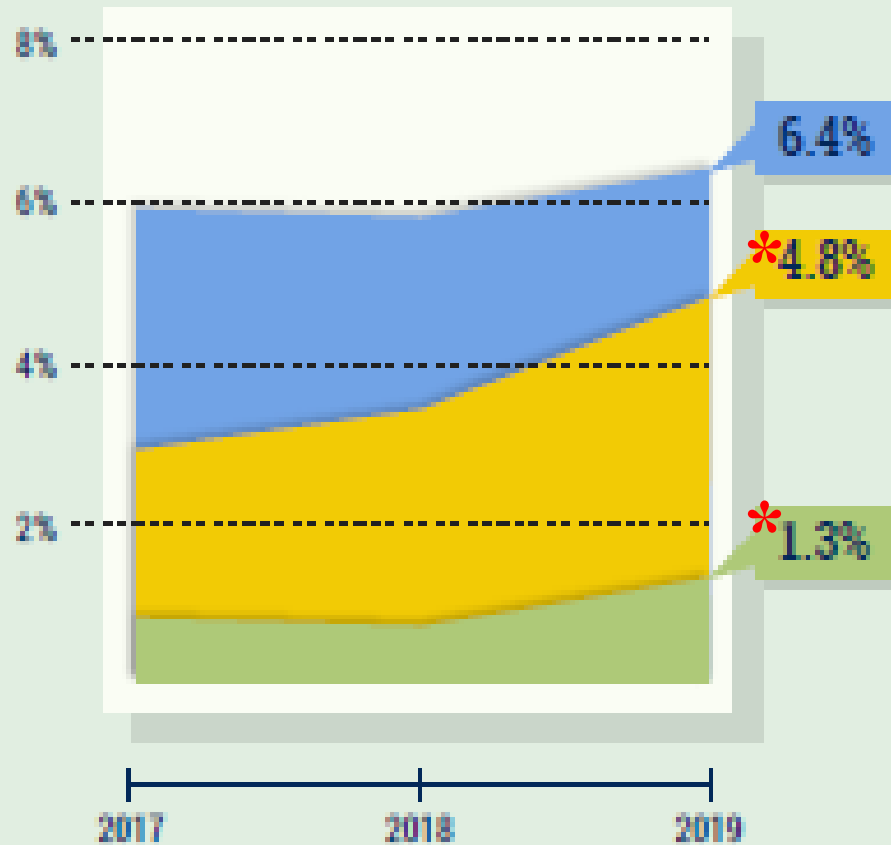
\*2018 – 2019 INCREASE IS THE SECOND LARGEST ONE-YEAR JUMP EVER TRACKED FOR ANY SUBSTANCE IN THE 45-YEAR SURVEY HISTORY (NICOTINE VAPING WAS THE LARGEST FROM 2017 – 2018)

SOURCE: University of Michigan, 2019 Monitoring the Future Study

# Daily Marijuana Increased in Teenagers

## DAILY MARIJUANA USE

sees significant increase among  
8th and 10th graders since 2018



## Cannabis Potency Tripled in Past 20 Years

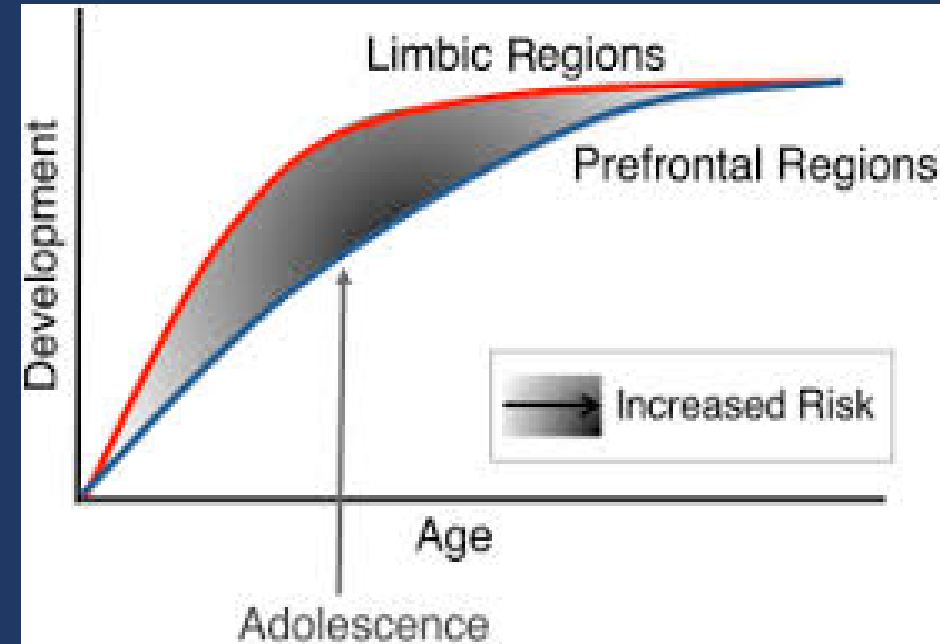
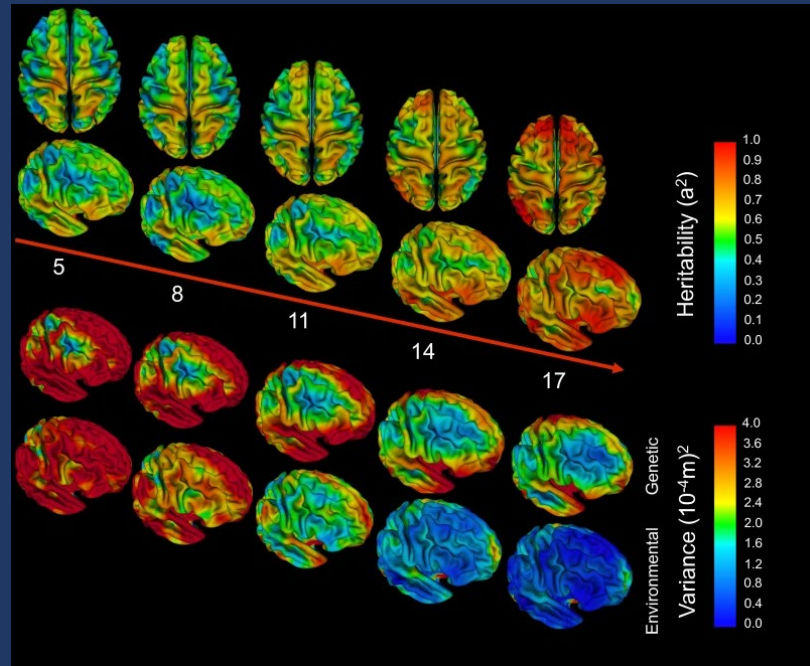


Potency of Cannabis Samples Seized by the DEA. Source: Potency Monitoring Program, Quarterly Report # 142, NIDA Contract Number: N01DA-15-7793

SOURCE: University of Michigan, 2019 Monitoring the Future Study

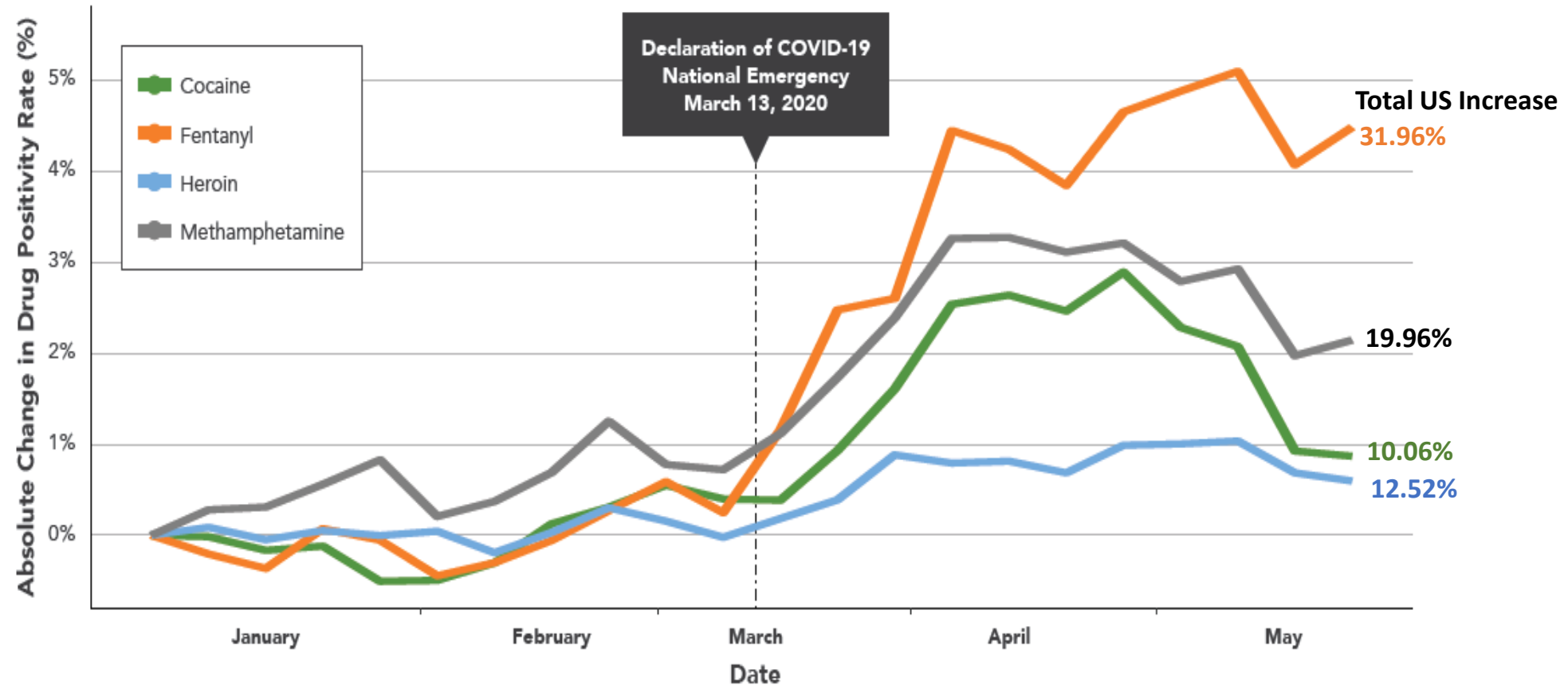


# Role Of **Genetics** On Brain Development



- Highest heritability in evolutionarily novel regions (temporal poles, inferior parietal lobes, and superior and dorsolateral frontal cortices)
- Heritability increased through late childhood and adolescence.

# Drug Use Increase During COVID



Millennium Health Signals Report™ **COVID-19 Special Edition:**

Significant Changes in Drug Use During the Pandemic Volume 2.1 Published July 2020

**Total Study Population Change in Unadjusted Positivity Rate for Cocaine, Fentanyl, Heroin and Methamphetamine**